



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



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DOT HS 810 767

April 2007

# Pre-Crash Scenario Typology for Crash Avoidance Research

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## REPORT DOCUMENTATION PAGE

*Form Approved  
OMB No. 0704-0188*

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED	
	April 2007	Final Report, 2004 - 2006 October 2003 – October 2005	
4. TITLE AND SUBTITLE Pre-Crash Scenario Typology for Crash Avoidance Research		5. FUNDING NUMBERS  PPA # HS-19	
6. AUTHOR(S) Wassim G. Najm, John D. Smith, and Mikio Yanagisawa			
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) U.S. Department of Transportation Research and Innovative Technology Administration John A. Volpe National Transportation Systems Center Cambridge, MA 02142		8. PERFORMING ORGANIZATION REPORT NUMBER  DOT-VNTSC-NHTSA-06-02	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) U.S. Department of Transportation National Highway Traffic Safety Administration 400 7 <sup>th</sup> St. SW Washington, DC 20590		10. SPONSORING/MONITORING AGENCY REPORT NUMBER  DOT HS 810 767	
11. SUPPLEMENTARY NOTES			
12a. DISTRIBUTION/AVAILABILITY STATEMENT  This document is available to the public through the National Technical Information Service, Springfield, Virginia 22161.		12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words)  This report defines a new pre-crash scenario typology for crash avoidance research based on the 2004 General Estimates System (GES) crash database, which consists of pre-crash scenarios depicting vehicle movements and dynamics as well as the critical event immediately prior to a crash. This typology establishes a common vehicle safety research foundation for public and private organizations, which will allow researchers to determine which traffic safety issues should be of first priority to investigate and to develop concomitant crash avoidance systems. Its main objectives are to identify all common pre-crash scenarios of all police-reported crashes involving at least one light vehicle (i.e., passenger car, sports utility vehicle, van, minivan, and light pickup truck); quantify their severity in terms of frequency of occurrence, economic cost, and functional years lost; portray each scenario by crash contributing factors and circumstances in terms of the driving environment, driver, and vehicle; and provide nationally representative crash statistics that can be annually updated using national crash databases such as GES. This new typology includes 37 pre-crash scenarios accounting for approximately 5,942,000 police-reported light-vehicle crashes, an estimated economic cost of 120 billion dollars, and 2,767,000 functional years lost. These statistics do not incorporate data from non-police-reported crashes.			
14. SUBJECT TERMS General Estimates System, pre-crash scenarios, vehicle safety research, crash avoidance research, crash frequency, economic cost, functional years lost		15. NUMBER OF PAGES 128	
		16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT



## PREFACE

The National Highway Traffic Safety Administration (NHTSA), in conjunction with the Research and Innovative Technology Administration's Volpe National Transportation Systems Center (Volpe Center), conducts vehicle safety research in crash avoidance and crashworthiness. In particular, extensive analyses have been performed to define the crash and injury problems, identify intervention opportunities, assess the state-of-the-art technology for crash avoidance and injury mitigation systems, and estimate potential safety benefits of promising systems. This research supports NHTSA's mission to save lives, prevent injuries, and reduce health care and other economic costs associated with motor vehicle crashes.

This report presents results obtained from the analysis of the 2004 General Estimates System crash database. It describes a new typology of pre-crash scenarios leading to all police-reported crashes that involve at least one light vehicle (e.g., passenger car, sports utility vehicle, van, minivan, and light pickup truck).

Authors of this report are Wassim G. Najm, John D. Smith, and Mikio Yanagisawa of the Volpe Center.

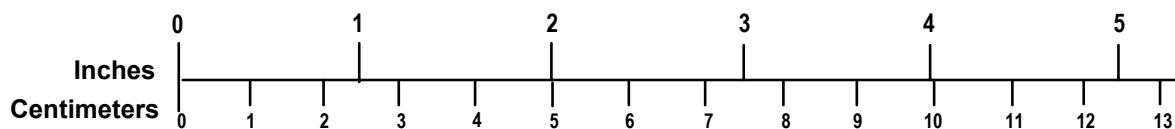
The authors acknowledge the technical contribution and cooperation from Dr. David L. Smith and Mr. Ray Resendes of NHTSA. This acknowledgement is also extended to Mr. Richard Deering of General Motors for his technical support and desire for cooperation between the automotive industry and NHTSA in vehicle safety research. Also acknowledged are the technical staffs from the Crash Avoidance Metrics Partnership.

## METRIC/ENGLISH CONVERSION FACTORS

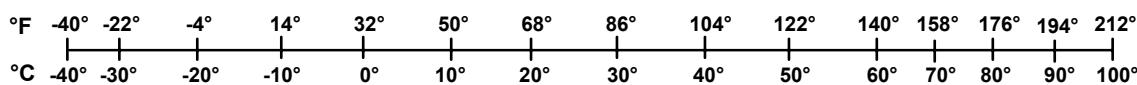
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<b>LENGTH (APPROXIMATE)</b> <p>1 inch (in) = 2.5 centimeters (cm)          1 foot (ft) = 30 centimeters (cm)          1 yard (yd) = 0.9 meter (m)          1 mile (mi) = 1.6 kilometers (km)</p>	<b>LENGTH (APPROXIMATE)</b> <p>1 millimeter (mm) = 0.04 inch (in)          1 centimeter (cm) = 0.4 inch (in)          1 meter (m) = 3.3 feet (ft)          1 meter (m) = 1.1 yards (yd)          1 kilometer (km) = 0.6 mile (mi)</p>
<b>AREA (APPROXIMATE)</b> <p>1 square inch (sq in, in<sup>2</sup>) = 6.5 square centimeters (cm<sup>2</sup>)          1 square foot (sq ft, ft<sup>2</sup>) = 0.09 square meter (m<sup>2</sup>)          1 square yard (sq yd, yd<sup>2</sup>) = 0.8 square meter (m<sup>2</sup>)          1 square mile (sq mi, mi<sup>2</sup>) = 2.6 square kilometers (km<sup>2</sup>)          1 acre = 0.4 hectare (ha) = 4,000 square meters (m<sup>2</sup>)</p>	<b>AREA (APPROXIMATE)</b> <p>1 square centimeter (cm<sup>2</sup>) = 0.16 square inch (sq in, in<sup>2</sup>)          1 square meter (m<sup>2</sup>) = 1.2 square yards (sq yd, yd<sup>2</sup>)          1 square kilometer (km<sup>2</sup>) = 0.4 square mile (sq mi, mi<sup>2</sup>)          10,000 square meters (m<sup>2</sup>) = 1 hectare (ha) = 2.5 acres</p>
<b>MASS - WEIGHT (APPROXIMATE)</b> <p>1 ounce (oz) = 28 grams (gm)          1 pound (lb) = 0.45 kilogram (kg)          1 short ton = 2,000 pounds (lb) = 0.9 tonne (t)</p>	<b>MASS - WEIGHT (APPROXIMATE)</b> <p>1 gram (gm) = 0.036 ounce (oz)          1 kilogram (kg) = 2.2 pounds (lb)          1 tonne (t) = 1,000 kilograms (kg)          = 1.1 short tons</p>
<b>VOLUME (APPROXIMATE)</b> <p>1 teaspoon (tsp) = 5 milliliters (ml)          1 tablespoon (tbsp) = 15 milliliters (ml)          1 fluid ounce (fl oz) = 30 milliliters (ml)          1 cup (c) = 0.24 liter (l)          1 pint (pt) = 0.47 liter (l)          1 quart (qt) = 0.96 liter (l)          1 gallon (gal) = 3.8 liters (l)          1 cubic foot (cu ft, ft<sup>3</sup>) = 0.03 cubic meter (m<sup>3</sup>)          1 cubic yard (cu yd, yd<sup>3</sup>) = 0.76 cubic meter (m<sup>3</sup>)</p>	<b>VOLUME (APPROXIMATE)</b> <p>1 milliliter (ml) = 0.03 fluid ounce (fl oz)          1 liter (l) = 2.1 pints (pt)          1 liter (l) = 1.06 quarts (qt)          1 liter (l) = 0.26 gallon (gal)          1 cubic meter (m<sup>3</sup>) = 36 cubic feet (cu ft, ft<sup>3</sup>)          1 cubic meter (m<sup>3</sup>) = 1.3 cubic yards (cu yd, yd<sup>3</sup>)</p>
<b>TEMPERATURE (EXACT)</b> <p><math>[(x-32)(5/9)]^{\circ}\text{F} = y^{\circ}\text{C}</math></p>	<b>TEMPERATURE (EXACT)</b> <p><math>[(9/5)y + 32]^{\circ}\text{C} = x^{\circ}\text{F}</math></p>

### QUICK INCH - CENTIMETER LENGTH CONVERSION



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Updated 6/17/98

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## EXECUTIVE SUMMARY

This report defines and statistically describes a new pre-crash scenario typology for light vehicles (i.e., passenger car, sports utility vehicle, minivan, van, and light pickup truck) based on the 2004 General Estimates System (GES) crash database. This new typology consists of pre-crash scenarios that depict vehicle movements and dynamics as well as the critical event occurring immediately prior to a crash. The goal of this typology is to establish a common vehicle safety research foundation for public and private organizations, which will allow researchers to determine which traffic safety issues should be of first priority to investigate and to develop concomitant crash avoidance systems. Its main objectives are to identify all common pre-crash scenarios of all police-reported crashes involving at least one light vehicle; quantify their severity in terms of frequency of occurrence, economic cost, and functional years lost; portray each scenario by crash contributing factors and circumstances in terms of the driving environment, driver, and vehicle; and provide nationally representative crash statistics that can be annually updated using GES and the Crashworthiness Data System (CDS) crash databases.

The following 37 pre-crash scenarios, including “other”, comprise the new typology:

<b>1</b>	Vehicle Failure
<b>2</b>	Control Loss With Prior Vehicle Action
<b>3</b>	Control Loss Without Prior Vehicle Action
<b>4</b>	Running Red Light
<b>5</b>	Running Stop Sign
<b>6</b>	Road Edge Departure With Prior Vehicle Maneuver
<b>7</b>	Road Edge Departure Without Prior Vehicle Maneuver
<b>8</b>	Road Edge Departure While Backing Up
<b>9</b>	Animal Crash With Prior Vehicle Maneuver
<b>10</b>	Animal Crash Without Prior Vehicle Maneuver
<b>11</b>	Pedestrian Crash With Prior Vehicle Maneuver
<b>12</b>	Pedestrian Crash Without Prior Vehicle Maneuver
<b>13</b>	Pedalcyclist Crash With Prior Vehicle Maneuver
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<b>20</b>	Vehicle(s) Making a Maneuver – Opposite Direction
<b>21</b>	Vehicle(s) Not Making a Maneuver – Opposite Direction
<b>22</b>	Following Vehicle Making a Maneuver

<b>23</b>	Lead Vehicle Accelerating
<b>24</b>	Lead Vehicle Moving at Lower Constant Speed
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<b>32</b>	Evasive Action With Prior Vehicle Maneuver
<b>33</b>	Evasive Action Without Prior Vehicle Maneuver
<b>34</b>	Non-Collision Incident
<b>35</b>	Object Crash With Prior Vehicle Maneuver
<b>36</b>	Object Crash Without Prior Vehicle Maneuver
<b>37</b>	Other

- Vehicle Action refers to a vehicle decelerating, accelerating, starting, passing, parking, turning, backing up, changing lanes, merging, and successful corrective action to a previous critical event.
- Vehicle Maneuver denotes passing, parking, turning, changing lanes, merging, and successful corrective action to a previous critical event.

Pre-crash scenarios listed above accounted for approximately 5,942,000 police-reported crashes involving at least one light vehicle, and resulted in an estimated economic cost of \$120 billion and 2,767,000 functional years lost. These statistics do not incorporate data from non-police-reported crashes. Excluding “other” scenario, this new pre-crash scenario typology represents about 99.4 percent of all light-vehicle crashes.

Pre-crash scenarios of this new typology were ranked using three measures: crash frequency, functional years lost, and economic cost. Table ES-1 lists the dominant pre-crash scenarios emerging from the top five scenarios in each of the three measures.

Ranking by crash frequency, the five most frequent scenarios accounted for 45 percent of all police-reported light-vehicle crashes. Ranking by functional years lost, the top five scenarios resulted in 49 percent of all years lost. Ranking by economic cost, the top five scenarios contributed to 46 percent of all cost associated with light-vehicle crashes. As seen in Table ES-1, the three most dominant scenarios are:

1. Control loss without prior vehicle action
2. Lead vehicle stopped
3. Road edge departure without prior vehicle maneuver

**Table ES-1.** Dominant Pre-Crash Scenarios

Scenario	Occurrence		Functional Years Lost		Direct Economic Cost	
	Rank	Frequency	Rank	Years	Rank	Cost (\$)
Control Loss Without Prior Vehicle Action	<b>2</b>	529,000	<b>1</b>	478,000	<b>1</b>	15,796,000,000
Lead Vehicle Stopped	<b>1</b>	975,000	<b>3</b>	240,000	<b>2</b>	15,388,000,000
Road Edge Departure Without Prior Vehicle Maneuver	<b>5</b>	334,000	<b>2</b>	270,000	<b>3</b>	9,005,000,000
Vehicle(s) Turning at Non-Signalized Junctions	<b>3</b>	435,000			<b>4</b>	7,343,000,000
Straight Crossing Paths at Non-Signalized Junctions			<b>5</b>	174,000	<b>5</b>	7,290,000,000
Lead Vehicle Decelerating	<b>4</b>	428,000				
Vehicle(s) Not Making a Maneuver – Opposite Direction			<b>4</b>	206,000		



## 1. INTRODUCTION

A number of crash typologies have been developed over the years in support of vehicle safety research. Crash typologies provide an understanding of distinct crash types and scenarios and explain why they occur. They serve as a tool to identify intervention opportunities, set research priorities and direction in technology development, and evaluate the effectiveness of selected crash countermeasure systems. Recently, two crash typologies have been widely used for crash avoidance research in support of the Intelligent Vehicle Initiative (IVI) within the U.S. Department of Transportation's (USDOT) Intelligent Transportation Systems program: 44-crashes and pre-crash scenarios.

The 44-crashes typology has been developed by General Motors (GM) and adopted by automakers for the design, development, and benefits assessment of potential crash countermeasure technologies [1, 2]. This typology identified very specific crash scenarios representing all collisions in the United States and investigated the causes associated with each crash scenario using the 1991 General Estimates System (GES) crash database and samples of 1990-1991 police-reported crashes from Michigan and North Carolina. Shortcomings of this typology include the limited study of State crash data and the amount of effort required to replicate the results using recent crash data.

USDOT has devised the pre-crash scenarios typology based primarily on pre-crash variables in the National Automotive Sampling System (NASS) crash databases including GES and the Crashworthiness Data System (CDS) [3]. This typology has been utilized to identify intervention opportunities, develop performance guidelines and objective test procedures, and estimate the safety benefits for IVI crash countermeasure systems. Single-vehicle and two-vehicle crashes of common crash types were analyzed to produce the list of representative pre-crash scenarios. Multi-vehicle ( $> 2$ ) crashes were not included in the analysis. Some low-frequency crash types were also excluded such as vehicle failure, non-collision incidents, and evasive action scenarios. As a result, the pre-crash scenario typology did not represent 100 percent of all police-reported crashes.

This report defines a new typology of pre-crash scenarios for crash avoidance research, which combines crash information from both typologies mentioned above. This new typology consists of pre-crash scenarios that depict vehicle movements and dynamics as well as the critical event occurring immediately prior to crashes involving at least one light vehicle (i.e., passenger car, sports utility vehicle, van, minivan, and light pickup truck). The goal of this typology is to establish a common vehicle safety research foundation for public and private organizations, which will allow researchers to determine which traffic safety issues should be of first priority to investigate and to develop concomitant crash avoidance systems. Its main objectives are to:

1. Identify all common pre-crash scenarios of all police-reported crashes involving at least one light vehicle.
2. Quantify the severity of each pre-crash scenario in terms of frequency of occurrence, direct economic cost, and functional years lost.

3. Portray each scenario by crash contributing factors and circumstances in terms of the driving environment, driver, and vehicle.
4. Provide nationally representative crash statistics that can be annually updated using GES and CDS crash databases.

This report describes a new typology that comprises all scenarios in the 44-crashes and pre-crash scenarios typologies using the 2004 GES crash database [4].

### **1.1. 44-Crashes Typology**

Table 1 lists the 44 crashes developed by GM using multiple crash data sources [1]. This typology described the national crash problem based on an analysis of crash involved vehicles and factors that may increase the likelihood of occurrence. Three distributions of crashes were defined using the frequency of occurrence, losses due to direct costs, and losses due to years of functional life lost. There were originally 100 crash scenarios, each representing about one percent of the entire crash problem. Some scenarios have been combined because of similarities, thus bringing the list down to 44 crash scenarios.

The 44-crashes typology was developed to give in a simplistic sense an understanding of crashes and to prioritize crash countermeasure development. It also helps address some of the obstacles associated with trying to predict field effectiveness using raw statistics:

- Double counting: Consider two crash prevention measures that are each 10-percent effective. If they influence totally different crashes, then together they are probably about 20-percent effective. However, if their benefit applies to exactly the same crashes, then together they are only about 10-percent effective. To claim these redundant countermeasures are more than 10-percent effective is double-counting. The 44-crashes typology helps prevent double counting.
- Complexity of crash statistics: Crash statistics may be confusing and may take a long time to process, which cannot be used efficiently by technologists. This typology was proposed as a simple problem definition.
- Inconsistency: Crash avoidance has no standard metric, like emissions and fuel economy. Crash avoidance needed a standard problem definition that spanned organizations and time.

As seen in Table 1, the definition of the 44 scenarios incorporates vehicle dynamics, vehicle movements, critical events, crash causes, and crash contributing factors. Specifics of some scenario descriptions are not represented by GES variables and codes, such as pedal miss and other details of causal factors.

**Table 1.** List of 44 Crash Scenarios

No.	Title	Scenario Definition
1	Struck Human	A pedestrian crossing a multi-lane roadway was struck by vehicle. The driver was looking for other vehicles and traffic controls, but did not see the pedestrian. This crash occurs more frequently in urban areas. The weather is typically clear and the road is usually dry.
3	Struck Animal	A male driving home after dark on a rural two-lane country road in November struck a deer crossing the road. The driver could not avoid hitting the deer.
9	Drowsy	The driver fell asleep and drifted off the right side of the road and struck a telephone pole. Witnesses say that there was no attempt to brake or steer away from the pole. The crash occurred in a rural area at night.
10	Aggressive, Departure	The male driver was driving too fast, as well as cutting in and out of traffic, maneuvering the vehicle to the limits of control. The driver lost control of the vehicle and went into a skid. The driver left the roadway and struck the guardrail and then a tree.
11	Slick Road Departure	The driver lost control while driving on an icy, wet road. The driver tried to bring the vehicle back under control by braking and steering. The vehicle spun out and came to rest in the ditch.
12	Rough Road Departure	Due to the patched and eroded condition of the road surface, the driver lost control of the vehicle and left the roadway.
13	Avoidance, Departure	The driver was alert and driving along a surface street. Suddenly something appeared in the driver's path (e.g., child, bicyclist, or animal). The driver slammed on the brakes and swerved to avoid the immediate threat. The vehicle drove over a curb and into an object.
18	Impaired, Departure	The young (under 25) male driver, who was legally impaired, was driving too fast. He lost control of the vehicle, which left the roadway and overturned. The crash occurred in a rural area between midnight and 2 a.m. on a weekend.
19	Back Into Object	Vehicle A was backing out of a driveway and struck Vehicle B that was parked along the side of the road. Driver A did not see the other vehicle.
22	Ran Red "T-Bone"	Driver ran the red light. The driver saw the light turn yellow but decided to continue through the intersection. The majority of these crashes occur during daylight hours in urban areas.
28	Slick Road, Ran Stop	As vehicle approached an intersection, the driver noticed the stop sign, applied the brakes hard, but slid on the wet pavement into crossing traffic. (This group does not include the condition where there is no sign.)
30	Inattentive, Ran Stop	An inattentive driver in a vehicle, heading north, did not see a stop sign (two-way only) and struck an eastbound vehicle on the passenger's side.
33	Obstruction View	A vehicle, at a two-way stop sign, could not see adequately down the road due to the hill. This vehicle pulled out and was struck on the driver's side by a lateral-crossing vehicle. This crash is most likely to occur in daylight in rural areas.
35	Looked but Didn't See	Vehicle A was turning right at a two-way stop sign. The driver did not see Vehicle B approaching from lateral direction as Vehicle A turned into the lane. Upon turning, Vehicle A was struck by Vehicle B.
37	Sirens	A police car, with lights and siren on, slowed to cross through an intersection with a red light. Another vehicle was on the crossing road and did not see the approaching police car.
38	Left Turn Clip	Vehicle A, in an attempt to turn left, cut the corner too sharply and clipped Vehicle B waiting at the intersection. Vehicle A began the turn too early and misjudged the distance between cars.

**Table 1.** List of 44 Crash Scenarios (Cont. 1)

No.	Title	Scenario Definition
40	Wrong Driveway	Driver A observed Vehicle B approaching with the right turn signal on. A assumed that B was turning into the driveway that A was turning out of and proceeded in front of B. B was not turning until the intersection and struck A in the side.
44	Wave to Go	From a driveway, Vehicle A was waiting to make a left turn, but full view of all lanes was not possible due to other traffic. Driver B stopped—leaving a gap—and waved driver A through in front of him. However, Driver C was unaware of this arrangement and crashed into the driver's side of Vehicle A.
47	Turn into Passer	An impatient driver, A, was following behind a slower vehicle, B. Driver A passed vehicle B. Driver B turned left as A was passing and collided with A.
48	Back into Roadway	Driver A backed vehicle into roadway. Driver A did not see vehicle B heading west.
52	Tailgate	Vehicle B was following Vehicle A too closely. Vehicle A had to stop quickly; B could not stop in time and rear-ended A.
56	Distracted, Rear	The driver of Vehicle A was reaching down to retrieve an item from the floor of the vehicle and did not notice that Vehicle B was stopped ahead.
58	Avoidance, Rear	Vehicle A observed traffic slowing in the curb lane. A decided to change lanes and go around slowing traffic. A changed lanes to the inside lane only to find Vehicle B stopped directly in front. Driver A could not stop and struck B in the rear. (This also includes cases of three cars in the same lane. The middle vehicle pulled out of the lane at the last moment leaving the rear-most vehicle to collide with the foremost.)
61	Pedal Miss	Driver A was attempting to stop behind Vehicle B when Driver A's foot missed the brake pedal and Vehicle A struck Vehicle B from behind.
62	Inattentive, Rear	A northbound vehicle, A, was stopped waiting at a red traffic signal in an urban area on a major artery. Another vehicle, B, coming from some distance behind, didn't notice that A was stopped and could not stop in time. (This crash includes a lead vehicle just stopping or lead vehicle turning.)
64	Stutter Stop	A stopped vehicle, A, was looking left and right down a cross road waiting for traffic to clear before proceeding. Another driver, B, waiting behind A was also checking crossing traffic. Vehicle A started to go, decided that it wasn't safe, and abruptly stopped. Driver B, who had been watching traffic, thought that A had moved on and proceeded. Driver B rear-ended driver A.
66	Aggressive, Rear	Vehicle A was stopped in traffic. Driver B (at a distance from A) was driving too fast. By the time B realized he/she needed to stop, it was not possible.
68	Maintenance	Vehicle A was stopped prior to turning when struck by Vehicle B. Driver B stated that the brakes failed to stop the car. Vehicle B was an older vehicle (more than six years). (The failure is usually a maintenance problem.)
74	Slick Road, Rear	Vehicle A was braking for stopped traffic. Driver B, coming from some distance behind A, saw the brake lights. When B braked the road was very slick. B did not stop and struck A in the rear.
75	Passing Clip	Vehicle A, in an attempt to pass vehicle B, cut around B, but too closely. Driver A misjudged the distance between cars and clipped the corner of B.

**Table 1.** List of 44 Crash Scenarios (Cont. 2)

No.	Title	Scenario Definition
76	Lane Change Right	Driver of Vehicle A looked for traffic before changing lanes to the right on a four-lane road. The driver did not see Vehicle B in the curb lane. Vehicle B braked and steered to avoid Vehicle A.
78	Visibility, Rear	Driver A could not see well due to the blowing snow (whiteout conditions). Vehicle B was in front of A and traveling in the same direction. B had to brake for stopped traffic ahead and A did not notice the brake lights.
79	Lane Change Left	Driver of Vehicle A looked for traffic before changing lanes to the left on a four-lane road. The driver did not see Vehicle B in the next lane. Vehicle B had no time to react and nowhere to go to avoid Vehicle A.
80	Lane Change, Rear	Vehicle A saw Vehicle B approaching in the next lane. A determined that B was far enough back that A could change lanes. Driver A misjudged the distance and speed of Vehicle B. Driver B pressed the brake hard but was unable to stop and struck A from behind. Vehicle C could not stop and struck B from behind.
82	Back Track	Front Vehicle A stopped too far out in an intersection. Driver A did not see Vehicle B and backed up to allow other traffic through, striking vehicle B.
83	U-Turn	Vehicle A and vehicle B were both heading in the same direction on a multi-lane road in different lanes. B attempted to turn from the curb lane across the path of A onto a side street. Driver A struck illegally turning B in the driver's side.
91	Inexperience, Departure	Driver A was having a difficult time controlling the vehicle on the slippery road. The driver lost control of the vehicle while starting into a curve and applied the brakes. The vehicle crossed into the opposite direction traffic and collided head-on with Vehicle B. (This often involves a new driver or a driver who lacks experience on a roadway with a low coefficient of friction.)
92	Impaired, Head-on	A young male driver A, who was legally impaired, was driving too fast. He lost control of the vehicle, crossed the centerline, and struck an approaching vehicle head-on. The crash occurred in a rural area between midnight and 2 a.m. on a weekend.
93	Slick Road, head-on	Vehicle A attempted to stop at an intersection, but because of the slick road, lost control of the vehicle. Vehicle B was approaching head-on in the opposite direction and was struck by A.
94	Run Red Into Left Turner	A northbound vehicle, A, was waiting to make a left turn. The light changed and the northbound vehicle began to turn left. A southbound driver, B, accelerated hard, hoping to make the light and struck Vehicle A.
96	Misjudgment, Left Turn	Vehicle A was waiting to turn left. Driver A observed B approaching from the opposite direction, but thought there was enough time to complete the left turn. Driver A misjudged vehicle B's distance and was struck by Vehicle B.
99	View Obstructed Left Turn	Vehicle A was stopped in the left lane of a four-lane road, facing north, waiting to complete a left turn. Driver A, able to see past C only a short distance, thought it was clear and completed the turn. Vehicle B, in the curb lane adjacent to Vehicle C was traveling south at the posted speed limit and struck Vehicle A head-on.
100	Miscellaneous	This is a miscellaneous assortment that could not be classified as any of the other previously mentioned crash descriptions.
101	New	This is a crash that may not have occurred without the introduction of a new safety technology. The driver may have used the new technology for increased mobility rather than an increase in safety as intended. A crash may evolve to another type under the driver's control rather than becoming eliminated.

## 1.2. Pre-Crash Scenarios Typology

Table 2 lists the pre-crash scenarios developed by USDOT using primarily the Accident Type variable and the first two pre-crash variables in the NASS crash databases. These two pre-crash variables are the Movement Prior to Critical Event and Critical Event. The Accident Type variable categorizes the pre-crash situation. The Movement Prior to Critical Event variable records the attribute that best describes vehicle activity prior to the driver's realization of an impending critical event or just prior to impact if the driver took no action or had no time to attempt any evasive maneuver. The Critical Event variable identifies the circumstances that made the crash imminent.

The scenarios listed in Table 2 were identified within each of the following crash types: rear-end, off-road, lane change, crossing paths, opposite direction, backing, pedestrian, pedalcyclist, animal, and object crashes. Moreover, the identification of these scenarios was based on the analysis of single- and two-vehicle crashes. Crashes that involved more than two vehicles were excluded from the analysis due to the uncertainty and crosscutting among the various crash types as a result of associating the Accident Type variable with the pre-crash variables.

**Table 2.** List of Pre-Crash Scenarios Based on NASS Variables

No.	Scenario Definition
1	Animal: other
2	Animal: vehicle going straight and animal in road
3	Animal: vehicle negotiating a curve and animal in road
4	Off-road: single vehicle performing avoidance maneuver
5	Off-road: single vehicle going straight and departing road edge
6	Off-road: single vehicle going straight and losing control
7	Off-road: single vehicle initiating a maneuver and departing road edge
8	Off-road: single vehicle initiating a maneuver and losing control
9	Off-road: single vehicle negotiating a curve and departing road edge
10	Off-road: single vehicle negotiating a curve and losing control
11	Off-road: single vehicle and other loss of control
12	Off-road: single vehicle due to vehicle failure
13	Off-road: single vehicle and other road edge departure
14	Off-road: single vehicle with other/unknown
15	Off-road: backing
16	Off-road: no impact
17	Pedalcyclist: other/unknown
18	Pedalcyclist: vehicle going straight on crossing paths
19	Pedalcyclist: vehicle going straight on parallel paths
20	Pedalcyclist: vehicle starting in traffic lane on crossing paths
21	Pedalcyclist: vehicle turning left on crossing paths
22	Pedalcyclist: vehicle turning left on parallel paths
23	Pedalcyclist: vehicle turning right on crossing paths
24	Pedalcyclist: vehicle turning right on parallel paths
25	Pedestrian: other
26	Pedestrian: vehicle backing
27	Pedestrian: vehicle going straight and pedestrian crossing road
28	Pedestrian: vehicle going straight and pedestrian darting onto road

**Table 2.** List of Pre-Crash Scenarios Based on NASS Variables (Cont.)

No.	Scenario Definition
29	Pedestrian: vehicle going straight and pedestrian playing/working on Road
30	Pedestrian: vehicle going straight and pedestrian walking along road
31	Pedestrian: vehicle turning left and pedestrian crossing road
32	Pedestrian: vehicle turning right and pedestrian crossing road
33	Backing: at driveways
34	Backing: at intersections
35	Backing: other
36	Lane change: 2 vehicles going straight and 1 vehicle encroaching in same lane
37	Lane change: 2 vehicles going straight and 1 vehicle encroaching into another lane
38	Lane change: 1 vehicle going straight and another changing lanes
39	Lane change: 1 vehicle going straight and another entering or leaving parking position
40	Lane change: 1 vehicle going straight and another passing
41	Lane change: 1 vehicle going straight and another turning
42	Lane change: 2 vehicles in other combinations
43	Lane change: 1 vehicle passing and another turning
44	Opposite direction: control loss
45	Opposite direction: 2 vehicles going straight and 1 vehicle encroaching
46	Opposite direction: 2 vehicles going straight both in same lane
47	Opposite direction: 2 vehicles negotiating a curve and 1 vehicle encroaching
48	Opposite direction: 2 vehicles negotiating a curve both in same lane
49	Opposite direction: other/unknown
50	Opposite direction: involves 1 vehicle passing
51	Opposite direction: involves vehicle failure
52	Rear-end: following vehicle changing lanes
53	Rear-end: lead vehicle accelerating
54	Rear-end: lead vehicle changing lanes
55	Rear-end: lead vehicle decelerating
56	Rear-end: lead vehicle moving at constant, slower speed
57	Rear-end: lead vehicle stopped
58	Rear-end: other/unknown
59	Crossing paths: left turn across path from lateral direction (LTAP/LD)
60	Crossing paths: left turn across path from opposite direction (LTAP/OD)
61	Crossing paths: left turn into path (LTIP)
62	Crossing paths: other/unknown
63	Crossing paths: right turn across path from lateral direction (RTAP/LD)
64	Crossing paths: right turn into path (RTIP)
65	Crossing paths: straight crossing paths (SCP)

### 1.3. Report Outline

Following the introduction, this report delineates the approach used to identify and statistically describe the scenarios of the new pre-crash typology, and to estimate the societal cost measures of direct economic cost and functional years lost. This is followed by crash statistics of light-vehicle crashes. Afterwards, the new pre-crash typology is introduced and each of its scenarios is defined. After that, this report maps a sample of crash police reports, 44 crashes, and crash types to the new pre-crash typology. Finally, this report concludes with some comments about the overall analysis.

## **2. IDENTIFICATION OF NEW PRE-CRASH SCENARIO TYPOLOGY**

GES was selected as the best available source for the identification and description of the new pre-crash scenario typology because it:

- Is nationally representative
- Is annually updated
- Contains the Accident Type variable and pre-crash variables that enable the identification of dynamically-distinct vehicle scenarios
- Features the availability of different sets of variables that describe the environmental and driving conditions at the time of the crash, driver and vehicle factors that might have contributed to the cause of the crash, and severity of the crash.

### **2.1. Scenario Coding Schemes**

Appendix A presents coding schemes to identify common pre-crash scenarios leading to all single-vehicle and multi-vehicle ( $\geq 2$ ) crashes based on GES variables and codes. A total of 46 pre-crash scenarios are listed in a selected order starting with scenarios associated with crash contributing factors such as vehicle control loss and driver violation of red light/stop sign (numbers 2-6). Such scenarios result in different crash types. For example, loss of vehicle control due to excessive speed could lead to a vehicle running off the road, rear-ending another vehicle in front of it, or encroaching into another lane and side-swiping an adjacent vehicle. From a crash avoidance perspective, the problem of vehicle control loss is identical in all three cases. A potential crash countermeasure function would detect the excessive speed or the imminent loss of control regardless of what crash type these conditions might lead to. Therefore, scenarios based on crash contributing factors in Appendix A supersede remaining scenarios that represent dynamically distinct driving situations based on vehicle movements and dynamic states. The new pre-crash scenario typology was then created by deducting the scenarios in the same order listed in Appendix A using the process of elimination. The sum of the resulting frequency distribution adds to 100 percent, and thus eliminating double counting of crashes in each of the scenarios.

The Accident Type, Movement Prior to Critical Event, and Critical Event variables from the GES Vehicle File were primarily used to identify dynamically distinct pre-crash scenarios. The first event in a crash from the GES Event File helped to distinguish pre-crash scenarios in multi-vehicle crashes. In addition to these variables, the coding schemes utilize the following GES variables:

- Traffic Control Device: Indicates whether or not a traffic control device was present for the crash and the type of traffic control device.
- Violations Charged: Indicates which violations are cited to drivers.
- First Harmful Event: Indicates the first property damaging or injury-producing event in the crash.

- Crash Event Sequence Number: Number assigned to each harmful event in a crash, in chronological order.
- Vehicle Number-This Vehicle: Number assigned to an in-transport motor vehicle involved in the event.
- Vehicle Number-Other Vehicle or Object Contacted: Vehicle number of the other vehicle or object hit, or the type of non-collision involved in the event.
- Vehicle Role: Indicates vehicle role (e.g., striking, struck) in single or multi-vehicle crashes.
- Rollover Type: Indicates if a rollover occurred (tripped or untripped). Rollover is defined as any vehicle rotation of 90 degrees or more about any true longitudinal or lateral axis. Rollover can occur at any time during the crash.
- Hit-and-run: It is coded when a motor vehicle in transport, or its driver, departs from the scene; vehicles not in transport are excluded. It does not matter whether the hit-and-run vehicle was striking or struck.
- Number of Vehicles Involved: Indicates the number of vehicles involved in the crash.

The following GES variables and codes were queried to identify the light vehicle:

- Body Type (Hot-Deck Imputed) = 01 – 22, 28 – 41, and 45 – 49
- Special Use = 00. This variable indicates whether the vehicle has a special use, meaning “in use” and not necessarily emergency use.

## **2.2. Crash Contributing Factors and Circumstances**

Statistical description of crash contributing factors and circumstances was performed for each of the pre-crash scenarios that made up the final list of all scenarios leading to light-vehicle crashes. These factors and circumstances were broken down into three categories: driving environment, driver, and vehicle.

The following GES variables describe the driving environment:

- Light Condition: General light conditions at the time of the crash, including light from external roadway illumination fixtures.
- Atmospheric Conditions: General atmospheric conditions at the time of the crash (e.g., no adverse conditions, rain, sleet, fog, etc.).
- Roadway Surface Condition: Condition of road surface at the time of the crash (e.g., dry, wet, ice, etc.).
- Roadway Alignment: Horizontal alignment of roadway (straight or curve).
- Roadway Profile: Vertical alignment of roadway (e.g., level, grade etc.).
- Land Use: Population of the area associated with the police jurisdiction from which the crash report is selected. An area is considered rural if its population is less than or equal to 50,000.
- Day of Week
- Relation to Roadway: Indicates the location of the first harmful event.

- Relation to Junction: Indicates if the first harmful event is located within a junction or interchange area. If the first harmful event occurs off the roadway, the location classified is the point of departure.
- Posted Speed Limit
- Traffic Control Device

The following GES variables depict the driver factors:

- Driver Drinking in Vehicle: Reports alcohol use by driver of the vehicle.
- Driver’s Vision Obscured by: Identifies visual circumstances that may have contributed to the cause of the crash.
- Driver Distracted by: Identifies a distraction that may have influenced driver performance and contributed to the cause of the crash. The distraction can be either inside or outside the vehicle.
- Speed Related: Indicates whether speed is a contributing factor to the cause of the crash.
- Violations Charged
- Person’s Physical Impairment: Identifies physical impairments (e.g., ill, drowsy, deaf, etc.) for all drivers, which may have contributed to the cause of the crash.
- Sex: Male or female
- Age: This report classifies younger drivers as age 24 or younger, middle-aged drivers as between the ages of 25 and 64, and older drivers as age 65 or older.

The following GES variables portray the vehicle factors:

- Vehicle Contributing Factors: Indicates vehicle factors that may have contributed to the cause of the crash (e.g., tires, brakes, wipers, etc.)
- Rollover Type
- Movement Prior to Critical Event: (This variable is listed here so as to help in identifying dynamic variations of already-defined pre-crash scenarios).
- Driver Maneuvered to Avoid: Identifies an action taken by the driver to avoid something or someone in the road. The maneuver may have subsequently contributed to the cause of the crash.
- Corrective Action Attempted: Describes the actions taken by the driver of the vehicle in response to the impending danger. Because this variable focuses upon the driver’s action just prior to the first harmful event, it is coded independently of any maneuvers associated with this vehicle’s Accident Type. It should be noted that this variable reports many unknowns as seen in the results presented in this report. This same variable in the Crashworthiness Data System crash database provides a better description of driver evasive maneuvers in response to the critical event.

## **2.3. Societal Harm Measures**

This report determines the frequency of occurrence for each pre-crash scenario in the new typology. It also estimates for each scenario its concomitant societal harm expressed in terms of economic cost or functional years lost. The “functional years lost” measure was selected for this analysis over other measures such as “equivalent lives” in order to harmonize with automakers who have recently adopted this measure in their crash avoidance research [1, 2]. These harm measures are derived from the maximum injury severity of all people involved in a specific crash scenario.

### Economic Cost

Economic costs in this report account for goods and services that must be purchased or productivity that is lost as a result of motor vehicle crashes. They do not represent the intangible consequences of these events to individuals and families, such as pain and suffering and loss of life. Economic costs of crashes include lost productivity, medical costs, legal and court costs, emergency service costs, insurance administration costs, travel delay, property damage, and workplace losses.

The economic cost of crashes is computed on the basis of injury severity to the occupants of each vehicle involved in the crash according to the Abbreviated Injury Scale (AIS). The AIS is a classification system for assessing impact injury severity developed by the Association for the Advancement of Automotive Medicine. It provides the basis for stratifying the economic costs of crashes by injury severity. The Maximum Abbreviated Injury Scale (MAIS) is a function of AIS on a single injured person that measures overall maximum injury severity. Significant elements of economic loss, such as medical costs and lost productivity, are highly dependent on injury outcome.

GES does not provide detailed information regarding injury severity based on the AIS coding scheme. Instead, GES records injury severity by crash victim on the KABCO scale from police crash reports. Police reports in almost every State use KABCO to classify crash victims as K – killed, A – incapacitating injury, B – non-incapacitating injury, C – possible injury, O – no apparent injury, or ISU – Injury Severity Unknown. The KABCO coding scheme allows non-medically trained persons to make on-scene injury assessments without a hands-on examination. However, KABCO ratings are imprecise and inconsistently coded between States and over time. To estimate injuries based on the MAIS coding structure, a translator derived from 1982–1986 NASS data was applied to the GES police-reported injury profile [5]. The following matrix equation shows the multiplicative factors used to convert injury severity from KABCO to MAIS designations:

$$\begin{bmatrix}
 MAIS0 \\
 MAIS1 \\
 MAIS2 \\
 MAIS3 \\
 MAIS4 \\
 MAIS5 \\
 MAIS6
 \end{bmatrix} = \begin{bmatrix}
 0 & 0.01516 & 0.04938 & 0.19919 & 0.92423 & 0.07523 \\
 0 & 0.49183 & 0.79229 & 0.71729 & 0.07342 & 0.70581 \\
 0 & 0.27920 & 0.12487 & 0.06761 & 0.00206 & 0.15708 \\
 0 & 0.16713 & 0.03009 & 0.01509 & 0.00029 & 0.04343 \\
 0 & 0.02907 & 0.00267 & 0.00064 & 0.00001 & 0.01712 \\
 0 & 0.01762 & 0.00069 & 0.00018 & 0.00000 & 0.00134 \\
 1 & 0 & 0 & 0 & 0 & 0
 \end{bmatrix} \begin{bmatrix}
 K \\
 A \\
 B \\
 C \\
 O \\
 ISU
 \end{bmatrix}$$

It should be noted that K injuries in KABCO are converted only to fatalities and non-K injuries in KABCO are converted to MAIS 0-5 injuries. NHTSA recommends that fatal crashes and fatalities be extracted from the Fatality Analysis Reporting System (FARS), not GES, since it contains records on all fatal traffic crashes and thus provides a more accurate representation of fatal crashes and fatalities than the sample contained in GES. This report, however, counts fatalities from GES because FARS does not contain the Accident Type and Critical Event variables needed to identify the pre-crash scenarios of the new typology.

Table 3 provides MAIS values based on the 2000 crash economic cost [6]. These values are assigned to occupants of crash-involved vehicles in which one or more person suffered an injury. An amount of \$2,532 was allocated to each property-damage-only (PDO) vehicle, referring to a vehicle that was damaged in a crash but no occupant was injured. All PDO vehicles, including those involved in injury crashes, were counted under PDO vehicles. The total economic costs of motor vehicle crashes in 2000 were estimated at \$230.6 billion. Estimates of the number of crashes that occurred in 2000 included police-reported crashes from the 2000 GES as well as a significant number of non-reported crashes.

**Table 3.** MAIS Levels and Unit Costs in 2000 Dollars

MAIS	Severity	2000 \$
0	Uninjured	1,962
1	Minor	10,562
2	Moderate	66,820
3	Serious	186,097
4	Severe	348,133
5	Critical	1,096,161
6	Fatal	977,208

#### Functional Years Lost

Functional years lost is a non-monetary measure that sums the years of life lost to fatal injury and the years of functional capacity lost to nonfatal injury [7]. This measure does not mirror the monetary economic cost. It assigns a different value to the relative

severity of injuries suffered from motor vehicle crashes. Table 4 presents the functional years lost by MAIS levels.

**Table 4.** Functional Years Lost by MAIS Per-Unit Basis

MAIS	Severity	Functional Years Lost
1	Minor	0.07
2	Moderate	1.1
3	Serious	6.5
4	Severe	16.5
5	Critical	33.1
6	Fatal	42.7

### 3. DESCRIPTION OF LIGHT-VEHICLE CRASHES

This section presents statistics on the frequency of occurrence, severity, and number of vehicles involved for light-vehicle police-reported crashes based on the 2004 GES. These statistics are also compared to those of all-vehicle crashes. In addition, this section describes driving environment, driver, and vehicle factors that may have contributed to the cause of light-vehicle crashes.

#### 3.1. Crash Severity

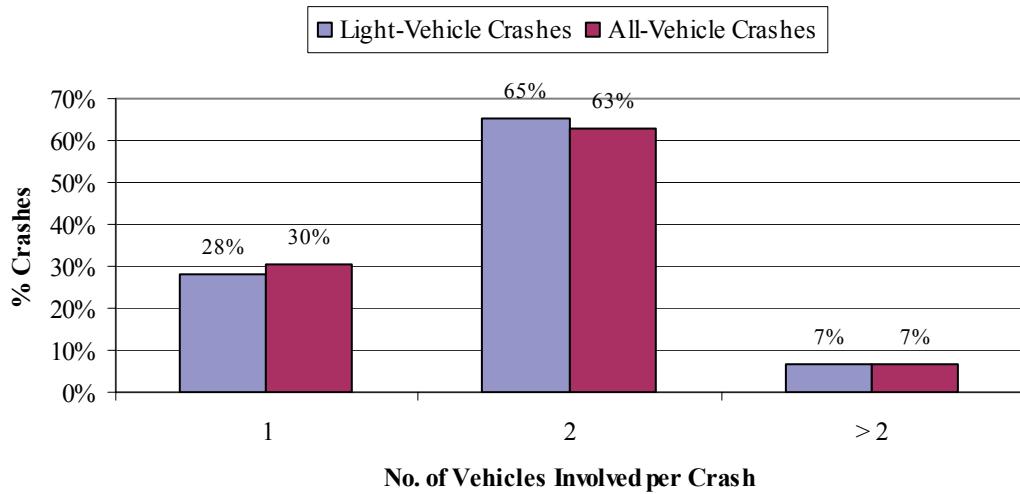
Approximately 6,170,000 police-reported crashes of all vehicle types involving 10,945,000 vehicles occurred in the United States based on 2004 GES statistics. A total of 15,342,000 people were involved in these crashes. About 2,819,000, or 18.4 percent of involved people were injured. By comparison, approximately 5,942,000 police-reported crashes involved at least one light vehicle, which accounted for 96 percent of all crashes in 2004. A total of 10,695,000 vehicles and 15,027,000 people were involved in these light-vehicle crashes resulting in 2,737,000 injured people. Table 5 compares the ratios of people involved by maximum injury severity between light-vehicle crashes and all-vehicle crashes using the KABCO and AIS injury scales. The two crash sets have almost similar injury distributions. “Died Prior” listed in the KABCO injury scale is indicated in police reports if the person died prior to the crash as a result of natural causes (e.g., heart attack), disease, drug overdose, or alcohol poisoning.

**Table 5.** Injury Severity Comparison between Light-Vehicle and All-Vehicle Crashes

Injury Severity	Light-Vehicle Crashes	All-Vehicle Crashes	Light/All
KABCO Injury Scale	None	0.8179	0.8163
	Possible	0.1092	0.1085
	Non-incapacitating	0.0482	0.0495
	Incapacitating	0.0192	0.0201
	Fatal	0.0018	0.0020
	Unknown	0.0037	0.0037
	Died prior	0.000025	0.000024
Sum		1.0000	1.0000
AIS Injury Scale	None	0.7806	0.7791
	Minor	0.1886	0.1894
	Moderate	0.0210	0.0214
	Serious	0.0067	0.0069
	Severe	0.0008	0.0009
	Critical	0.00040	0.00041
	Fatal	0.0018	0.0020
	Sum	1.0000	1.0000
Injured people per crash		0.555	0.549

#### 3.2. Crash Breakdown by Number of Vehicles Involved Per Crash

Figure 1 breaks down light-vehicle crashes and all-vehicle crashes by the number of vehicles involved per crash. Table 6 shows that the crash severity in terms of people involved or injured people per crash is the same between light-vehicle and all-vehicle crashes by the three categories of number of vehicles involved per crash.



**Figure 1.** Distribution of Light-Vehicle and All-Vehicle Crashes by Number of Vehicles Involved per Crash

**Table 6.** Comparison of Crash Severity Between Light-Vehicle and All-Vehicle Crashes by Number of Vehicles Involved per Crash

	Type	Number of Crashes	Number of Persons	Number of Injured Persons	Persons per Crash	Injured Persons per Crash
1-Vehicle Crash	All	1,879,000	2,657,000	709,000	1.41	0.38
	Light	1,673,000	2,398,000	637,000	1.43	0.38
	Light/All	89.0%	90.3%	89.8%	1.01	1.01
2-Vehicle Crash	All	3,890,000	10,885,000	1,722,000	2.80	0.44
	Light	3,869,000	10,829,000	1,712,000	2.80	0.44
	Light/All	99.5%	99.5%	99.4%	1.00	1.00
Greater Than 2-Vehicle Crash	All	401,000	1,801,000	388,000	4.49	0.97
	Light	401,000	1,800,000	388,000	4.49	0.97
	Light/All	99.9%	99.9%	100.0%	1.00	1.00

### 3.3. Contributing Factors and Circumstances of Light-Vehicle Crashes

Table 7 presents statistics on driving environment factors, which are associated with all light-vehicle crashes.

**Table 7.** Driving Environment Statistics of Light-Vehicle Crashes

<b>Lighting</b>	Daylight	69%	<b>Relation to Junction</b>	Unknown	0.1%
	Dark Lighted	15%		Non-Junction	44%
	Dark	12%		Intersection	21.8%
	Dawn/Dusk	4%		Intersection-Related	19%
<b>Weather</b>	Clear	84%		Driveway/Alley	9.4%
	Adverse	16%		Entrance/Exit Ramp	3%
<b>Road Surface</b>	Dry	76%		Rail Grade Crossing	0.2%
	Wet/Slippery	24%		Other/Unknown	2%
<b>Road Alignment</b>	Straight	86%	<b>Posted Speed Limit (mph)</b>	<= 20	2%
	Curve	14%		25	13%
<b>Road Profile</b>	Level	78%		30	9%
	Other	22%		35	22%
<b>Land Use</b>	Rural	52%		40	9%
	Urban	48%		45	17%
<b>Day</b>	Weekday	77%		50	4%
	Weekend	23%		>= 55	24%
<b>Relation to Roadway</b>	On Roadway	78%	<b>Traffic Control Device</b>	No Traffic Controls	59%
	Shoulder/Parking Lane	4%		Traffic Signal	22%
	Off Roadway	17%		Stop/Yield Sign	12%
	Left Turn Lane	0.2%		Other	7%

A recent field operational test of a collision avoidance system, employing 66 subjects who drove instrumented vehicles as their own personal cars, revealed that approximately 10 percent and 25 percent of the distance traveled were done respectively in adverse weather and in the dark [8]. In addition, year 2000 data from the Bureau of Transportation Statistics showed that about 40 percent of the mileage driven in the United States was traveled in rural areas. Normalizing by distance traveled, light-vehicle crashes are over-represented at night, in adverse weather, and in rural areas. The reader is cautioned that this is a simple comparison of percentages and that these factors might not be over-represented.

Table 8 shows descriptive statistics of driver factors for light-vehicle crashes. Based on the 1995 Nationwide Personal Transportation Survey (NPTS), female drivers accounted for about 40 percent of the distance traveled by motor vehicles in the United States; younger and older drivers accumulated respectively 12 and 9 percent of the distance traveled [9]. Normalizing by distance traveled, younger drivers are greatly over-represented in light-vehicle crashes. As stated above, this over-representation of younger drivers is based on a simple comparison of percentages. Table 9 lists descriptive statistics of vehicle factors and evasive maneuvers for light-vehicle crashes.

**Table 8.** Driver Factors Statistics of All Light-Vehicle Drivers

<b>Alcohol</b>	Yes	4%
	No	96%
<b>Vision Obscured</b>	No Obstruction	71%
	Vision Obscured	3%
	Unknown	26%
<b>Driver Distracted</b>	Inattention	14%
	Sleepy	1%
	Not Distracted	44%
	Unknown	42%
<b>Speeding</b>	Yes	12%
	No	85%
	Unknown	3%
<b>Violation</b>	Speeding	0.1%
	Reckless	1%
	None	69%
	Other	27%
	Unknown	4%
<b>Impairment</b>	Ill/Blackout	0.2%
	Drowsy	1%
	None	93%
	Other	2%
	Unknown	4%
<b>Gender</b>	Male	56%
	Female	44%
<b>Age</b>	Younger <= 24	30%
	Middle = 25 to 64	63%
	Older >= 65	8%

**Table 9.** Vehicle Factor Statistics of All Light Vehicles

<b>Contributing Factors</b>	Yes	1%		Prior Corrective Action	0.3%
	No	91%		Other	1%
	Unknown	7%		Object in Road	0.2%
<b>Rollover</b>	Yes	3%		Poor Road Conditions	0.05%
	No	97%		Animal in Road	1%
<b>Pre-Event Movement</b>	No Driver Present	0.2%		Vehicle in Road	8%
	Going Straight	50%		Non-Motorist in Road	0.2%
	Decelerating in Traffic Lane	7%		Hit & Run	5%
	Accelerating in Traffic Lane	0.1%		No Driver Present	0.2%
	Starting in Traffic Lane	3%		Other Avoidance Maneuver	0.02%
	Stopped in Traffic Lane	14%		Unknown	56%
	Passing Another Vehicle	1%		None	29%
	Parked in Travel Lane	0.1%		Phantom Vehicle	0.2%
	Leaving a Parked Position	1%		No Driver Present	0.2%
	Entering a Parked Position	0.2%		No Avoidance Maneuver	24%
	Turning Right	3%		Braking	6%
	Turning Left	10%		Releasing Brakes	0.01%
	Making U-turn	0.5%		Steering	4%
	Backing Up	2%		Braked and Steered	1%
	Negotiating a Curve	4%		Accelerated	0.2%
	Changing Lanes	3%		Accelerated and Steered	0.03%
	Merging	0.4%		Other	0.2%
				Unknown	65%
<b>Driver Avoidance Maneuver</b>					
<b>Corrective Action Attempted</b>					

## 4. DETAILS OF NEW PRE-CRASH SCENARIO TYPOLOGY

The new pre-crash scenario typology of all light-vehicle crashes was derived by integrating lists of pre-crash scenarios from single-, two-, and multi-vehicle (more than two) crashes based on 2004 GES statistics. This section first presents results for each of the three crash categories. Afterward, the list of pre-crash scenarios for all light-vehicle crashes is discussed in terms of the frequency of occurrence, economic cost, and functional years lost. This is followed by a detailed description of crash characteristics for each scenario in the new pre-crash scenario typology. Such portrayal of scenario severity and crash characteristics will enable researchers to:

- Prioritize crash problem areas to be targeted for crash avoidance technology intervention
- Devise appropriate crash countermeasure concepts
- Determine applicable scenarios and define concomitant functional requirements
- Specify sensing and processing needs to assist drivers in preventing crashes via warning signals or automatic vehicle controls
- Develop guidelines for objective test procedures based on dynamic scenarios and driving characteristics most relevant to each applicable pre-crash scenario
- Estimate system effectiveness in each applicable pre-crash scenario and collectively assess potential safety benefits

This new typology is created to establish a consistent crash problem definition for developers of crash avoidance technologies, simplify crash characteristics for system designers, and prevent double counting of system safety benefits.

### 4.1. Single-Vehicle Pre-Crash Scenarios

Table 10 lists pre-crash scenarios of all single light-vehicle crashes in descending order in terms of frequency of occurrence. A total of 31 pre-crash scenarios represent 100 percent of all single light-vehicle crashes. The top three scenarios – control loss without prior vehicle action, road edge departure without prior vehicle maneuver, and animal crash without prior vehicle maneuver – account for about two thirds of all single light-vehicle crashes. The following twelve scenarios represent about 29 percent of all these crashes. The remaining sixteen pre-crash scenarios only correspond to five percent of all single light-vehicle crashes. It should be noted that vehicle action refers to a vehicle decelerating, accelerating, starting, passing, parking, turning, backing up, changing lanes, merging, and successful corrective action to a previous critical event. On the other hand, vehicle maneuver denotes passing, parking, turning, changing lanes, merging, and successful corrective action to a previous critical event.

Single light-vehicle crashes resulted in an estimated economic cost of about \$37 billion and 1.1 million functional years lost. In terms of economic cost and functional years lost, the top three scenarios in descending order are:

1. Control loss without prior vehicle action: 36.7 percent of economic cost and 38.4 percent of functional years lost.
2. Road edge departure without prior vehicle maneuver: 24 percent of economic cost and 24.7 percent of functional years lost.
3. Pedestrian crash without prior vehicle maneuver: 10.3 percent of economic cost and 12.6 percent of functional years lost.

Thus, the top three scenarios listed above accounted for a total of 71 and 76 percent respectively of all economic cost and functional years lost due to single-vehicle light-vehicle crashes.

**Table 10.** Pre-Crash Scenarios of Single-Vehicle Light-Vehicle Crashes

No.	Scenario	Frequency	Rel. Freq.
1	Control Loss Without Prior Vehicle Action	471,000	28.15%
2	Road Edge Departure Without Prior Vehicle Maneuver	330,000	19.73%
3	Animal Crash Without Prior Vehicle Maneuver	300,000	17.91%
4	Control Loss With Prior Vehicle Action	74,000	4.41%
5	Road Edge Departure While Backing Up	66,000	3.93%
6	Road Edge Departure With Prior Vehicle Maneuver	66,000	3.92%
7	Object Crash Without Prior Vehicle Maneuver	55,000	3.26%
8	Pedestrian Crash Without Prior Vehicle Maneuver	37,000	2.22%
9	Vehicle Failure	33,000	1.99%
10	Object Crash With Prior Vehicle Maneuver	30,000	1.81%
11	Vehicle Changing Lanes – Same Direction	29,000	1.75%
12	Pedalcyclist Crash Without Prior Vehicle Maneuver	23,000	1.40%
13	Vehicle(s) Not Making a Maneuver – Opposite Direction	23,000	1.40%
14	Animal Crash With Prior Vehicle Maneuver	23,000	1.37%
15	Pedalcyclist Crash With Prior Vehicle Maneuver	18,000	1.07%
16	Non-Collision Incident	17,000	1.00%
17	Evasive Action Without Prior Vehicle Maneuver	16,000	0.98%
18	Pedestrian Crash With Prior Vehicle Maneuver	16,000	0.98%
19	Lead Vehicle Decelerating	9,000	0.55%
20	Vehicle(s) Turning at Non-Signalized Junctions	7,000	0.43%
21	Lead Vehicle Stopped	4,000	0.26%
22	Running Stop Sign	4,000	0.25%
23	No Driver Present	4,000	0.24%
24	Evasive Action With Prior Vehicle Maneuver	4,000	0.21%
25	On-Road Rollover	3,000	0.21%
26	Straight Crossing Paths at Non-Signalized Junctions	2,000	0.15%
27	Vehicle(s) Making a Maneuver – Opposite Direction	2,000	0.12%
28	Following Vehicle Making a Maneuver	2,000	0.12%
29	Lead Vehicle Moving at Lower Constant Speed	1,000	0.07%
30	Running Red Light	1,000	0.06%
31	Vehicle(s) Parking – Same Direction	1,000	0.05%

## **4.2. Two-Vehicle Pre-Crash Scenarios**

Table 11 ranks pre-crash scenarios of two-vehicle crashes in descending order in terms of frequency of occurrence. A total of 31 pre-crash scenarios represent 99.3 percent of all two-vehicle crashes involving at least one light vehicle. The top three scenarios – lead vehicle stopped, vehicle(s) turning at non-signalized junctions, and lead vehicle decelerating – account for about 40 percent of all two-vehicle crashes and the following five scenarios represent about 31 percent of all these crashes. The remaining 23 pre-crash scenarios correspond to 28 percent of these crashes. There are “other” scenarios that only account for 0.7 percent of two-vehicle crashes involving at least one light vehicle including animal and cyclist with prior vehicle maneuver (0.01 percent each), on-road rollover (0.01 percent), hit-and-run (0.13 percent), and other non-specific or no-details scenarios. In about 50 percent of the lead-vehicle-stopped crashes, the lead vehicle first decelerates to a stop and is later struck by the following vehicle. This typically happens in the presence of a traffic control device or the lead vehicle is slowing down to make a turn. Thus, this particular scenario overlaps with the lead-vehicle-decelerating scenario.

Two-vehicle crashes involving at least one light vehicle resulted in an estimated economic cost of about \$69 billion and 1.4 million functional years lost. In terms of economic cost, the top three scenarios in descending order are:

1. Lead vehicle stopped (14.9%)
2. Vehicle(s) turning at non-signalized junctions (10%)
3. Straight crossing paths at non-signalized junctions (9.9%)

The top three scenarios listed above accounted for a total of 34.9 percent of all economic cost due to two-vehicle light-vehicle crashes. In terms of functional years lost, the top three scenarios in descending order are:

1. Straight crossing paths at non-signalized junctions (11.6%)
2. Opposite direction without prior vehicle maneuver (11.6%)
3. Lead vehicle stopped (10.9%)

The top three scenarios listed above resulted in a total of 34 percent of all functional years lost due to two-vehicle light-vehicle crashes.

**Table 11.** Pre-Crash Scenarios of Two-Vehicle Light-Vehicle Crashes

No.	Scenario	Frequency	Rel. Freq.
1	Lead Vehicle Stopped	792,000	20.46%
2	Vehicle(s) Turning at Non-Signalized Junctions	419,000	10.83%
3	Lead Vehicle Decelerating	347,000	8.96%
4	Vehicle(s) Changing Lanes – Same Direction	295,000	7.62%
5	Straight Crossing Paths at Non-Signalized Junctions	252,000	6.52%
6	Running Red Light	233,000	6.02%
7	Vehicle(s) Turning – Same Direction	220,000	5.68%
8	LTAP/OD at Signalized Junctions	205,000	5.29%
9	Lead Vehicle Moving at Lower Constant Speed	186,000	4.82%
10	LTAP/OD at Non-Signalized Junctions	181,000	4.68%
11	Backing Up Into Another Vehicle	131,000	3.38%
12	Vehicle(s) Not Making a Maneuver – Opposite Direction	94,000	2.43%
13	Vehicle(s) Drifting – Same Direction	91,000	2.35%
14	Following Vehicle Making a Maneuver	74,000	1.92%
15	Control Loss Without Prior Vehicle Action	52,000	1.33%
16	Vehicle(s) Parking – Same Direction	47,000	1.21%
17	Running Stop Sign	43,000	1.12%
18	Evasive Action Without Prior Vehicle Maneuver	37,000	0.95%
19	Vehicle Turning Right at Signalized Junctions	34,000	0.89%
20	Control Loss With Prior Vehicle Action	26,000	0.68%
21	Non-Collision Incident	25,000	0.64%
22	Lead Vehicle Accelerating	16,000	0.41%
23	Vehicle(s) Making a Maneuver – Opposite Direction	13,000	0.33%
24	Evasive Action With Prior Vehicle Maneuver	8,000	0.21%
25	Vehicle Failure	8,000	0.20%
26	Animal Crash Without Prior Vehicle Maneuver	6,000	0.14%
27	Road Edge Departure Without Prior Vehicle Maneuver	3,000	0.08%
28	Pedestrian Crash Without Prior Vehicle Maneuver	2,000	0.05%
29	Road Edge Departure With Prior Vehicle Maneuver	2,000	0.04%
30	Pedestrian Crash With Prior Vehicle Maneuver	1,000	0.02%
31	Pedalcyclist Crash Without Prior Vehicle Maneuver	1,000	0.02%
32	Other	28,000	0.73%

### 4.3. Multi-Vehicle Pre-Crash Scenarios

Table 12 ranks pre-crash scenarios of multi-vehicle (more than two) crashes involving at least one light vehicle in descending order in terms of frequency of occurrence. A total of 24 pre-crash scenarios represent 99.4 percent of all these crashes. The top three scenarios – lead vehicle stopped, decelerating, and moving at lower constant speed – account for 68 percent of all multi-vehicle crashes and lead mostly to rear-end crashes. The following 11 scenarios represent about 27 percent of all these crashes. The

remaining 10 pre-crash scenarios correspond to only 4 percent of these crashes. There are “other” scenarios that only account for 0.6 percent of multi-vehicle crashes involving at least one light vehicle including road edge departure with prior vehicle maneuver, animal and pedestrian without prior vehicle maneuver, backing up into another vehicle, parking, on-road rollover, hit-and-run, and other non-specific or no-details scenarios.

Multi-vehicle light-vehicle crashes resulted in an estimated economic cost of about \$14 billion and 292 thousand functional years lost based on 2004 GES statistics. The top three scenarios, accounting for a total of 57.8 percent of all direct economic cost, are listed below in descending order:

1. Lead vehicle stopped (35.9%)
2. Lead vehicle decelerating (14.8%)
3. Opposite direction without prior vehicle maneuver (7.1%)

The top three scenarios, resulting in a total of 55 percent of all functional years lost, are listed below in descending order:

1. Lead vehicle stopped (29.6%)
2. Lead vehicle decelerating (13.3%)
3. Opposite direction without prior vehicle maneuver (11.7%)

**Table 12.** Pre-Crash Scenarios of Multi-Vehicle Light-Vehicle Crashes

No.	Scenario	Frequency	Rel. Freq.
1	Lead Vehicle Stopped	179,000	44.56%
2	Lead Vehicle Decelerating	72,000	18.05%
3	Lead Vehicle Moving at Lower Constant Speed	22,000	5.50%
4	Running Red Light	20,000	4.93%
5	LTAP/OD at Signalized Junctions	16,000	3.91%
6	Vehicle(s) Changing Lanes – Same Direction	14,000	3.54%
7	Following Vehicle Making a Maneuver	9,000	2.25%
8	Straight Crossing Paths at Non-Signalized Junctions	9,000	2.24%
9	LTAP/OD at Non-Signalized Junctions	9,000	2.23%
10	Vehicle(s) Turning at Non-Signalized Junctions	9,000	2.14%
11	Vehicle(s) Drifting – Same Direction	7,000	1.81%
12	Control Loss Without Prior Vehicle Action	6,000	1.62%
13	Vehicle(s) Not Making a Maneuver – Opposite Direction	6,000	1.60%
14	Non-Collision Incident	5,000	1.15%
15	Evasive Action Without Prior Vehicle Maneuver	3,000	0.77%
16	Lead Vehicle Accelerating	3,000	0.67%
17	Control Loss With Prior Vehicle Action	3,000	0.64%
18	Vehicle(s) Turning – Same Direction	2,000	0.49%
19	Evasive Action With Prior Vehicle Maneuver	1,000	0.33%
20	Vehicle Failure	1,000	0.32%

No.	Scenario	Frequency	Rel. Freq.
21	Running Stop Sign	1,000	0.24%
22	Vehicle Turning Right at Signalized Junctions	1,000	0.17%
23	Vehicle(s) Making a Maneuver – Opposite Direction	1,000	0.16%
24	Road Edge Departure Without Prior Vehicle Maneuver	1,000	0.14%
25	Other	2,000	0.55%

#### 4.4. All Light-Vehicle Pre-Crash Scenarios

Table 13 ranks pre-crash scenarios of all light-vehicle crashes in descending order in terms of frequency of occurrence. A total of 36 pre-crash scenarios represent 99.4 percent of all light-vehicle crashes. The top scenario with an individual relative frequency over ten percent – lead vehicle stopped – accounts for 16 percent of all light-vehicle crashes. The following six scenarios with an individual relative frequency between 5 and 10 percent represent about 40 percent of all these crashes. The remaining 29 pre-crash scenarios correspond to 43 percent of all light-vehicle crashes. There are “other” scenarios that only account for 0.6 percent of all light-vehicle crashes including on-road rollover (0.06%), hit-and-run (0.09%), no driver present (0.07%), and other non-specific or no-details scenarios.

Table 14 ranks pre-crash scenarios of all light-vehicle crashes in descending order in terms of economic cost. Overall, police-reported light-vehicle crashes resulted in an estimated cost of \$120 billion based on 2004 GES statistics. It should be noted that these societal harm estimates are based solely on police-reported crashes captured by the GES crash database, excluding a large number of non-police-reported crashes. The top three scenarios – control loss without prior vehicle action, lead vehicle stopped, and road edge departure without prior vehicle maneuver – account for a total of 34 percent of all economic cost.

Table 15 ranks pre-crash scenarios of all light-vehicle crashes in descending order in terms of functional years lost, which totaled about 2,767,000 years based on 2004 GES statistics. The top five scenarios, accounting for a total of 49 percent of all functional years lost, are listed below in descending order along with their respective ranks in terms of frequency of occurrence (frequency) and economic cost (cost):

1. Control loss without prior vehicle action – second in frequency and first in cost
2. Road edge departure without prior vehicle maneuver – fifth in frequency and third in cost
3. Lead vehicle stopped – first in frequency and second in cost
4. Opposite direction without prior vehicle maneuver – fifteenth in frequency and seventh in cost
5. Straight crossing paths at non-signalized junctions – eighth in frequency and fifth in cost

The following lists three scenarios that appear in the top five pre-crash scenarios in frequency of occurrence, economic cost, and functional years lost:

1. Control loss without prior vehicle action
2. Lead vehicle stopped
3. Road edge departure without prior vehicle maneuver

**Table 13.** Pre-Crash Scenarios of All Light-Vehicle Crashes

No.	Scenario	1-Frequency	Frequency	Rel. Freq.
1	Lead Vehicle Stopped	974,855	975,000	16.41%
2	Control Loss Without Prior Vehicle Action	528,930	529,000	8.90%
3	Vehicle(s) Turning at Non-Signalized Junctions	434,892	435,000	7.32%
4	Lead Vehicle Decelerating	428,067	428,000	7.20%
5	Road Edge Departure Without Prior Vehicle Maneuver	333,706	334,000	5.62%
6	Vehicle(s) Changing Lanes – Same Direction	338,309	338,000	5.69%
7	Animal Crash Without Prior Vehicle Maneuver	305,102	305,000	5.13%
8	Straight Crossing Paths at Non-Signalized Junctions	263,840	264,000	4.44%
9	Running Red Light	253,618	254,000	4.27%
10	Vehicle(s) Turning – Same Direction	221,791	222,000	3.73%
11	LTAP/OD at Signalized Junctions	220,206	220,000	3.71%
12	Lead Vehicle Moving at Lower Constant Speed	209,610	210,000	3.53%
13	LTAP/OD at Non-Signalized Junctions	189,816	190,000	3.19%
14	Backing Up Into Another Vehicle	130,701	131,000	2.20%
15	Vehicle(s) Not Making a Maneuver – Opposite Direction	123,699	124,000	2.08%
16	Control Loss With Prior Vehicle Action	102,617	103,000	1.73%
17	Vehicle(s) Drifting – Same Direction	97,973	98,000	1.65%
18	Following Vehicle Making a Maneuver	85,373	85,000	1.44%
19	Road Edge Departure With Prior Vehicle Maneuver	67,528	68,000	1.14%
20	Road Edge Departure While Backing Up	65,809	66,000	1.11%
21	Object Crash Without Prior Vehicle Maneuver	54,526	55,000	0.92%
22	Evasive Action Without Prior Vehicle Maneuver	56,199	56,000	0.95%
23	Vehicle(s) Parking – Same Direction	48,138	48,000	0.81%
24	Running Stop Sign	48,296	48,000	0.81%
25	Non-Collision Incident	45,910	46,000	0.77%
26	Vehicle Failure	42,147	42,000	0.71%
27	Pedestrian Crash Without Prior Vehicle Maneuver	39,324	39,000	0.66%
28	Vehicle Turning Right at Signalized Junctions	34,951	35,000	0.59%
29	Object Crash With Prior Vehicle Maneuver	30,301	30,000	0.51%
30	Pedalcyclist Crash Without Prior Vehicle Maneuver	24,071	24,000	0.41%
31	Animal Crash With Prior Vehicle Maneuver	23,322	23,000	0.39%
32	Pedalcyclist Crash With Prior Vehicle Maneuver	18,325	18,000	0.31%
33	Pedestrian Crash With Prior Vehicle Maneuver	17,118	17,000	0.29%
34	Lead Vehicle Accelerating	18,722	19,000	0.32%
35	Vehicle(s) Making a Maneuver – Opposite Direction	15,472	15,000	0.26%
36	Evasive Action With Prior Vehicle Maneuver	13,120	13,000	0.22%
37	Other	35,859	36,000	0.60%

**Table 14.** Ranking of Light-Vehicle Pre-Crash Scenarios by Economic Cost

No.	Scenario	Cost (\$)	Rel. Cost
1	Control Loss Without Prior Vehicle Action	\$ 15,796,000,000	13.18%
2	Lead Vehicle Stopped	\$ 15,388,000,000	12.84%
3	Road Edge Departure Without Prior Vehicle Maneuver	\$ 9,005,000,000	7.51%
4	Vehicle(s) Turning at Non-Signalized Junctions	\$ 7,343,000,000	6.13%
5	Straight Crossing Paths at Non-Signalized Junctions	\$ 7,290,000,000	6.08%
6	Running Red Light	\$ 6,627,000,000	5.53%
7	Vehicle(s) Not Making a Maneuver - Opposite Direction	\$ 6,407,000,000	5.35%
8	Lead Vehicle Decelerating	\$ 6,390,000,000	5.33%
9	LTAP/OD at Signalized Junctions	\$ 5,749,000,000	4.80%
10	LTAP/OD at Non-Signalized Junctions	\$ 5,137,000,000	4.29%
11	Vehicle(s) Changing Lanes - Same Direction	\$ 4,247,000,000	3.54%
12	Pedestrian Crash Without Prior Vehicle Maneuver	\$ 4,022,000,000	3.36%
13	Lead Vehicle Moving at Lower Constant Speed	\$ 3,910,000,000	3.26%
14	Vehicle(s) Turning - Same Direction	\$ 2,810,000,000	2.34%
15	Control Loss With Prior Vehicle Action	\$ 1,970,000,000	1.64%
16	Animal Crash Without Prior Vehicle Maneuver	\$ 1,632,000,000	1.36%
17	Vehicle(s) Drifting - Same Direction	\$ 1,383,000,000	1.15%
18	Evasive Action Without Prior Vehicle Maneuver	\$ 1,349,000,000	1.13%
19	Running Stop Sign	\$ 1,310,000,000	1.09%
20	Pedalcyclist Crash Without Prior Vehicle Maneuver	\$ 1,301,000,000	1.09%
21	Following Vehicle Making a Maneuver	\$ 1,212,000,000	1.01%
22	Road Edge Departure With Prior Vehicle Maneuver	\$ 1,144,000,000	0.95%
23	Vehicle Failure	\$ 1,051,000,000	0.88%
24	Backing Up Into Another Vehicle	\$ 947,000,000	0.79%
25	Vehicle(s) Making a Maneuver - Opposite Direction	\$ 943,000,000	0.79%
26	Pedestrian Crash With Prior Vehicle Maneuver	\$ 843,000,000	0.70%
27	Object Crash Without Prior Vehicle Maneuver	\$ 687,000,000	0.57%
28	Vehicle(s) Parking - Same Direction	\$ 623,000,000	0.52%
29	Non-Collision Incident	\$ 592,000,000	0.49%
30	Pedalcyclist Crash With Prior Vehicle Maneuver	\$ 523,000,000	0.44%
31	Vehicle Turning Right at Signalized Junctions	\$ 355,000,000	0.30%
32	Road Edge Departure While Backing Up	\$ 350,000,000	0.29%
33	Lead Vehicle Accelerating	\$ 273,000,000	0.23%
34	Evasive Action With Prior Vehicle Maneuver	\$ 198,000,000	0.17%
35	Object Crash With Prior Vehicle Maneuver	\$ 155,000,000	0.13%
36	Animal Crash With Prior Vehicle Maneuver	\$ 120,000,000	0.10%
37	Other	\$ 764,000,000	0.64%

**Table 15.** Ranking of Light-Vehicle Pre-Crash Scenarios by Functional Years Lost

No.	Scenario	Years Lost	Rel. Yrs Lost
1	Control Loss Without Prior Vehicle Action	478,000	17.27%
2	Road Edge Departure Without Prior Vehicle Maneuver	270,000	9.76%
3	Lead Vehicle Stopped	240,000	8.69%
4	Vehicle(s) Not Making a Maneuver – Opposite Direction	206,000	7.44%
5	Straight Crossing Paths at Non-Signalized Junctions	174,000	6.29%
6	Pedestrian Crash Without Prior Vehicle Maneuver	144,000	5.21%
7	Vehicle(s) Turning at Non-Signalized Junctions	138,000	5.00%
8	Running Red Light	135,000	4.87%
9	LTAP/OD at Signalized Junctions	121,000	4.36%
10	LTAP/OD at Non-Signalized Junctions	113,000	4.09%
11	Lead Vehicle Decelerating	100,000	3.62%
12	Lead Vehicle Moving at Lower Constant Speed	78,000	2.81%
13	Vehicle(s) Changing Lanes – Same Direction	71,000	2.57%
14	Control Loss With Prior Vehicle Action	49,000	1.76%
15	Vehicle(s) Turning – Same Direction	47,000	1.68%
16	Pedalcyclist Crash Without Prior Vehicle Maneuver	39,000	1.42%
17	Vehicle(s) Drifting – Same Direction	37,000	1.32%
18	Evasive Action Without Prior Vehicle Maneuver	36,000	1.31%
19	Road Edge Departure With Prior Vehicle Maneuver	34,000	1.22%
20	Vehicle(s) Making a Maneuver – Opposite Direction	32,000	1.14%
21	Running Stop Sign	28,000	1.02%
22	Vehicle Failure	26,000	0.93%
23	Pedestrian Crash With Prior Vehicle Maneuver	24,000	0.88%
24	Animal Crash Without Prior Vehicle Maneuver	24,000	0.86%
25	Object Crash Without Prior Vehicle Maneuver	19,000	0.68%
26	Following Vehicle Making a Maneuver	18,000	0.67%
27	Non-Collision Incident	13,000	0.45%
28	Vehicle(s) Parking – Same Direction	11,000	0.41%
29	Pedalcyclist Crash With Prior Vehicle Maneuver	11,000	0.39%
30	Backing Up Into Another Vehicle	9,000	0.32%
31	Road Edge Departure While Backing Up	6,000	0.21%
32	Lead Vehicle Accelerating	4,000	0.15%
33	Vehicle Turning Right at Signalized Junctions	4,000	0.15%
34	Evasive Action With Prior Vehicle Maneuver	4,000	0.13%
35	Object Crash With Prior Vehicle Maneuver	3,000	0.10%
36	Animal Crash With Prior Vehicle Maneuver	2,000	0.06%
37	Other	21,000	0.75%

#### 4.5. Statistical Description of All Light-Vehicle Pre-Crash Scenarios

The following provides a detailed description for each of the 37 scenarios based on the same order as listed in Appendix A. Appendix B also lists in tabular format descriptive statistics about driving environment, driver, and vehicle factors for each of these scenarios.

## Vehicle Failure

*Typical Scenario:* Vehicle is going straight in a rural area, in daylight, under clear weather conditions, on a dry road with a posted speed limit of 55 mph or more, and then loses control due to catastrophic component failure at a non-junction and runs off the road. Failure of tires, brakes, power train, steering system, and wheels contributed to about 95 percent of these crashes, with tires alone accounting for 62 percent of vehicle failure crashes.



*Factor Over-Representation:* Rural area, non-junction, high-speed road, younger driver, and rollover are over-represented (based on a simple comparison of percentages).

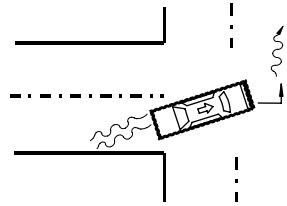
*Dynamic Variations:* Vehicle is negotiating a curve and then loses control due to component failure (24% of crashes).

*Scenario Severity:* Table below quantifies the annual severity of this crash scenario in terms of five different metrics based on 2004 GES statistics. This table also provides the ratios of people involved by maximum injury severity using the KABCO and AIS injury scales. About 1.78 percent of all people involved in this crash scenario suffered high-level MAIS 3+ injuries (serious, severe, critical, or fatal).

Crash Severity		Scenario	Scenario/All
No. of crashes		42,000	0.71%
No. of vehicles involved		53,000	0.50%
No. of people involved		89,000	0.59%
Societal Cost	Economic cost	\$1,051,000,000	0.88%
	Functional years lost	26,000	0.93%
KABCO Injury Scale	None	0.718	0.878
	Possible	0.097	0.884
	Non-incapacitating	0.133	2.759
	Incapacitating	0.043	2.261
	Fatal	0.002	1.101
	Unknown	0.007	1.860
	Died prior	-	-
AIS Injury Scale	None	0.691	0.885
	Minor	0.253	1.344
	Moderate	0.038	1.796
	Serious	0.013	1.969
	Severe	0.002	2.175
	Critical	0.001	2.226
	Fatal	0.002	1.092
	Injured people per crash	0.655	1.181

## Control Loss With Prior Vehicle Action

*Typical Scenario:* Vehicle is turning left or right at an intersection-related area, in daylight, under clear weather conditions, with a posted speed limit of 45 mph or less, and then loses control due to wet or slippery roads and runs off the road.



*Factor Over-Representation:* Dark, adverse weather, wet or slippery road, intersection-related, speeding, younger driver, and rollover are over-represented (based on a simple comparison of percentages).

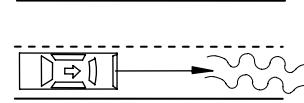
*Dynamic Variations:* Vehicle is decelerating in the traffic lane or changing lanes and then loses control.

*Scenario Severity:* The table below quantifies the annual severity of this crash scenario in terms of five different metrics based on 2004 GES statistics. This table also provides the ratios of people involved by maximum injury severity using the KABCO and AIS injury scales. About 1.43 percent of all people involved in this crash scenario suffered high-level MAIS 3+ injuries (serious, severe, critical, or fatal).

Crash Severity		Scenario	Scenario/All
No. of crashes		103,000	1.73%
No. of vehicles involved		135,000	1.26%
No. of people involved		192,000	1.28%
Societal Cost	Economic cost	\$1,970,000,000	1.64%
	Functional years lost	49,000	1.76%
KABCO Injury Scale	None	0.780	0.954
	Possible	0.105	0.959
	Non-incapacitating	0.074	1.532
	Incapacitating	0.035	1.827
	Fatal	0.002	1.263
	Unknown	0.004	0.999
AIS Injury Scale	Died prior	-	-
	None	0.747	0.956
	Minor	0.211	1.117
	Moderate	0.028	1.344
	Serious	0.010	1.497
	Severe	0.001	1.634
	Critical	0.001	1.746
	Fatal	0.002	1.252
	Injured people per crash	0.474	0.855

## Control Loss Without Prior Vehicle Action

*Typical Scenario:* Vehicle is going straight in a rural area, in daylight, under adverse weather conditions, with a posted speed limit of 55 mph or more, and then loses control due to wet or slippery roads and runs off the road.



*Factor Over-Representation:* Dark, adverse weather, wet/slippery road, rural area, non-junction, high-speed road, speeding, younger driver, and rollover are over-represented (based on a simple comparison of percentages).

*Dynamic Variations:* Vehicle is negotiating a curve and loses control (42% of crashes).

*Scenario Severity:* Table below quantifies the annual severity of this crash scenario in terms of five different metrics based on 2004 GES statistics. This table also provides the ratios of people involved by maximum injury severity using the KABCO and AIS injury scales. About 2.67 percent of all people involved in this crash scenario suffered high-level MAIS 3+ injuries (serious, severe, critical, or fatal). Approximately 1,000 pedestrians were involved in this crash scenario.

Crash Severity		Scenario	Scenario/All
No. of crashes		529,000	8.90%
No. of vehicles involved		596,000	5.57%
No. of people involved		825,000	5.49%
Societal Cost	Economic cost	\$15,796,000,000	13.18%
	Functional years lost	478,000	17.27%
KABCO Injury Scale	None	0.672	0.821
	Possible	0.139	1.271
	Non-incapacitating	0.121	2.506
	Incapacitating	0.056	2.928
	Fatal	0.008	4.443
	Unknown	0.004	1.163
	Died prior	0.0003	11.118
AIS Injury Scale	None	0.656	0.840
	Minor	0.275	1.459
	Moderate	0.042	2.006
	Serious	0.015	2.310
	Severe	0.002	2.565
	Critical	0.001	2.785
	Fatal	0.008	4.405
	Injured people per crash	0.537	0.967

## Running Red Light

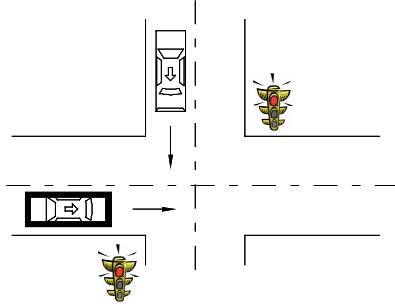
*Typical Scenario:* Vehicle is going straight in an urban area, in daylight, under clear weather conditions, with a posted speed limit of 35 mph; vehicle then runs a red light, crossing an intersection and colliding with another vehicle crossing the intersection from a lateral direction.

*Factor Over-Representation:* Urban area, inattention, female driver, and younger and older drivers are over-represented (based on a simple comparison of percentages).

*Dynamic Variations:* Vehicle runs a red light while turning left and collides with another straight crossing vehicle from a lateral direction.

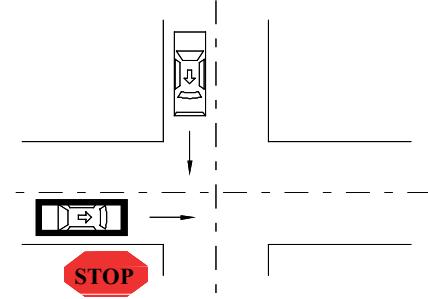
*Scenario Severity:* Table below quantifies the annual severity of this crash scenario in terms of five different metrics based on 2004 GES statistics. This table also provides the ratios of people involved by maximum injury severity using the KABCO and AIS injury scales. About 1.18 percent of all people involved in this crash scenario suffered high-level MAIS 3+ injuries (serious, severe, critical, or fatal).

Crash Severity		Scenario	Scenario/All
No. of crashes		254,000	4.27%
No. of vehicles involved		528,000	4.94%
No. of people involved		740,000	4.92%
Societal Cost	Economic cost	\$6,627,000,000	5.53%
	Functional years lost	135,000	4.87%
KABCO Injury Scale	None	0.726	0.888
	Possible	0.169	1.546
	Non-incapacitating	0.073	1.522
	Incapacitating	0.025	1.283
	Fatal	0.001	0.457
	Unknown	0.006	1.666
	Died prior	-	-
AIS Injury Scale	None	0.709	0.909
	Minor	0.249	1.320
	Moderate	0.030	1.422
	Serious	0.009	1.393
	Severe	0.001	1.366
	Critical	0.001	1.319
	Fatal	0.001	0.453
	Injured people per crash	0.848	1.528



## Running Stop Sign

*Typical Scenario:* Vehicle is going straight in a rural area, in daylight, under clear weather conditions, with a posted speed limit of 35 mph or less; and runs a stop sign at an intersection.



*Factor Over-Representation:* Low posted speed limit (35 mph or less), inattention, and younger and older drivers are over-represented (based on a simple comparison of percentages).

*Dynamic Variations:* Vehicle runs a stop sign while turning either left or right.

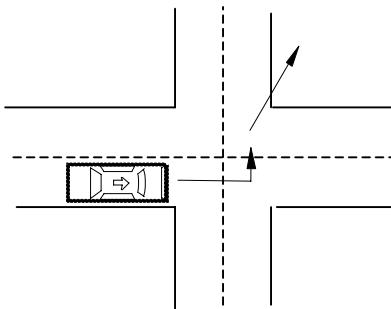
*Scenario Severity:* Table below quantifies the annual severity of this crash scenario in terms of five different metrics based on 2004 GES statistics. This table also provides the ratios of people involved by maximum injury severity using the KABCO and AIS injury scales. About 1.33 percent of all people involved in this crash scenario suffered high-level MAIS 3+ injuries (serious, severe, critical, or fatal).

Crash Severity		Scenario	Scenario/All
No. of crashes		48,000	0.81%
No. of vehicles involved		93,000	0.87%
No. of people involved		133,000	0.88%
Societal Cost	Economic cost	\$1,310,000,000	1.09%
	Functional years lost	28,000	1.02%
KABCO Injury Scale	None	0.710	0.868
	Possible	0.162	1.487
	Non-incapacitating	0.088	1.830
	Incapacitating	0.026	1.386
	Fatal	0.001	0.671
	Unknown	0.012	3.169
	Died prior	-	-
AIS Injury Scale	None	0.694	0.889
	Minor	0.260	1.377
	Moderate	0.033	1.555
	Serious	0.010	1.530
	Severe	0.001	1.592
	Critical	0.001	1.448
	Fatal	0.001	0.665
	Injured people per crash	0.839	1.513

## Road Edge Departure With Prior Vehicle Maneuver

*Typical Scenario:* Vehicle is turning left/right at an intersection-related location, in a rural area at night, under clear weather conditions, with a posted speed limit of 25 mph; and then departs the edge of the road.

*Factor Over-Representation:* Dark, intersection-related, low-speed road, alcohol, inattention, and younger driver are over-represented (based on a simple comparison of percentages).



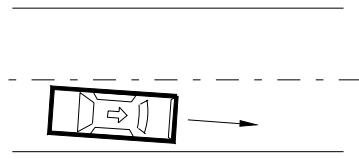
*Dynamic Variations:* Vehicle attempts to change lanes/pass or enter/leave a parking position and departs the edge of the road. The first harmful event of the “road edge departure with prior vehicle maneuver” scenario occurs at road shoulder or parking lane in one-third of these crashes. Moreover, the vehicle departs the road edge to the right in about two-thirds of these crashes.

*Scenario Severity:* Table below quantifies the annual severity of this crash scenario in terms of five different metrics based on 2004 GES statistics. This table also provides the ratios of people involved by maximum injury severity using the KABCO and AIS injury scales. About 1.42 percent of all people involved in this crash scenario suffered high-level MAIS 3+ injuries (serious, severe, critical, or fatal). Approximately 1,000 pedestrians were involved in this crash scenario.

	Crash Severity	Scenario	Scenario/All
	No. of crashes	68,000	1.14%
	No. of vehicles involved	70,000	0.65%
	No. of people involved	98,000	0.65%
Societal Cost	Economic cost	\$1,144,000,000	0.95%
	Functional years lost	34,000	1.22%
KABCO Injury Scale	None	0.827	1.011
	Possible	0.059	0.540
	Non-incapacitating	0.079	1.642
	Incapacitating	0.022	1.130
	Fatal	0.005	2.925
	Unknown	0.008	2.162
	Died prior	-	-
AIS Injury Scale	None	0.781	1.000
	Minor	0.182	0.965
	Moderate	0.023	1.087
	Serious	0.007	1.115
	Severe	0.001	1.235
	Critical	0.0005	1.155
	Fatal	0.005	2.899
	Injured people per crash	0.318	0.574

## Road Edge Departure Without Prior Vehicle Maneuver

*Typical Scenario:* Vehicle is going straight in a rural area at night, under clear weather conditions, with a posted speed limit of 55 mph or more, and departs the edge of the road at a non-junction area.



*Factor Over-Representation:* Dark, rural area, non-junction, alcohol, inattention, speeding, drowsiness, younger driver, and rollover are over-represented (based on a simple comparison of percentages).

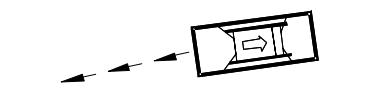
*Dynamic Variations:* Vehicle is negotiating a curve and departs the edge of the road (26% of crashes). The first harmful event of the “road edge departure without prior vehicle maneuver” scenario occurs at road shoulder or parking lane in about 27 percent of these crashes. Moreover, the vehicle departs the road edge to the right in about two-thirds of these crashes.

*Scenario Severity:* Table below quantifies the annual severity of this crash scenario in terms of five different metrics based on 2004 GES statistics. This table also provides the ratios of people involved by maximum injury severity using the KABCO and AIS injury scales. About 2.79 percent of all people involved in this crash scenario suffered high-level MAIS 3+ injuries (serious, severe, critical, or fatal). Approximately 2,000 pedestrians were involved in this crash scenario.

Crash Severity		Scenario	Scenario/All
No. of crashes		334,000	5.62%
No. of vehicles involved		338,000	3.16%
No. of people involved		456,000	3.03%
Societal Cost	Economic cost	\$9,005,000,000	7.51%
	Functional years lost	270,000	9.76%
KABCO Injury Scale	None	0.652	0.798
	Possible	0.131	1.201
	Non-incapacitating	0.141	2.930
	Incapacitating	0.058	3.023
	Fatal	0.008	4.410
	Unknown	0.009	2.572
	Died prior	-	-
AIS Injury Scale	None	0.638	0.817
	Minor	0.289	1.532
	Moderate	0.045	2.164
	Serious	0.016	2.462
	Severe	0.002	2.795
	Critical	0.001	2.915
	Fatal	0.008	4.371
	Injured people per crash	0.495	0.892

## Road Edge Departure While Backing Up

*Typical Scenario:* Vehicle is backing up in an urban area, in daylight, under clear weather conditions, with a posted speed limit of 25 mph; and then departs the road edge on the shoulder/parking lane in a driveway/alley location.



*Factor Over-Representation:* Driveway/alley location, low-speed road, alcohol, inattention, and younger driver are over-represented (based on a simple comparison of percentages).

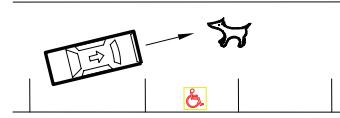
*Dynamic Variations:* Vehicle is leaving/entering a parked position while backing up and departs the edge of the road.

*Scenario Severity:* Table below quantifies the annual severity of this crash scenario in terms of five different metrics based on 2004 GES statistics. This table also provides the ratios of people involved by maximum injury severity using the KABCO and AIS injury scales. About 0.27 percent of all people involved in this crash scenario suffered high-level MAIS 3+ injuries (serious, severe, critical, or fatal). Approximately 4,000 pedestrians were involved in this crash scenario.

Crash Severity		Scenario	Scenario/All
No. of crashes		66,000	1.11%
No. of vehicles involved		66,000	0.62%
No. of people involved		95,000	0.63%
Societal Cost	Economic cost	\$350,000,000	0.29%
	Functional years lost	6,000	0.21%
KABCO Injury Scale	None	0.941	1.150
	Possible	0.037	0.342
	Non-incapacitating	0.016	0.336
	Incapacitating	0.003	0.131
	Fatal	0.001	0.358
	Unknown	0.002	0.605
	Died prior	-	-
AIS Injury Scale	None	0.878	1.125
	Minor	0.112	0.591
	Moderate	0.008	0.359
	Serious	0.002	0.275
	Severe	0.0002	0.227
	Critical	0.0001	0.165
	Fatal	0.001	0.355
	Injured people per crash	0.176	0.318

## Animal Crash With Prior Vehicle Maneuver

*Typical Scenario:* Vehicle is leaving a parked position in a rural area at night, under clear weather conditions; and encounters an animal at a non-junction area.



*Factor Over-Representation:* Dark, wet, or slippery road, rural area, non-junction, and high-speed road are over-represented (based on a simple comparison of percentages).

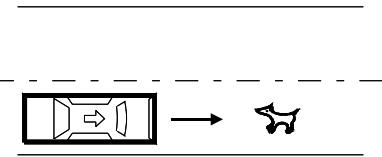
*Dynamic Variations:* Vehicle is passing another vehicle and encounters an animal.

*Scenario Severity:* Table below quantifies the annual severity of this crash scenario in terms of five different metrics based on 2004 GES statistics. This table also provides the ratios of people involved by maximum injury severity using the KABCO and AIS injury scales. About 0.36 percent of all people involved in this crash scenario suffered high-level MAIS 3+ injuries (serious, severe, critical, or fatal).

Crash Severity		Scenario	Scenario/All
No. of crashes		23,000	0.39%
No. of vehicles involved		24,000	0.22%
No. of people involved		27,000	0.18%
Societal Cost	Economic cost	\$120,000,000	0.10%
	Functional years lost	2,000	0.06%
KABCO Injury Scale	None	0.889	1.087
	Possible	0.083	0.759
	Non-incapacitating	0.022	0.451
	Incapacitating	0.005	0.240
	Fatal	0.0002	0.099
	Unknown	0.002	0.498
	Died prior	-	-
AIS Injury Scale	None	0.839	1.075
	Minor	0.145	0.771
	Moderate	0.012	0.557
	Serious	0.003	0.449
	Severe	0.0003	0.344
	Critical	0.0001	0.286
	Fatal	0.0002	0.098
	Injured people per crash	0.186	0.336

## Animal Crash Without Prior Vehicle Maneuver

*Typical Scenario:* Vehicle is going straight in a rural area at night, under clear weather conditions, with a posted speed limit of 55 mph or more; and encounters an animal at a non-junction location.



*Factor Over-Representation:* Dark, rural area, non-junction, and high-speed road are over-represented (based on a simple comparison of percentages).

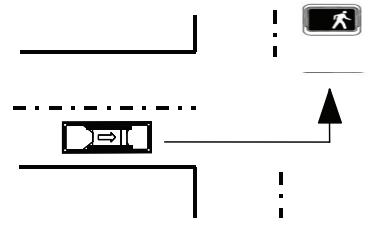
*Dynamic Variations:* Vehicle is negotiating a curve and encounters an animal (11% of crashes).

*Scenario Severity:* Table below quantifies the annual severity of this crash scenario in terms of five different metrics based on 2004 GES statistics. This table also provides the ratios of people involved by maximum injury severity using the KABCO and AIS injury scales. About 0.38 percent of all people involved in this crash scenario suffered high-level MAIS 3+ injuries (serious, severe, critical, or fatal).

Crash Severity		Scenario	Scenario/All
No. of crashes		305,000	5.13%
No. of vehicles involved		311,000	2.90%
No. of people involved		414,000	2.76%
Societal Cost	Economic cost	\$1,632,000,000	1.36%
	Functional years lost	24,000	0.86%
KABCO Injury Scale	None	0.921	1.126
	Possible	0.040	0.364
	Non-incapacitating	0.030	0.618
	Incapacitating	0.008	0.412
	Fatal	0.0001	0.065
	Unknown	0.001	0.324
	Died prior	-	-
AIS Injury Scale	None	0.861	1.103
	Minor	0.124	0.660
	Moderate	0.011	0.509
	Serious	0.003	0.468
	Severe	0.0004	0.440
	Critical	0.0002	0.425
	Fatal	0.0001	0.064
	Injured people per crash	0.189	0.340

## Pedestrian Crash With Prior Vehicle Maneuver

*Typical Scenario:* Vehicle is turning left in an urban area, in daylight, under clear weather conditions with a posted speed limit of 35 mph; and encounters a pedestrian in the crosswalk at a signaled intersection.



*Factor Over-Representation:* Urban area, intersection and intersection-related locations, low-speed road, vision obscured, and inattention are over-represented (based on a simple comparison of percentages).

*Dynamic Variations:* Vehicle is turning right and encounters a pedestrian. The pedestrian is running into the road or playing in the roadway in about 15 percent of overall scenario crashes.

*Scenario Severity:* Table below quantifies the annual severity of this crash scenario in terms of five different metrics based on 2004 GES statistics. This table also provides the ratios of people involved by maximum injury severity using the KABCO and AIS injury scales. About 2.87 percent of all people involved in this crash scenario suffered high-level MAIS 3+ injuries (serious, severe, critical, or fatal).

Crash Severity		Scenario	Scenario/All
No. of crashes		17,000	0.29%
No. of vehicles involved		18,000	0.17%
No. of people involved		41,000	0.27%
Societal Cost	Economic cost	\$843,000,000	0.70%
	Functional years lost	24,000	0.88%
KABCO Injury Scale	None	0.545	0.666
	Possible	0.228	2.090
	Non-incapacitating	0.150	3.119
	Incapacitating	0.054	2.799
	Fatal	0.007	4.148
	Unknown	0.016	4.288
	Died prior	-	-
AIS Injury Scale	None	0.558	0.715
	Minor	0.360	1.910
	Moderate	0.053	2.509
	Serious	0.018	2.651
	Severe	0.002	2.877
	Critical	0.001	2.806
	Fatal	0.007	4.111
	Injured people per crash	1.060	1.910

## Pedestrian Crash Without Prior Vehicle Maneuver

*Typical Scenario:* Vehicle is going straight in an urban area, in daylight, under clear weather conditions, with a posted speed limit of 25 mph; and then encounters a pedestrian at a non-junction location.



*Factor Over-Representation:* Dark, adverse weather, non-junction area, low-speed road, vision obscured, and younger driver are over-represented (based on a simple comparison of percentages).

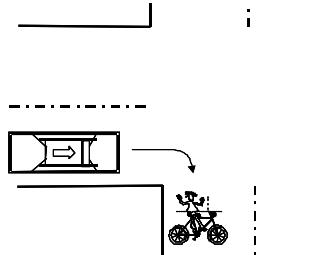
*Dynamic Variations:* Vehicle is starting in traffic lane or negotiating a curve and encounters a pedestrian. The pedestrian is running into the road in 36 percent of overall scenario crashes. Moreover, the pedestrian is improperly crossing the roadway in 26 percent of overall scenario crashes.

*Scenario Severity:* Table below quantifies the annual severity of this crash scenario in terms of five different metrics based on 2004 GES statistics. This table also provides the ratios of people involved by maximum injury severity using the KABCO and AIS injury scales. About 5.74 percent of all people involved in this crash scenario suffered high-level MAIS 3+ injuries (serious, severe, critical, or fatal).

Crash Severity		Scenario	Scenario/All
No. of crashes		39,000	0.66%
No. of vehicles involved		42,000	0.39%
No. of people involved		98,000	0.65%
Societal Cost	Economic cost	\$4,022,000,000	3.36%
	Functional years lost	144,000	5.21%
KABCO Injury Scale	None	0.587	0.717
	Possible	0.124	1.131
	Non-incapacitating	0.131	2.715
	Incapacitating	0.115	5.997
	Fatal	0.025	14.008
	Unknown	0.019	5.236
	Died prior	-	-
AIS Injury Scale	None	0.576	0.738
	Minor	0.305	1.618
	Moderate	0.061	2.899
	Serious	0.026	3.878
	Severe	0.004	4.957
	Critical	0.002	5.462
	Fatal	0.025	13.884
	Injured people per crash	1.055	1.902

## Pedalcyclist Crash With Prior Vehicle Maneuver

*Typical Scenario:* Vehicle is turning right in an urban area, in daylight, under clear weather conditions, with a posted speed limit of 25 mph; and encounters a pedalcyclist at an intersection.



*Factor Over-Representation:* Clear weather, dry road, intersection and intersection-related locations, low-speed road, vision obscured, inattention, and younger driver are over-represented (based on a simple comparison of percentages).

*Dynamic Variations:* Vehicle is turning left and encounters a pedalcyclist. The pedalcyclist is in the crosswalk in about one-third of overall scenario crashes. Moreover, the pedalcyclist fails to yield the right-of-way and is riding on the wrong side of the road respectively in about 13 and 24 percent of overall scenario crashes.

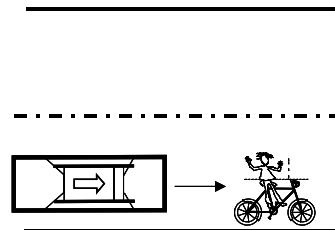
*Scenario Severity:* Table below quantifies the annual severity of this crash scenario in terms of five different metrics based on 2004 GES statistics. This table also provides the ratios of people involved by maximum injury severity using the KABCO and AIS injury scales. About 1.65 percent of all people involved in this crash scenario suffered high-level MAIS 3+ injuries (serious, severe, critical, or fatal).

Crash Severity		Scenario	Scenario/All
No. of crashes		18,000	0.31%
No. of vehicles involved		19,000	0.18%
No. of people involved		48,000	0.32%
Societal Cost	Economic cost	\$523,000,000	0.44%
	Functional years lost	11,000	0.39%
KABCO Injury Scale	None	0.645	0.788
	Possible	0.126	1.158
	Non-incapacitating	0.189	3.922
	Incapacitating	0.035	1.821
	Fatal	0.0002	0.127
	Unknown	0.005	1.279
	Died prior	-	-
AIS Injury Scale	None	0.631	0.809
	Minor	0.308	1.634
	Moderate	0.044	2.091
	Serious	0.014	2.062
	Severe	0.002	2.039
	Critical	0.001	1.956
	Fatal	0.0002	0.126
	Injured people per crash	0.975	1.757

## Pedalcyclist Crash Without Prior Vehicle Maneuver

*Typical Scenario:* Vehicle is going straight in an urban area, in daylight, under clear weather conditions, with a posted speed limit of 25 mph; and encounters a pedalcyclist at an intersection.

*Factor Over-Representation:* Clear weather, dry road, intersection, low-speed road, vision obscured, and female driver are over-represented (based on a simple comparison of percentages).



*Dynamic Variations:* Vehicle is starting in traffic lane and encounters a pedalcyclist. The pedalcyclist fails to yield the right-of-way and is riding on the wrong side of the road respectively in about 46 and 6 percent of overall scenario crashes.

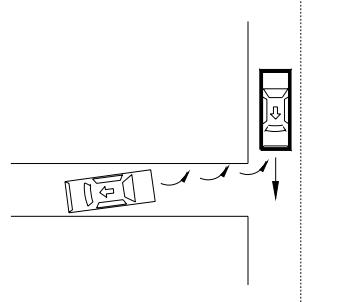
*Scenario Severity:* Table below quantifies the annual severity of this crash scenario in terms of five different metrics based on 2004 GES statistics. This table also provides the ratios of people involved by maximum injury severity using the KABCO and AIS injury scales. About 3.27 percent of all people involved in this crash scenario suffered high-level MAIS 3+ injuries (serious, severe, critical, or fatal).

Crash Severity		Scenario	Scenario/All
No. of crashes		24,000	0.41%
No. of vehicles involved		25,000	0.23%
No. of people involved		58,000	0.39%
Societal Cost	Economic cost	\$1,301,000,000	1.09%
	Functional years lost	39,000	1.42%
KABCO Injury Scale	None	0.593	0.726
	Possible	0.134	1.229
	Non-incapacitating	0.184	3.823
	Incapacitating	0.070	3.663
	Fatal	0.009	4.837
	Unknown	0.009	2.518
	Died prior	-	-
AIS Injury Scale	None	0.586	0.751
	Minor	0.327	1.733
	Moderate	0.054	2.585
	Serious	0.020	2.964
	Severe	0.003	3.362
	Critical	0.001	3.537
	Fatal	0.009	4.795
	Injured people per crash	1.003	1.808

## Backing Up Into Another Vehicle

*Typical Scenario:* Vehicle is backing up in an urban area, in daylight, under clear weather conditions, at a driveway or alley location, with a posted speed limit of 25 mph; and collides with another vehicle.

*Factor Over-Representation:* Daylight, driveway or alley and intersection-related locations, low-speed road, vision obscured, inattention, and younger driver are over-represented (based on a simple comparison of percentages).



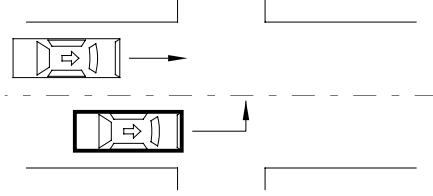
*Dynamic Variations:* Vehicle is leaving a parked position and backs into another vehicle.

*Scenario Severity:* Table below quantifies the annual severity of this crash scenario in terms of five different metrics based on 2004 GES statistics. This table also provides the ratios of people involved by maximum injury severity using the KABCO and AIS injury scales. About 0.13 percent of all people involved in this crash scenario suffered high-level MAIS 3+ injuries (serious, severe, critical, or fatal).

Crash Severity	Scenario	Scenario/All
No. of crashes	131,000	2.20%
No. of vehicles involved	261,000	2.44%
No. of people involved	363,000	2.42%
Societal Cost		
Economic cost	\$947,000,000	0.79%
Functional years lost	9,000	0.32%
KABCO Injury Scale		
None	0.957	1.170
Possible	0.034	0.313
Non-incapacitating	0.007	0.143
Incapacitating	0.001	0.030
Fatal	0.00003	0.019
Unknown	0.001	0.371
Died prior	-	-
AIS Injury Scale		
None	0.892	1.142
Minor	0.102	0.538
Moderate	0.006	0.263
Serious	0.001	0.173
Severe	0.0001	0.109
Critical	0.00002	0.058
Fatal	0.00003	0.019
Injured people per crash	0.301	0.542

## Vehicle(s) Turning – Vehicles Traveling in Same Direction

*Typical Scenario:* Vehicle is turning left at an intersection in an urban area, in daylight, under clear weather conditions, with a posted speed limit of 35 mph; and then cuts across the path of another vehicle initially traveling in the same direction.



*Factor Over-Representation:* Clear weather, dry road, low-speed road, and younger driver are over-represented (based on a simple comparison of percentages).

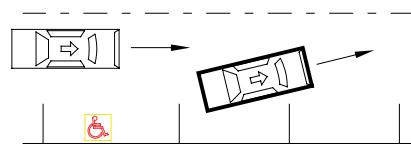
*Dynamic Variations:* Vehicle is turning right and cuts across the path of another vehicle initially traveling in the same direction.

*Scenario Severity:* Table below quantifies the annual severity of this crash scenario in terms of five different metrics based on 2004 GES statistics. This table also provides the ratios of people involved by maximum injury severity using the KABCO and AIS injury scales. About 0.44 percent of all people involved in this crash scenario suffered high-level MAIS 3+ injuries (serious, severe, critical, or fatal).

Crash Severity		Scenario	Scenario/All
No. of crashes		222,000	3.73%
No. of vehicles involved		446,000	4.17%
No. of people involved		641,000	4.26%
Societal Cost	Economic cost	\$2,810,000,000	2.34%
	Functional years lost	47,000	1.68%
KABCO Injury Scale	None	0.900	1.100
	Possible	0.066	0.608
	Non-incapacitating	0.023	0.470
	Incapacitating	0.009	0.455
	Fatal	0.0003	0.190
	Unknown	0.002	0.574
	Died prior	-	-
AIS Injury Scale	None	0.846	1.084
	Minor	0.137	0.728
	Moderate	0.012	0.568
	Serious	0.003	0.521
	Severe	0.0004	0.485
	Critical	0.0002	0.465
	Fatal	0.0003	0.189
	Injured people per crash	0.444	0.801

## Vehicle(s) Parking – Vehicles Traveling in Same Direction

*Typical Scenario:* Vehicle is leaving a parked position in an urban area, in daylight, under clear weather conditions, with a posted speed limit of 25 mph; and encounters another vehicle traveling in the same direction at a non-junction area.



*Factor Over-Representation:* Adverse weather, non-junction area, low-speed road, inattention, and younger driver are over-represented (based on a simple comparison of percentages).

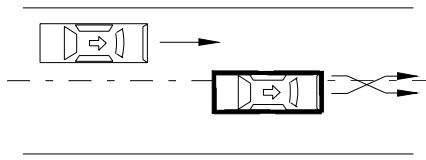
*Dynamic Variations:* Vehicle is making a U-turn and encounters a vehicle traveling in the same direction.

*Scenario Severity:* Table below quantifies the annual severity of this crash scenario in terms of five different metrics based on 2004 GES statistics. This table also provides the ratios of people involved by maximum injury severity using the KABCO and AIS injury scales. About 0.45 percent of all people involved in this crash scenario suffered high-level MAIS 3+ injuries (serious, severe, critical, or fatal).

Crash Severity		Scenario	Scenario/All	
No. of crashes		48,000	0.81%	
No. of vehicles involved		95,000	0.89%	
No. of people involved		125,000	0.83%	
Societal Cost	Economic cost	\$623,000,000	0.52%	
	Functional years lost	11,000	0.41%	
KABCO Injury Scale	None	0.892	1.090	
	Possible	0.064	0.582	
	Non-incapacitating	0.038	0.781	
	Incapacitating	0.004	0.228	
	Fatal	0.0009	0.485	
	Unknown	0.002	0.543	
AIS Injury Scale	Died prior	-	-	
	None	0.839	1.074	
	Minor	0.144	0.766	
	Moderate	0.012	0.588	
	Serious	0.003	0.473	
	Severe	0.0003	0.376	
	Critical	0.0001	0.295	
	Fatal	0.0009	0.480	
Injured people per crash		0.426	0.768	

## Vehicle(s) Changing Lanes – Vehicles Traveling in Same Direction

*Typical Scenario:* Vehicle is changing lanes in an urban area, in daylight, under clear weather conditions, at a non-junction with a posted speed limit of 55 mph or more; and then encroaches into another vehicle traveling in the same direction.



*Factor Over-Representation:* Non-junction area, high-speed road, inattention, and younger driver are over-represented (based on a simple comparison of percentages).

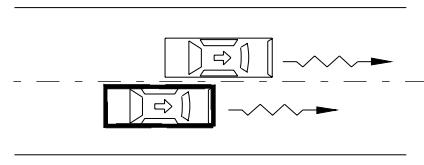
*Dynamic Variations:* Vehicle is passing another vehicle and encroaches into another vehicle traveling in the same direction (15% of crashes). Vehicle may also be merging (8% of crashes). When changing lanes or passing, the vehicle is equally as likely to be moving to the right as to the left. On the other hand, the vehicle merges to the left in about 75 percent of the merging crashes.

*Scenario Severity:* Table below quantifies the annual severity of this crash scenario in terms of five different metrics based on 2004 GES statistics. This table also provides the ratios of people involved by maximum injury severity using the KABCO and AIS injury scales. About 0.42 percent of all people involved in this crash scenario suffered high-level MAIS 3+ injuries (serious, severe, critical, or fatal).

Crash Severity		Scenario	Scenario/All
No. of crashes		338,000	5.69%
No. of vehicles involved		635,000	5.94%
No. of people involved		884,000	5.88%
Societal Cost	Economic cost	\$4,247,000,000	3.54%
	Functional years lost	71,000	2.57%
KABCO Injury Scale	None	0.924	1.129
	Possible	0.048	0.441
	Non-incapacitating	0.017	0.351
	Incapacitating	0.008	0.421
	Fatal	0.0007	0.396
	Unknown	0.002	0.666
	Died prior	-	-
AIS Injury Scale	None	0.864	1.107
	Minor	0.121	0.644
	Moderate	0.010	0.471
	Serious	0.003	0.441
	Severe	0.0004	0.437
	Critical	0.0002	0.419
	Fatal	0.0007	0.392
	Injured people per crash	0.387	0.697

## Vehicle(s) Drifting – Vehicles Traveling in Same Direction

*Typical Scenario:* Vehicle is going straight in an urban area, in daylight, under clear weather conditions, at a non-junction with a posted speed limit of 55 mph or more; and then drifts into an adjacent vehicle traveling in the same direction.



*Factor Over-Representation:* High-speed road, speeding, and younger driver are over-represented (based on a simple comparison of percentages).

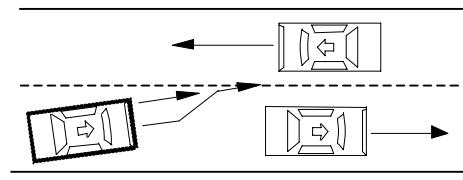
*Dynamic Variations:* Vehicle drifts into another vehicle stopped in traffic lane.

*Scenario Severity:* Table below quantifies the annual severity of this crash scenario in terms of five different metrics based on 2004 GES statistics. This table also provides the ratios of people involved by maximum injury severity using the KABCO and AIS injury scales. About 0.58 percent of all people involved in this crash scenario suffered high-level MAIS 3+ injuries (serious, severe, critical, or fatal).

Crash Severity	Scenario	Scenario/All
No. of crashes	98,000	1.65%
No. of vehicles involved	235,000	2.20%
No. of people involved	330,000	2.19%
Societal Cost		
Economic cost	\$1,383,000,000	1.15%
Functional years lost	37,000	1.32%
KABCOS Injury Scale		
None	0.893	1.092
Possible	0.067	0.612
Non-incapacitating	0.026	0.534
Incapacitating	0.011	0.598
Fatal	0.001	0.587
Unknown	0.001	0.374
Died prior	-	-
AIS Injury Scale		
None	0.841	1.077
Minor	0.141	0.745
Moderate	0.013	0.618
Serious	0.004	0.600
Severe	0.0005	0.577
Critical	0.0002	0.590
Fatal	0.001	0.581
Injured people per crash	0.413	0.744

## Vehicle(s) Making a Maneuver – Vehicles Traveling in Opposite Direction

*Typical Scenario:* Vehicle is passing another vehicle in a rural area, in daylight, under clear weather conditions, at a non-junction with a posted speed limit of 55 mph or more; and encroaches into another vehicle traveling in the opposite direction.



*Factor Over-Representation:* Dark, adverse weather, rural area, non-junction, high-speed road, alcohol, vision obscured, inattention, speeding, male, and young driver are over-represented (based on a simple comparison of percentages).

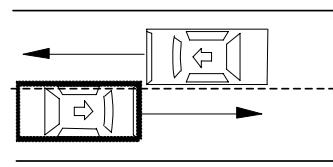
*Dynamic Variations:* Vehicle is changing lanes or in the middle of a corrective maneuver and encroaches into another vehicle traveling in the opposite direction.

*Scenario Severity:* Table below quantifies the annual severity of this crash scenario in terms of five different metrics based on 2004 GES statistics. This table also provides the ratios of people involved by maximum injury severity using the KABCO and AIS injury scales. About 3.16 percent of all people involved in this crash scenario suffered high-level MAIS 3+ injuries (serious, severe, critical, or fatal).

	Crash Severity	Scenario	Scenario/All
	No. of crashes	15,000	0.26%
	No. of vehicles involved	30,000	0.28%
	No. of people involved	40,000	0.27%
Societal Cost	Economic cost	\$943,000,000	0.79%
	Functional years lost	32,000	1.14%
KABCO Injury Scale	None	0.710	0.868
	Possible	0.130	1.189
	Non-incapacitating	0.079	1.649
	Incapacitating	0.063	3.305
	Fatal	0.013	7.125
	Unknown	0.005	1.251
	Died prior	-	-
AIS Injury Scale	None	0.687	0.881
	Minor	0.243	1.286
	Moderate	0.039	1.833
	Serious	0.015	2.288
	Severe	0.0022	2.684
	Critical	0.0012	3.031
	Fatal	0.013	7.062
	Injured people per crash	0.816	1.470

## Vehicle(s) Not Making a Maneuver – Vehicles Traveling in Opposite Direction

*Typical Scenario:* Vehicle is going straight in a rural area, in daylight, under clear weather conditions, at a non-junction with a posted speed limit of 55 mph or more; and drifts and encroaches into another vehicle traveling in the opposite direction.



*Factor Over-Representation:* Dark, adverse weather, wet or slippery road surface, non-level road, rural area, non-junction, alcohol, male, and younger driver are over-represented (based on a simple comparison of percentages).

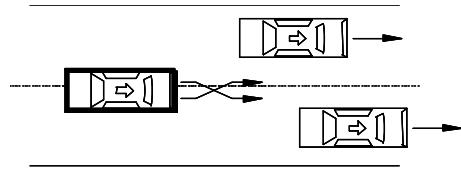
*Dynamic Variations:* Vehicle is negotiating a curve and then drifts and encroaches into another vehicle traveling in the opposite direction. About 42 percent of overall scenario crashes occur on curves.

*Scenario Severity:* Table below quantifies the annual severity of this crash scenario in terms of five different metrics based on 2004 GES statistics. This table also provides the ratios of people involved by maximum injury severity using the KABCO and AIS injury scales. About 2.58 percent of all people involved in this crash scenario suffered high-level MAIS 3+ injuries (serious, severe, critical, or fatal).

Crash Severity	Scenario	Scenario/All
No. of crashes	124,000	2.08%
No. of vehicles involved	232,000	2.17%
No. of people involved	330,000	2.20%
Societal Cost	\$6,407,000,000	5.35%
Functional years lost	206,000	7.44%
KABCOS Injury Scale		
None	0.723	0.884
Possible	0.119	1.086
Non-incapacitating	0.092	1.906
Incapacitating	0.049	2.536
Fatal	0.010	5.448
Unknown	0.008	2.122
Died prior	-	-
AIS Injury Scale		
None	0.698	0.894
Minor	0.240	1.274
Moderate	0.036	1.701
Serious	0.013	1.972
Severe	0.002	2.265
Critical	0.0009	2.403
Fatal	0.010	5.400
Injured people per crash	0.806	1.452

## Following Vehicle Making a Maneuver and Approaching Lead Vehicle

*Typical Scenario:* Vehicle is changing lanes or passing in an urban area, in daylight, under clear weather conditions, at a non-junction with a posted speed limit of 55 mph; and closes in on a lead vehicle.



*Factor Over-Representation:* Intersection-related location, inattention, speeding, and younger driver are over-represented (based on a simple comparison of percentages).

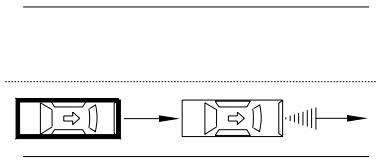
*Dynamic Variations:* Vehicle is turning right and then closes in on a lead vehicle (22% of crashes).

*Scenario Severity:* Table below quantifies the annual severity of this crash scenario in terms of five different metrics based on 2004 GES statistics. This table also provides the ratios of people involved by maximum injury severity using the KABCO and AIS injury scales. About 0.50 percent of all people involved in this crash scenario suffered high-level MAIS 3+ injuries (serious, severe, critical, or fatal).

Crash Severity		Scenario	Scenario/All
No. of crashes		85,000	1.44%
No. of vehicles involved		180,000	1.69%
No. of people involved		249,000	1.66%
Societal Cost	Economic cost	\$1,212,000,000	1.01%
	Functional years lost	18,000	0.67%
KABCO Injury Scale	None	0.860	1.052
	Possible	0.103	0.946
	Non-incapacitating	0.023	0.482
	Incapacitating	0.009	0.487
	Fatal	0.0001	0.053
	Unknown	0.004	1.049
	Died prior	-	-
AIS Injury Scale	None	0.817	1.047
	Minor	0.163	0.864
	Moderate	0.015	0.707
	Serious	0.004	0.632
	Severe	0.0005	0.573
	Critical	0.0002	0.516
	Fatal	0.0001	0.053
	Injured people per crash	0.533	0.962

## Following Vehicle Approaching an Accelerating Lead Vehicle

*Typical Scenario:* Vehicle is going straight in an urban area, in daylight, under clear weather conditions, at an intersection-related location with a posted speed limit of 45 mph; and closes in on an accelerating lead vehicle.



*Factor Over-Representation:* Dry road, intersection-related, high-speed road, traffic signal, inattention, speeding, female, and younger driver are over-represented (based on a simple comparison of percentages).

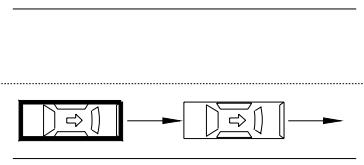
*Dynamic Variations:* Vehicle is starting in traffic lane and then closes in on an accelerating lead vehicle (34% of crashes).

*Scenario Severity:* Table below quantifies the annual severity of this crash scenario in terms of five different metrics based on 2004 GES statistics. This table also provides the ratios of people involved by maximum injury severity using the KABCO and AIS injury scales. About 0.55 percent of all people involved in this crash scenario suffered high-level MAIS 3+ injuries (serious, severe, critical, or fatal).

Crash Severity		Scenario	Scenario/All
No. of crashes		19,000	0.32%
No. of vehicles involved		40,000	0.38%
No. of people involved		54,000	0.36%
Societal Cost	Economic cost	\$273,000,000	0.23%
	Functional years lost	4,000	0.15%
KABCO Injury Scale	None	0.865	1.058
	Possible	0.088	0.802
	Non-incapacitating	0.035	0.724
	Incapacitating	0.012	0.625
	Fatal	0.0001	0.057
	Unknown	0.000	0.000
	Died prior	-	-
AIS Injury Scale	None	0.819	1.049
	Minor	0.160	0.848
	Moderate	0.015	0.733
	Serious	0.005	0.690
	Severe	0.0005	0.611
	Critical	0.0003	0.633
	Fatal	0.0001	0.056
	Injured people per crash	0.518	0.934

## Following Vehicle Approaching Lead Vehicle Moving at Lower Constant Speed

*Typical Scenario:* Vehicle is going straight in an urban area, in daylight, under clear weather conditions, at a non-junction with a posted speed limit of 55 mph or more; and closes in on a lead vehicle moving at lower constant speed.



*Factor Over-Representation:* Non-junction location, high-speed road, inattention, speeding, and younger driver are over-represented (based on a simple comparison of percentages).

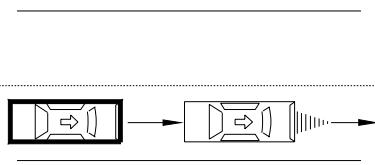
*Dynamic Variations:* Vehicle is decelerating in traffic lane and then closes in on a lead vehicle moving at lower constant speed.

*Scenario Severity:* Table below quantifies the annual severity of this crash scenario in terms of five different metrics based on 2004 GES statistics. This table also provides the ratios of people involved by maximum injury severity using the KABCO and AIS injury scales. About 0.71 percent of all people involved in this crash scenario suffered high-level MAIS 3+ injuries (serious, severe, critical, or fatal).

Crash Severity	Scenario	Scenario/All
No. of crashes	210,000	3.53%
No. of vehicles involved	445,000	4.16%
No. of people involved	612,000	4.07%
Societal Cost	Economic cost	\$3,910,000,000
	Functional years lost	78,000
KABCO Injury Scale	None	0.836
	Possible	0.116
	Non-incapacitating	0.031
	Incapacitating	0.013
	Fatal	0.001
	Unknown	0.002
	Died prior	-
AIS Injury Scale	None	0.797
	Minor	0.178
	Moderate	0.018
	Serious	0.005
	Severe	0.0006
	Critical	0.0003
	Fatal	0.001
	Injured people per crash	0.592
		1.066

## Following Vehicle Approaching a Decelerating Lead Vehicle

*Typical Scenario:* Vehicle is going straight and following another lead vehicle in a rural area, in daylight, under clear weather conditions, at a non-junction with a posted speed limit of 55 mph or more; and the lead vehicle suddenly decelerates.



*Factor Over-Representation:* Daylight, adverse weather, rural area, intersection-related, high-speed road, inattention, speeding, and younger driver are over-represented (based on a simple comparison of percentages).

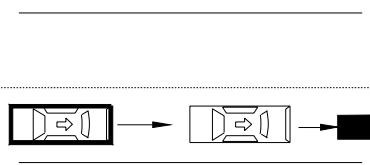
*Dynamic Variations:* Vehicle is decelerating in traffic lane and then closes in on a decelerating lead vehicle (11% of crashes).

*Scenario Severity:* Table below quantifies the annual severity of this crash scenario in terms of five different metrics based on 2004 GES statistics. This table also provides the ratios of people involved by maximum injury severity using the KABCO and AIS injury scales. About 0.49 percent of all people involved in this crash scenario suffered high-level MAIS 3+ injuries (serious, severe, critical, or fatal).

Crash Severity		Scenario	Scenario/All
No. of crashes		428,000	7.20%
No. of vehicles involved		936,000	8.76%
No. of people involved		1,283,000	8.54%
Societal Cost	Economic cost	\$6,390,000,000	5.33%
	Functional years lost	100,000	3.62%
KABCO Injury Scale	None	0.856	1.047
	Possible	0.112	1.026
	Non-incapacitating	0.022	0.455
	Incapacitating	0.009	0.452
	Fatal	0.0003	0.140
	Unknown	0.001	0.293
AIS Injury Scale	Died prior	-	-
	None	0.815	1.044
	Minor	0.166	0.878
	Moderate	0.015	0.698
	Serious	0.004	0.611
	Severe	0.0004	0.495
	Critical	0.0002	0.479
	Fatal	0.0003	0.139
	Injured people per crash	0.555	1.001

## Following Vehicle Approaching a Stopped Lead Vehicle

*Typical Scenario:* Vehicle is going straight in an urban area, in daylight, under clear weather conditions, at an intersection-related location with a posted speed limit of 35 mph; and closes in on a stopped lead vehicle.



*Factor Over-Representation:* Rural area, intersection-related, inattention, speeding and younger driver are over-represented (based on a simple comparison of percentages).

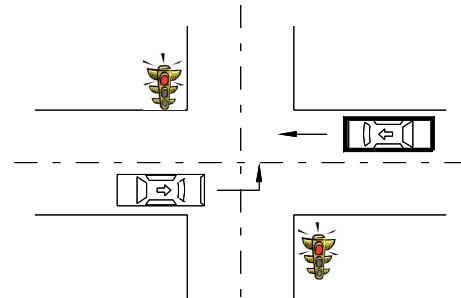
*Dynamic Variations:* Vehicle is decelerating in traffic lane and closes in on a stopped lead vehicle (12% of crashes). Vehicle may also be starting in traffic lane and closes in on a stopped lead vehicle (8% of crashes). In about 50 percent of the lead-vehicle-stopped crashes, the lead vehicle first decelerates to a stop and is struck afterwards by the following vehicle. This typically happens in the presence of a traffic control device or the lead vehicle is slowing down to make a turn. Thus, this particular scenario overlaps with the lead vehicle-decelerating scenario.

*Scenario Severity:* Table below quantifies the annual severity of this crash scenario in terms of five different metrics based on 2004 GES statistics. This table also provides the ratios of people involved by maximum injury severity using the KABCO and AIS injury scales. About 0.50 percent of all people involved in this crash scenario suffered high-level MAIS 3+ injuries (serious, severe, critical, or fatal).

	Crash Severity	Scenario	Scenario/All
	No. of crashes	975,000	16.41%
	No. of vehicles involved	2,162,000	20.21%
	No. of people involved	3,032,000	20.18%
Societal Cost	Economic cost	\$15,388,000,000	12.84%
	Functional years lost	240,000	8.69%
KABCO Injury Scale	None	0.844	1.032
	Possible	0.121	1.108
	Non-incapacitating	0.023	0.482
	Incapacitating	0.008	0.397
	Fatal	0.0002	0.128
	Unknown	0.004	0.995
	Died prior	0.00005	1.921
AIS Injury Scale	None	0.806	1.032
	Minor	0.174	0.920
	Moderate	0.016	0.738
	Serious	0.004	0.627
	Severe	0.0004	0.522
	Critical	0.0002	0.446
	Fatal	0.0002	0.127
	Injured people per crash	0.604	1.088

## Left Turn across Path from Opposite Directions at Signalized Junctions

*Typical Scenario:* Vehicle is turning left in an urban area, in daylight, under clear weather conditions, at a signalized intersection with a posted speed limit of 35 mph; and cuts across the path of another vehicle straight crossing from an opposite direction.



*Factor Over-Representation:* Intersection, low-speed road, vision obscured, inattention, female, and younger driver are over-represented (based on a simple comparison of percentages).

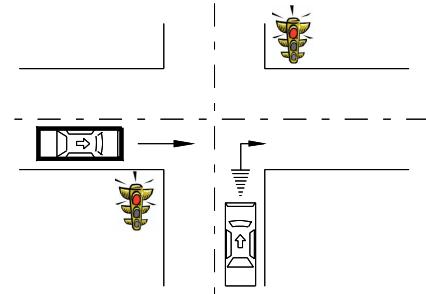
*Dynamic Variations:* Vehicle is turning left across the path of another vehicle that is also turning left from the opposite direction.

*Scenario Severity:* Table below quantifies the annual severity of this crash scenario in terms of five different metrics based on 2004 GES statistics. This table also provides the ratios of people involved by maximum injury severity using the KABCO and AIS injury scales. About 1.16 percent of all people involved in this crash scenario suffered high-level MAIS 3+ injuries (serious, severe, critical, or fatal).

Crash Severity	Scenario	Scenario/All
No. of crashes	220,000	3.71%
No. of vehicles involved	457,000	4.28%
No. of people involved	664,000	4.42%
Societal Cost		
Economic cost	\$5,749,000,000	4.80%
Functional years lost	121,000	4.36%
KABCOS Injury Scale		
None	0.753	0.920
Possible	0.144	1.314
Non-incapacitating	0.074	1.526
Incapacitating	0.025	1.319
Fatal	0.001	0.531
Unknown	0.004	1.043
Died prior	-	-
AIS Injury Scale		
None	0.729	0.934
Minor	0.232	1.228
Moderate	0.028	1.336
Serious	0.009	1.341
Severe	0.001	1.325
Critical	0.0005	1.331
Fatal	0.001	0.527
Injured people per crash	0.818	1.474

## Vehicle Turning Right at Signalized Junctions

*Typical Scenario:* Vehicle is turning right in an urban area, in daylight, under clear weather conditions, at a signalized intersection with a posted speed limit of 35 mph; and turns into the same direction of another vehicle crossing straight initially from a lateral direction.



*Factor Over-Representation:* Adverse weather, intersection or intersection-related locations, low-speed road, vision obscured, and younger and older drivers are over-represented (based on a simple comparison of percentages).

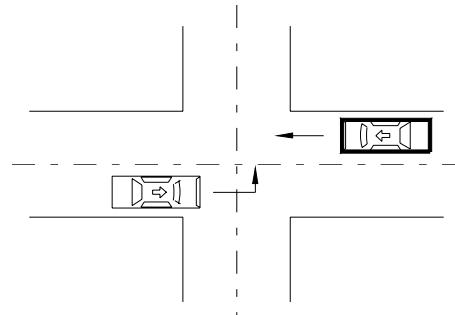
*Dynamic Variations:* Vehicle is turning right at a signalized intersection and then turns into the opposite direction of another vehicle traveling or stopped initially from a lateral direction.

*Scenario Severity:* Table below quantifies the annual severity of this crash scenario in terms of five different metrics based on 2004 GES statistics. This table also provides the ratios of people involved by maximum injury severity using the KABCO and AIS injury scales. About 0.27 percent of all people involved in this crash scenario suffered high-level MAIS 3+ injuries (serious, severe, critical, or fatal).

	Crash Severity	Scenario	Scenario/All
	No. of crashes	35,000	0.59%
	No. of vehicles involved	71,000	0.66%
	No. of people involved	98,000	0.65%
Societal Cost	Economic cost	\$355,000,000	0.30%
	Functional years lost	4,000	0.15%
KABCO Injury Scale	None	0.900	1.100
	Possible	0.076	0.698
	Non-incapacitating	0.019	0.400
	Incapacitating	0.002	0.108
	Fatal	-	-
	Unknown	0.002	0.617
	Died prior	-	-
AIS Injury Scale	None	0.848	1.087
	Minor	0.139	0.735
	Moderate	0.010	0.493
	Serious	0.002	0.364
	Severe	0.0002	0.251
	Critical	0.0001	0.168
	Fatal	-	-
	Injured people per crash	0.425	0.767

## Left Turn Across Path From Opposite Directions at Non-Signalized Junctions

*Typical Scenario:* Vehicle is turning left, in daylight, under clear weather conditions, at an intersection without traffic controls, with a posted speed limit of 35 mph; and then cuts across the path of another vehicle traveling from the opposite direction.



*Factor Over-Representation:* Rural area, intersection and driveway/alley locations, low-speed road, vision obscured, inattention, and younger and older drivers are over-represented (based on a simple comparison of percentages).

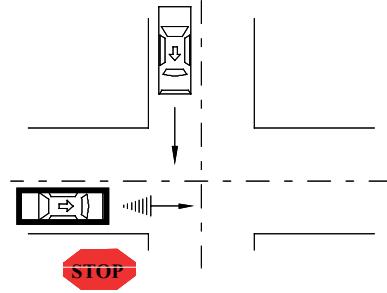
*Dynamic Variations:* Two vehicles are traveling in opposite directions and then both vehicles may turn left across their paths.

*Scenario Severity:* Table below quantifies the annual severity of this crash scenario in terms of five different metrics based on 2004 GES statistics. This table also provides the ratios of people involved by maximum injury severity using the KABCO and AIS injury scales. About 1.24 percent of all people involved in this crash scenario suffered high-level MAIS 3+ injuries (serious, severe, critical, or fatal).

Crash Severity		Scenario	Scenario/All
No. of crashes		190,000	3.19%
No. of vehicles involved		389,000	3.64%
No. of people involved		558,000	3.71%
Societal Cost	Economic cost	\$5,137,000,000	4.29%
	Functional years lost	113,000	4.09%
KABCO Injury Scale	None	0.749	0.916
	Possible	0.144	1.322
	Non-incapacitating	0.073	1.522
	Incapacitating	0.027	1.412
	Fatal	0.001	0.737
	Unknown	0.005	1.275
	Died prior	-	-
AIS Injury Scale	None	0.726	0.930
	Minor	0.233	1.237
	Moderate	0.029	1.368
	Serious	0.009	1.392
	Severe	0.001	1.405
	Critical	0.0006	1.414
	Fatal	0.001	0.731
	Injured people per crash	0.806	1.453

## Straight Crossing Paths at Non-Signalized Junctions

*Typical Scenario:* Vehicle stops at a stop sign in an urban area, in daylight, under clear weather conditions, at an intersection with a posted speed limit of 25 mph; and then proceeds against lateral crossing traffic.



*Factor Over-Representation:* Rural area, low-speed road, vision obscured, female, and younger and older drivers are over-represented (based on a simple comparison of percentages).

*Dynamic Variations:* Vehicle is going straight through an uncontrolled intersection and then cuts across the path of another straight crossing vehicle from lateral direction. Another scenario involves both vehicles first stopping and then proceeding on straight crossing paths.

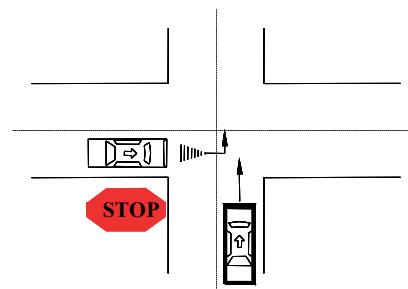
*Scenario Severity:* Table below quantifies the annual severity of this crash scenario in terms of five different metrics based on 2004 GES statistics. This table also provides the ratios of people involved by maximum injury severity using the KABCO and AIS injury scales. About 1.21 percent of all people involved in this crash scenario suffered high-level MAIS 3+ injuries (serious, severe, critical, or fatal).

Crash Severity		Scenario	Scenario/All
No. of crashes		264,000	4.44%
No. of vehicles involved		535,000	5.00%
No. of people involved		765,000	5.09%
Societal Cost	Economic cost	\$7,290,000,000	6.08%
	Functional years lost	174,000	6.29%
KABCO Injury Scale	None	0.769	0.940
	Possible	0.139	1.276
	Non-incapacitating	0.062	1.279
	Incapacitating	0.024	1.245
	Fatal	0.002	1.252
	Unknown	0.004	1.103
	Died prior	-	-
AIS Injury Scale	None	0.742	0.951
	Minor	0.220	1.166
	Moderate	0.026	1.237
	Serious	0.008	1.245
	Severe	0.001	1.238
	Critical	0.0005	1.246
	Fatal	0.002	1.241
	Injured people per crash	0.748	1.348

## Vehicle(s) Turning at Non-Signalized Junctions

*Typical Scenario:* Vehicle stops at a stop sign in a rural area, in daylight, under clear weather conditions, at an intersection with a posted speed limit of 35 mph; and proceeds to turn left against lateral crossing traffic.

*Factor Over-Representation:* Rural area, intersection and driveway/alley locations, low-speed road, vision obscured, inattention, female, and younger and older drivers are over-represented (based on a simple comparison of percentages).



*Dynamic Variations:* Vehicle stops at a stop sign and then proceeds to turn right against lateral crossing traffic.

*Scenario Severity:* Table below quantifies the annual severity of this crash scenario in terms of five different metrics based on 2004 GES statistics. This table also provides the ratios of people involved by maximum injury severity using the KABCO and AIS injury scales. About 0.71 percent of all people involved in this crash scenario suffered high-level MAIS 3+ injuries (serious, severe, critical, or fatal).

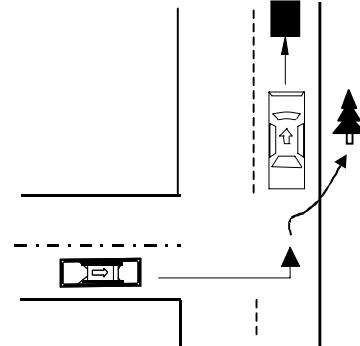
	<b>Crash Severity</b>	<b>Scenario</b>	<b>Scenario/All</b>
	No. of crashes	435,000	7.32%
	No. of vehicles involved	872,000	8.15%
	No. of people involved	1,212,000	8.07%
Societal Cost	Economic cost	\$7,343,000,000	6.13%
	Functional years lost	138,000	5.00%
KABCO Injury Scale	None	0.843	1.030
	Possible	0.101	0.925
	Non-incapacitating	0.038	0.788
	Incapacitating	0.015	0.778
	Fatal	0.001	0.331
	Unknown	0.003	0.736
	Died prior	-	-
AIS Injury Scale	None	0.801	1.027
	Minor	0.174	0.921
	Moderate	0.018	0.851
	Serious	0.006	0.823
	Severe	0.001	0.790
	Critical	0.0003	0.784
	Fatal	0.001	0.328
	Injured people per crash	0.554	0.998

## Vehicle Taking Evasive Action With Prior Vehicle Maneuver

*Typical Scenario:* Vehicle is turning left at an intersection-related location, in an urban area, in daylight, under clear weather conditions, with a posted speed limit of 35 mph; and takes an evasive action to avoid an obstacle.

*Factor Over-Representation:* Dark, urban area, intersection-related location, and younger driver are over-represented (based on a simple comparison of percentages).

*Dynamic Variations:* Vehicle is passing, turning right, or changing lanes and then takes an evasive action to avoid an obstacle. The first harmful event occurs on the road in 66 percent of overall scenario crashes and off the road or shoulder/parking lane in 32 percent of the crashes.

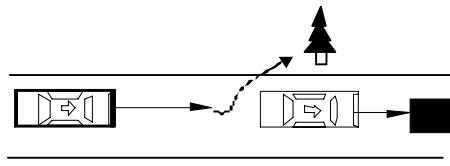


*Scenario Severity:* Table below quantifies the annual severity of this crash scenario in terms of five different metrics based on 2004 GES statistics. This table also provides the ratios of people involved by maximum injury severity using the KABCO and AIS injury scales. About 0.64 percent of all people involved in this crash scenario suffered high-level MAIS 3+ injuries (serious, severe, critical, or fatal).

Crash Severity		Scenario	Scenario/All
No. of crashes		13,000	0.22%
No. of vehicles involved		25,000	0.23%
No. of people involved		36,000	0.24%
Societal Cost	Economic cost	\$198,000,000	0.17%
	Functional years lost	4,000	0.13%
KABCO Injury Scale	None	0.864	1.057
	Possible	0.098	0.895
	Non-incapacitating	0.022	0.452
	Incapacitating	0.016	0.812
	Fatal	0.001	0.293
	Unknown	-	-
	Died prior	-	-
AIS Injury Scale	None	0.820	1.050
	Minor	0.158	0.840
	Moderate	0.015	0.735
	Serious	0.005	0.743
	Severe	0.001	0.703
	Critical	0.0003	0.775
	Fatal	0.001	0.290
	Injured people per crash	0.496	0.895

## Vehicle Taking Evasive Action Without Prior Vehicle Maneuver

*Typical Scenario:* Vehicle is going straight in an urban area, in daylight, under clear weather conditions, at a non-junction location with a posted speed limit of 35 mph; and takes an evasive action to avoid an obstacle.



*Factor Over-Representation:* Driveway/alley and younger driver are over-represented (based on a simple comparison of percentages).

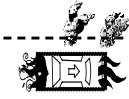
*Dynamic Variations:* The first harmful event occurs on the road in 65 percent of overall scenario crashes and off the road or shoulder/parking lane in 34 percent of the crashes.

*Scenario Severity:* Table below quantifies the annual severity of this crash scenario in terms of five different metrics based on 2004 GES statistics. This table also provides the ratios of people involved by maximum injury severity using the KABCO and AIS injury scales. About 1.23 percent of all people involved in this crash scenario suffered high-level MAIS 3+ injuries (serious, severe, critical, or fatal).

Crash Severity		Scenario	Scenario/All
No. of crashes		56,000	0.95%
No. of vehicles involved		99,000	0.93%
No. of people involved		137,000	0.91%
Societal Cost	Economic cost	\$1,349,000,000	1.13%
	Functional years lost	36,000	1.31%
KABCO Injury Scale	None	0.824	1.007
	Possible	0.086	0.789
	Non-incapacitating	0.058	1.201
	Incapacitating	0.023	1.217
	Fatal	0.003	1.917
	Unknown	0.005	1.438
	Died prior	-	-
AIS Injury Scale	None	0.782	1.002
	Minor	0.183	0.972
	Moderate	0.022	1.051
	Serious	0.007	1.105
	Severe	0.001	1.192
	Critical	0.0005	1.196
	Fatal	0.003	1.900
	Injured people per crash	0.530	0.956

## Non-Collision Incident

*Typical Scenario:* Vehicle is going straight in a rural area, in daylight, under clear weather conditions, at a non-junction location with a posted speed limit of over 55 mph; and then fire starts.



*Factor Over-Representation:* Clear weather, dry road, rural area, non-junction, high-speed road, and vehicle contributing factors are over-represented (based on a simple comparison of percentages).

*Dynamic Variations:* Vehicle is negotiating a curve and has a non-collision incident. The first harmful event occurs on the road in 90 percent of overall scenario crashes and off the road or shoulder/parking lane in ten percent of the crashes. In this overall scenario, the first harmful events cited are fire or explosion (26%), pavement surface irregularities such as potholes (13%), injured in vehicle or fell from vehicle (10%), thrown or falling object (7%), and other non-collision events. Moreover, this scenario experiences many vehicle-contributing factors such as trailer hitch (10%), tires (9%), power train (7%), wheels (6%), brakes (2%), body or doors (2%), and exhaust system (1%).

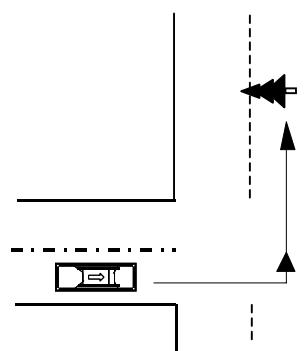
*Scenario Severity:* Table below quantifies the annual severity of this crash scenario in terms of five different metrics based on 2004 GES statistics. This table also provides the ratios of people involved by maximum injury severity using the KABCO and AIS injury scales. About 0.56 percent of all people involved in this crash scenario suffered high-level MAIS 3+ injuries (serious, severe, critical, or fatal).

Crash Severity		Scenario	Scenario/All
No. of crashes		46,000	0.77%
No. of vehicles involved		82,000	0.77%
No. of people involved		112,000	0.75%
Societal Cost	Economic cost	\$592,000,000	0.49%
	Functional years lost	13,000	0.45%
KABCO Injury Scale	None	0.920	1.125
	Possible	0.038	0.350
	Non-incapacitating	0.028	0.576
	Incapacitating	0.012	0.622
	Fatal	0.001	0.666
	Unknown	0.001	0.148
	Died prior	-	-
AIS Injury Scale	None	0.860	1.101
	Minor	0.123	0.653
	Moderate	0.011	0.540
	Serious	0.004	0.551
	Severe	0.000	0.560
	Critical	0.0002	0.598
	Fatal	0.001	0.660
	Injured people per crash	0.342	0.617

## Vehicle Contacting Object with Prior Vehicle Maneuver

*Typical Scenario:* Vehicle is leaving a parked position at night, in an urban area, under clear weather conditions, at a non-junction location with a posted speed limit of 25 mph; and collides with an object on road shoulder or parking lane.

*Factor Over-Representation:* Dark, wet/slippery road, urban area, non-junction, low-speed road, alcohol, younger driver (71%), and hit-and-run are over-represented (based on a simple comparison of percentages).



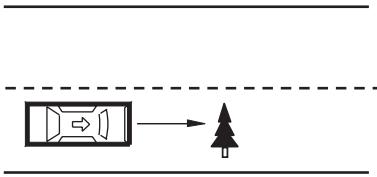
*Dynamic Variations:* Vehicle is turning right and collides with an object. The first harmful event occurs on the road shoulder or parking lane in 64 percent of overall scenario crashes and off the road in 30 percent of the crashes. The first harmful events that are commonly cited are parked motor vehicle (67%) and post, pole, or support (10%).

*Scenario Severity:* Table below quantifies the annual severity of this crash scenario in terms of five different metrics based on 2004 GES statistics. This table also provides the ratios of people involved by maximum injury severity using the KABCO and AIS injury scales. About 0.35 percent of all people involved in this crash scenario suffered high-level MAIS 3+ injuries (serious, severe, critical, or fatal).

Crash Severity		Scenario	Scenario/All
No. of crashes		30,000	0.51%
No. of vehicles involved		30,000	0.28%
No. of people involved		34,000	0.23%
Societal Cost	Economic cost	\$155,000,000	0.13%
	Functional years lost	3,000	0.10%
KABCO Injury Scale	None	0.957	1.170
	Possible	0.022	0.201
	Non-incapacitating	0.013	0.270
	Incapacitating	0.005	0.280
	Fatal	0.001	0.641
	Unknown	0.002	0.457
	Died prior	-	-
AIS Injury Scale	None	0.890	1.140
	Minor	0.100	0.531
	Moderate	0.007	0.325
	Serious	0.002	0.294
	Severe	0.0002	0.293
	Critical	0.0001	0.277
	Fatal	0.001	0.636
	Injured people per crash	0.125	0.226

## Vehicle Contacting Object Without Prior Vehicle Maneuver

*Typical Scenario:* Vehicle is going straight in a rural area, at night, under clear weather conditions, at a non-junction location with a posted speed limit of 55 mph or more; and collides with an object on the road.



*Factor Over-Representation:* Dark, rural area, non-junction, high-speed road, alcohol, younger driver, rollover, and hit-and-run are over-represented (based on a simple comparison of percentages).

*Dynamic Variations:* Vehicle is negotiating a curve and collides with an object. The first harmful event occurs on the road in 54 percent of overall scenario crashes, and on shoulder/parking lane and off the road respectively in 14 and 30 percent of the crashes. The first harmful events that are commonly cited are parked motor vehicle (15%), post, pole, or support (8%), tree (6%), and culvert or ditch (4%). Many objects were coded as “other”.

*Scenario Severity:* Table below quantifies the annual severity of this crash scenario in terms of five different metrics based on 2004 GES statistics. This table also provides the ratios of people involved by maximum injury severity using the KABCO and AIS injury scales. About 1.12 percent of all people involved in this crash scenario suffered high-level MAIS 3+ injuries (serious, severe, critical, or fatal).

Crash Severity	Scenario	Scenario/All
No. of crashes	55,000	0.92%
No. of vehicles involved	55,000	0.51%
No. of people involved	76,000	0.51%
Societal Cost		
Economic cost	\$687,000,000	0.57%
Functional years lost	19,000	0.68%
KABCO Injury Scale		
None	0.861	1.052
Possible	0.069	0.629
Non-incapacitating	0.042	0.875
Incapacitating	0.024	1.243
Fatal	0.003	1.839
Unknown	0.001	0.319
Died prior	-	-
AIS Injury Scale		
None	0.812	1.040
Minor	0.158	0.840
Moderate	0.019	0.881
Serious	0.007	0.983
Severe	0.0009	1.061
Critical	0.0005	1.169
Fatal	0.003	1.823
Injured people per crash	0.263	0.474

## Other

Other scenarios include on-road rollover, no driver present, hit-and-run, and crash types without any details or specifics. These crashes mostly occur in daylight, under clear weather conditions, dry road surface, straight road, in an urban area, at a non-junction location with a posted speed limit of 25 mph. Vehicle is going straight and encounters a critical event. First harmful event happens on the road.

*Factor Over-Representation:* Dark, driveway or alley location, low-speed road, rollover, no driver present, hit-and-run, and making a U-turn are over-represented (based on a simple comparison of percentages).

*Scenario Severity:* Table below quantifies the annual severity of this crash scenario in terms of five different metrics based on 2004 GES statistics. This table also provides the ratios of people involved by maximum injury severity using the KABCO and AIS injury scales. About 1.16 percent of all people involved in this crash scenario suffered high-level MAIS 3+ injuries (serious, severe, critical, or fatal).

Crash Severity		Scenario	Scenario/All
No. of crashes		36,000	0.60%
No. of vehicles involved		65,000	0.61%
No. of people involved		78,000	0.52%
Societal Cost	Economic cost	\$764,000,000	0.64%
	Functional years lost	21,000	0.75%
KABCO Injury Scale	None	0.855	1.045
	Possible	0.073	0.670
	Non-incapacitating	0.042	0.865
	Incapacitating	0.022	1.143
	Fatal	0.004	2.105
	Unknown	0.005	1.253
	Died prior	-	-
AIS Injury Scale	None	0.807	1.034
	Minor	0.162	0.861
	Moderate	0.019	0.892
	Serious	0.006	0.966
	Severe	0.0009	1.067
	Critical	0.0004	1.098
	Fatal	0.004	2.105
	Injured people per crash	0.418	0.754

## **5. MAPPING TO NEW PRE-CRASH SCENARIO TYPOLOGY**

### **5.1. Mapping of a Sample of Police-Reported Crashes**

A sample of 236 crash police reports was obtained from the department of motor vehicles in the State of Massachusetts. The dates of these reports spanned from September 2004 through March 2005. It should be noted that this time period in Massachusetts covers the severe winter months (November – March), which experienced a substantial amount of snowfall. Each of these police reports was carefully reviewed and assigned to each of the pre-crash scenarios of the new typology. All of them were successfully mapped to this new pre-crash scenario typology as shown in Table 16, except for one crash (other) in which a car being towed by a truck sideswiped six parallel-parked cars. Six scenarios were represented by at least 10 cases, which are listed below by a descending order of number of cases:

1. Lead vehicle stopped: 40 cases (17%)
2. Control loss without prior vehicle action: 21 cases (9%)
3. Control loss with prior vehicle action: 16 cases (7%)
4. Lead vehicle decelerating: 13 cases (6%)
5. Vehicle(s) turning at non-signalized intersections: 10 cases (4%)
6. Backing up into another vehicle: 10 cases (4%)

It is interesting to note that the first two scenarios listed above actually correspond to the top two most-frequent scenarios in the United States as indicated in Table 13. Moreover, the “lead vehicle decelerating” scenario and the “vehicle(s) turning at non-signalized intersections” scenario in the list shown above are ranked respectively fourth and third in the United States.

**Table 16.** Mapping of a Sample of Crash Reports to New Pre-Crash Scenario

No.	Pre-Crash Scenario	No. Cases	Pct. Cases
1	Vehicle Failure	3	1.3%
2	Control Loss With Prior Vehicle Action	16	6.8%
3	Control Loss Without Prior Vehicle Action	21	8.9%
4	Running Red Light	8	3.4%
5	Running Stop Sign	7	3.0%
6	Road Edge Departure With Prior Vehicle Maneuver	2	0.8%
7	Road Edge Departure Without Prior Vehicle Maneuver	5	2.1%
8	Road Edge Departure While Backing Up	2	0.8%
9	Animal Crash With Prior Vehicle Maneuver	1	0.4%
10	Animal Crash Without Prior Vehicle Maneuver	4	1.7%
11	Pedestrian Crash With Prior Vehicle Maneuver	3	1.3%
12	Pedestrian Crash Without Prior Vehicle Maneuver	1	0.4%
13	Pedalcyclist Crash With Prior Vehicle Maneuver	0	0.0%
14	Pedalcyclist Crash Without Prior Vehicle Maneuver	0	0.0%
15	Backing Up Into Another Vehicle	10	4.2%
16	Vehicle(s) Turning – Same Direction	6	2.5%
17	Vehicle(s) Parking – Same Direction	3	1.3%
18	Vehicle(s) Changing Lanes – Same Direction	9	3.8%
19	Vehicle(s) Drifting – Same Direction	8	3.4%
20	Vehicle(s) Making a Maneuver – Opposite Direction	2	0.8%
21	Vehicle(s) Not Making a Maneuver – Opposite Direction	5	2.1%
22	Following Vehicle Making a Maneuver	1	0.4%
23	Lead Vehicle Accelerating	1	0.4%
24	Lead Vehicle Moving at Lower Constant Speed	5	2.1%
25	Lead Vehicle Decelerating	13	5.5%
26	Lead Vehicle Stopped	40	16.9%
27	LTAP/OD at Signalized Junctions	6	2.5%
28	Vehicle Turning Right at Signalized Junctions	2	0.8%
29	LTAP/OD at Non-Signalized Junctions	3	1.3%
30	Straight Crossing Paths at Non-Signalized Junctions	7	3.0%
31	Vehicle(s) Turning at Non-Signalized Junctions	10	4.2%
32	Evasive Action With Prior Vehicle Maneuver	5	2.1%
33	Evasive Action Without Prior Vehicle Maneuver	3	1.3%
34	Non-Collision Incident	1	0.4%
35	Object Crash With Prior Vehicle Maneuver	6	2.5%
36	Object Crash Without Prior Vehicle Maneuver	5	2.1%
37	Other Hit-and-Run (7 cases) On-Road Rollover (3 cases) No Driver Present (1 case) Other (1 case)	12	5.1%
Total		236	100.0%

## **5.2. Mapping of 44 Crashes**

Table 17 maps the 44 crashes to this new pre-crash scenario typology. Most of the 44 crashes are represented either directly or indirectly by the different variations of pre-crash scenarios in the new typology. For example, number 37 addresses emergency vehicles as they pass through signalized intersections on red. This crash is assigned to “running red light” scenario in the new typology even though the analysis of light-vehicle crashes in this report excludes emergency vehicles. However, the GES contains the needed variables to explicitly describe emergency-vehicle crashes that involve police cars, ambulances, or firefighting vehicles. Moreover, number 101 (new crash due to new safety technology) is assigned to “other” since it is not practical at this time to quantify this crash using existing national crash databases. Other crash numbers, such as 52 (tailgate), 61 (pedal miss), and 64 (stutter stop), are classified, respectively, under lead vehicle decelerating, stopped, and accelerating due to the lack of GES variables and codes that refer to these particular events. As seen in Table 17, there are 11 pre-crash scenarios in the new typology, accounting for about 10 percent of all light-vehicle crashes, which do not match any of the 44 crashes.

**Table 17.** Mapping of 44 Crashes to New Pre-Crash Scenario Typology

No.	New Crash Typology	44 Crashes
<b>1</b>	Vehicle Failure	68
<b>2</b>	Control Loss With Prior Vehicle Action	10
<b>3</b>	Control Loss Without Prior Vehicle Action	11, 12, 18, 91
<b>4</b>	Running Red Light	22, 37, 94
<b>5</b>	Running Stop Sign	28, 30
<b>6</b>	Road Edge Departure With Prior Vehicle Maneuver	10
<b>7</b>	Road Edge Departure Without Prior Vehicle Maneuver	9, 18
<b>8</b>	Road Edge Departure While Backing Up	19
<b>9</b>	Animal Crash With Prior Vehicle Maneuver	3
<b>10</b>	Animal Crash Without Prior Vehicle Maneuver	3
<b>11</b>	Pedestrian Crash With Prior Vehicle Maneuver	1
<b>12</b>	Pedestrian Crash Without Prior Vehicle Maneuver	1
<b>13</b>	Pedalcyclist Crash With Prior Vehicle Maneuver	
<b>14</b>	Pedalcyclist Crash Without Prior Vehicle Maneuver	
<b>15</b>	Backing Up Into Another Vehicle	48, 82
<b>16</b>	Vehicle(s) Turning – Same Direction	47, 83
<b>17</b>	Vehicle(s) Parking – Same Direction	
<b>18</b>	Vehicle(s) Changing Lanes – Same Direction	75, 76, 79, 80
<b>19</b>	Vehicle(s) Drifting – Same Direction	
<b>20</b>	Vehicle(s) Making a Maneuver – Opposite Direction	
<b>21</b>	Vehicle(s) Not Making a Maneuver – Opposite Direction	91, 92, 93
<b>22</b>	Following Vehicle Making a Maneuver	58
<b>23</b>	Lead Vehicle Accelerating	64
<b>24</b>	Lead Vehicle Moving at Lower Constant Speed	
<b>25</b>	Lead Vehicle Decelerating	52, 62, 74, 78
<b>26</b>	Lead Vehicle Stopped	56, 61, 62, 66
<b>27</b>	LTAP/OD at Signalized Junctions	96, 99
<b>28</b>	Vehicle Turning Right at Signalized Junctions	
<b>29</b>	LTAP/OD at Non-Signalized Junctions	96, 99
<b>30</b>	Straight Crossing Paths at Non-Signalized Junctions	33
<b>31</b>	Vehicle(s) Turning at Non-Signalized Junctions	35, 38, 40, 44
<b>32</b>	Evasive Action With Prior Vehicle Maneuver	
<b>33</b>	Evasive Action Without Prior Vehicle Maneuver	13
<b>34</b>	Non-Collision Incident	
<b>35</b>	Object Crash With Prior Vehicle Maneuver	
<b>36</b>	Object Crash Without Prior Vehicle Maneuver	
<b>37</b>	Other	100, 101

### **5.3. Mapping of Crash Types**

Table shows an approximate mapping of pre-crash scenarios in the new typology to the eleven crash types identified in prior NHTSA studies. This is an approximation because some of these pre-crash scenarios can lead to different crash types. These eleven crash types are defined as follows:

- Rear-End: The front of a following vehicle strikes the rear of a lead vehicle, both traveling in the same direction.
- Crossing Paths: One moving vehicle cuts across the path of another, initially approaching from either lateral or opposite directions, in such a way that they collide at or near a junction.
- Run-Off-Road: The first harmful event occurs off the roadway after a vehicle in transport departs the travel portion of the roadway.
- Lane Change: A vehicle attempts to change lanes, merge, pass, leave/enter a parking position, or drift and strikes or is struck by another vehicle in the adjacent lane, both traveling in the same direction.
- Animal: A moving vehicle collides with an animal.
- Opposite Direction: A vehicle strikes another vehicle in the adjacent lane, traveling in the opposite direction, resulting in a frontal or sideswipe impact.
- Backing: A vehicle strikes or is struck by an obstacle or another vehicle while moving backwards.
- Pedestrian: A moving vehicle collides with a pedestrian.
- Pedalcyclist: A vehicle strikes or is struck by a pedalcyclist.
- Object: A vehicle strikes an object on the road.
- Other: This type encompasses the remaining crashes that are coded as “Other”, “Unknown”, or “No Impact” (e.g., fire or immersion) in the Accident Type variable.

**Table 18.** Mapping of Crash Types to New Pre-Crash Scenario Typology

No.	Pre-Crash Scenario	Crash Type
1	Vehicle Failure	Run-Off-Road
2	Control Loss With Prior Vehicle Action	
3	Control Loss Without Prior Vehicle Action	
4	Running Red Light	Crossing Paths
5	Running Stop Sign	
6	Road Edge Departure With Prior Vehicle Maneuver	Run-Off-Road
7	Road Edge Departure Without Prior Vehicle Maneuver	
8	Road Edge Departure While Backing Up	
9	Animal Crash With Prior Vehicle Maneuver	Animal
10	Animal Crash Without Prior Vehicle Maneuver	
11	Pedestrian Crash With Prior Vehicle Maneuver	Pedestrian
12	Pedestrian Crash Without Prior Vehicle Maneuver	
13	Pedalcyclist Crash With Prior Vehicle Maneuver	Pedalcyclist
14	Pedalcyclist Crash Without Prior Vehicle Maneuver	
15	Backing Up Into Another Vehicle	Backing
16	Vehicle(s) Turning – Same Direction	
17	Vehicle(s) Parking – Same Direction	
18	Vehicle(s) Changing Lanes – Same Direction	
19	Vehicle(s) Drifting – Same Direction	
20	Vehicle(s) Making a Maneuver – Opposite Direction	Opposite Direction
21	Vehicle(s) Not Making a Maneuver – Opposite Direction	
22	Following Vehicle Making a Maneuver	
23	Lead Vehicle Accelerating	Rear-End
24	Lead Vehicle Moving at Lower Constant Speed	
25	Lead Vehicle Decelerating	
26	Lead Vehicle Stopped	
27	LTAP/OD at Signalized Junctions	Crossing Paths
28	Vehicle Turning Right at Signalized Junctions	
29	LTAP/OD at Non-Signalized Junctions	
30	Straight Crossing Paths at Non-Signalized Junctions	
31	Vehicle(s) Turning at Non-Signalized Junctions	Run-Off-Road
32	Evasive Action With Prior Vehicle Maneuver	
33	Evasive Action Without Prior Vehicle Maneuver	Other
34	Non-Collision Incident	
35	Object Crash With Prior Vehicle Maneuver	
36	Object Crash Without Prior Vehicle Maneuver	Object
37	Other	

## 6. CONCLUSIONS

This report defined and statistically described a novel typology of pre-crash scenarios representing all light-vehicle crashes based on 2004 GES statistics. These pre-crash scenarios depict vehicle movements and dynamics as well as the critical event that occur immediately before impact in a crash. This report quantified the severity of these scenarios and portrayed them by crash contributing factors and circumstances in terms of the driving environment, driver, and vehicle. This typology establishes a common vehicle safety research foundation for public and private organizations, which will serve as a tool to identify intervention opportunities, set research priorities and direction in technology development, and evaluate the effectiveness of selected crash countermeasure systems. It also provides a consistent crash problem definition for developers of crash avoidance technologies, simplifies crash characteristics for system designers, and prevents double counting of system safety benefits.

This new typology consists of 37 pre-crash scenarios (including “other”) that accounted for approximately 5,942,000 police-reported crashes involving at least one light vehicle. These crashes resulted in an estimated economic cost of \$120 billion and 2,767,000 functional years lost. These statistics do not incorporate data from non-police-reported crashes. Excluding “other” scenario, this new pre-crash scenario typology represents about 99.4 percent of all light-vehicle crashes. This typology is nationally representative and can be updated on an annual basis using GES and CDS crash databases.

Pre-crash scenarios of this new typology were ranked using three measures: crash frequency, economic cost, and functional years lost. The following dominant scenarios emerged using the top five scenarios in each of the three measures:

1. Control loss without prior vehicle action
2. Lead vehicle stopped
3. Road edge departure without prior vehicle maneuver
4. Vehicle(s) turning at non-signalized junctions
5. Straight crossing paths at non-signalized junctions
6. Lead vehicle decelerating
7. Vehicle(s) not making a maneuver – opposite direction

Despite its limitations, GES remains the best available source to identify nationally representative, dynamically distinct pre-crash scenarios. Moreover, GES contains a multitude of variables that allow the statistical description of driving circumstances at the time of the crash, driver contributing factors, and vehicle conditions. It is noteworthy that GES underestimates some crash scenarios or contributing factors due to the lack of information or non-specific information in police collision reports.

Crash statistics of this new typology should be updated on an annual basis using GES or CDS so as to ensure the consistency of its scenario ranking and national representativeness of all light-vehicle crashes over time. Such updates also serve to

identify trends in crash statistics and assess effectiveness of new automotive safety technologies in the vehicle fleet such as electronic stability control systems.

Some hot-deck imputed GES variables were used to derive counts of crash frequency. It is recommended for further analysis that the percentage distribution between the original and the hot-deck variables be examined to assess any significant difference between the two sets of variables. If any significant difference existed, then further investigation might be necessary to determine which variables are more appropriate to be used for crash frequency counts.

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## APPENDIX A. IDENTIFICATION CODES OF PRE-CRASH SCENARIOS USING THE GENERAL ESTIMATES SYSTEM

No.	Scenario	Single-Vehicle Crashes (VEH_INVL = 1)	Multi-Vehicle Crashes (VEH_INVL >= 2, First Event)
1	No driver present	MANEUV_I = 0	P_CRASH2 = 1 - 4 (at least one vehicle)
2	Vehicle failure	P_CRASH2 = 1 - 4	Vx_P_CRASH2 = 5 - 9 AND Vx_MANEUV_I = 2 - 4, 6, 8 - 13, 15 - 97
3	Control loss/vehicle action	P_CRASH2 = 5 - 9 AND MANEUV_I = 2 - 4, 6, 8 - 13, 15 - 97 ACC_TYPE = 2, 7 AND MANEUV_I = 2 - 4, 6, 8 - 13, 15 - 97	Vx_ACC_TYPE = 34, 36, 54, 56 AND Vx_MANEUV_I = 2 - 4, 6, 8 - 13, 15 - 97 Vx_ACC_TYPE = 2, 7 AND Vx_MANEUV_I = 2 - 4, 6, 8 - 13, 15 - 97
4	Control loss/no vehicle action	P_CRASH2 = 5 - 9 AND MANEUV_I = 1, 14 ACC_TYPE = 2, 7 AND MANEUV_I = 1, 14	Vx_P_CRASH2 = 5 - 9 AND Vx_MANEUV_I = 1, 14 Vx_ACC_TYPE = 34, 36, 54, 56 AND Vx_MANEUV_I = 1, 14 Vx_ACC_TYPE = 2, 7 AND Vx_MANEUV_I = 1, 14
5	Running red light	TRAFFCON = 1, 4 AND MVVIOLATN = 7	TRAFFCON = 1 AND ACC_TYPE = 76, 77, 82, 83, 86 - 91
6	Running stop sign	TRAFFCON = 21 AND MVVIOLATN = 7	TRAFFCON = 21 AND MVVIOLATN = 7
7	Road edge departure/maneuver	P_CRASH2 = 10 - 14 AND MANEUV_I = 6, 8 - 12, 15 - 97 ACC_TYPE = 1, 6, 14 AND MANEUV_I = 6, 8 - 12, 15 - 97	Vx_ACC_TYPE = 1, 6, 14 AND Vx_MANEUV_I = 6, 8 - 12, 15 - 97
8	Road edge departure/no maneuver	P_CRASH2 = 10 - 14 AND MANEUV_I = 1 - 5, 7, 14 ACC_TYPE = 1, 6, 14 AND MANEUV_I = 1 - 5, 7, 14	Vx_ACC_TYPE = 1, 6, 14 AND Vx_MANEUV_I = 1 - 5, 7, 14
9	Road edge departure/backing	P_CRASH2 = 10 - 14 AND MANEUV_I = 13 ACC_TYPE = 1, 6, 14 AND MANEUV_I = 13 ACC_TYPE = 92	Vx_ACC_TYPE = 1, 6, 14 AND Vx_MANEUV_I = 13
10	Animal/maneuver	EVENTI_I = 24 AND MANEUV_I = 6, 8 - 13, 15 - 97 P_CRASH2 = 87 - 89 AND MANEUV_I = 6, 8 - 13, 15 - 97	Vx_P_CRASH2 = 87 - 89 AND Vx_MANEUV_I = 6, 8 - 13, 15 - 97 EVENTNUM = 1 AND VEHNUM = x AND OBJCONT = 124 AND Vx_MANEUV_I = 6, 8 - 13, 15 - 97
11	Animal/no maneuver	EVENTI_I = 24 AND MANEUV_I = 1 - 5, 7, 14 P_CRASH2 = 87 - 89 AND MANEUV_I = 1 - 5, 7, 14	Vx_P_CRASH2 = 87 - 89 AND Vx_MANEUV_I = 1 - 5, 7, 14 EVENTNUM = 1 AND VEHNUM = x AND OBJCONT = 124 AND Vx_MANEUV_I = 1 - 5, 7, 14
12	Pedestrian/maneuver	EVENTI_I = 21 AND MANEUV_I = 6, 8 - 13, 15 - 97 P_CRASH2 = 80 - 82 AND MANEUV_I = 6, 8 - 13, 15 - 97	Vx_P_CRASH2 = 80 - 82 AND Vx_MANEUV_I = 6, 8 - 13, 15 - 97 EVENTNUM = 1 AND VEHNUM = x AND OBJCONT = 121 AND Vx_MANEUV_I = 6, 8 - 13, 15 - 97
13	Pedestrian/no maneuver	EVENTI_I = 21 AND MANEUV_I = 1 - 5, 7, 14 P_CRASH2 = 80 - 82 AND MANEUV_I = 1 - 5, 7, 14	Vx_P_CRASH2 = 80 - 82 AND Vx_MANEUV_I = 1 - 5, 7, 14 EVENTNUM = 1 AND VEHNUM = x AND OBJCONT = 121 AND Vx_MANEUV_I = 1 - 5, 7, 14
14	Cyclist/maneuver	EVENTI_I = 22 AND MANEUV_I = 6, 8 - 13, 15 - 97	Vx_P_CRASH2 = 83 - 85 AND Vx_MANEUV_I = 6, 8 - 13, 15 - 97

No.	Scenario	Single-Vehicle Crashes (VEH_INVL = 1)	Multi-Vehicle Crashes (VEH_INVL >= 2), First Event
		P_CRASH2 = 83 - 85 AND MANEUV_I = 6, 8 - 13, 15 - 97	EVENTNUM = 1 AND VEHNUM = x AND OBJCONT = 122 AND Vx_MANEUV_I = 6, 8 - 13, 15 - 97
15	Cyclist/no maneuver	EVENT1_I = 22 AND MANEUV_I = 1 - 5, 7, 14	Vx_P_CRASH2 = 83 - 85 AND Vx_MANEUV_I = 1 - 5, 7, 14
		P_CRASH2 = 83 - 85 AND MANEUV_I = 1 - 5, 7, 14	EVENTNUM = 1 AND VEHNUM = x AND OBJCONT = 122 AND Vx_MANEUV_I = 1 - 5, 7, 14
16	Backing into vehicle	P_CRASH2 = 56	ACC_TYPE = 92, 93 AND EVENT1_I = 25
17	Turning/same direction		ACC_TYPE = 20 - 43 AND Vx_VROLE_I = 2 AND Vx_MANEUV_I = 10 - 12
			MANEUV_I = 10 - 12 AND P_CRASH2 = 60, 61
18	Parking/same direction	P_CRASH2 = 64	ACC_TYPE = 44 - 49, 70 - 73 AND MANEUV_I = 8, 9
			ACC_TYPE = 20 - 43 AND Vx_VROLE_I = 2 AND Vx_MANEUV_I = 10 - 12
19	Changing lanes/same direction	P_CRASH2 = 60, 61	MANEUV_I = 8, 9 AND P_CRASH2 = 60, 61
			P_CRASH2 = 64
20	Drifting/same lane		ACC_TYPE = 44 - 49, 70 - 73 AND MANEUV_I = 6, 15, 16
			ACC_TYPE = 20 - 43 AND Vx_VROLE_I = 2 AND Vx_MANEUV_I = 6, 15, 16
			MANEUV_I = 6, 15, 16 AND P_CRASH2 = 60, 61
21	Opposite direction/maneuver	P_CRASH2 = 54, 62, 63 AND MANEUV_I = 6, 8 - 13, 15 - 97	ACC_TYPE = 44 - 49, 70 - 73 AND MANEUV_I = 1 - 5, 7, 14
22	Opposite direction/no maneuver	P_CRASH2 = 54, 62, 63 AND MANEUV_I = 1 - 5, 7, 14	ACC_TYPE = 20 - 43 AND Vx_VROLE_I = 2 AND Vx_P_CRASH2 = 10, 11
23	Rear-end/striking maneuver	P_CRASH2 = 50 - 52 AND MANEUV_I = 6, 8 - 13, 15 - 97	ACC_TYPE = 50 - 67 AND MANEUV_I = 6, 8 - 13, 15 - 97
			ACC_TYPE = 50 - 67 AND MANEUV_I = 1 - 5, 7, 14
			ACC_TYPE = 20 - 43 AND Vx_VROLE_I = 1 AND Vx_MANEUV_I = 6, 8 - 13, 15 - 97
			Vx_VROLE_I = 1 AND Vx_MANEUV_I = 6, 8 - 13, 15 - 97 AND Vx_P_CRASH2 = 50, 51, 52
24	Rear-end/LVA		ACC_TYPE = 20 - 43 AND Vx_VROLE_I = 2 AND Vx_MANEUV_I = 3, 4
			Vx_MANEUV_I = 3, 4 AND Vx_P_CRASH2 = 53
25	Rear-end/LVM	P_CRASH2 = 51	ACC_TYPE = 25 - 27
			ACC_TYPE = 20 - 43 AND Vx_VROLE_I = 2 AND Vx_MANEUV_I = 1, 14
			P_CRASH2 = 51
			Vx_MANEUV_I = 1, 14 AND Vx_P_CRASH2 = 53
26	Rear-end/LVD	P_CRASH2 = 52	ACC_TYPE = 29 - 31
			ACC_TYPE = 20 - 43 AND Vx_VROLE_I = 2 AND Vx_MANEUV_I = 2
			ACC_TYPE = 20 - 43 AND Vx_VROLE_I = 1 AND Vx_P_CRASH2 = 52

No.	Scenario	Single-Vehicle Crashes (VEH_INVL = 1)	Multi-Vehicle Crashes (VEH_INVL >= 2), First Event
		P_CRASH2 = 52	
27	Rear-end/LVS	Vx_MANEUV_I = 2 AND Vx_P_CRASH2 = 53 ACC_TYPE = 21 - 23 ACC_TYPE = 20 - 43 AND Vx_VROLE_I = 2 AND Vx_MANEUV_I = 5, 7 ACC_TYPE = 20 - 43 AND Vx_VROLE_I = 1 AND Vx_P_CRASH2 = 50 P_CRASH2 = 50	
28	LTAP/OD @ signal	Vx_MANEUV_I = 5, 7 AND Vx_P_CRASH2 = 53 ACC_TYPE = 20 - 43 AND Vx_MANEUV_I = 1 AND Vx_MANEUV_I = 0 TRAF_CON = 1 AND ACC_TYPE = 68, 69	
29	Turn right @ signal	TRAF_CON = 1 AND MANEUV_I = 11 AND P_CRASH2 = 54, 62, 63 TRAF_CON = 1 AND Vx_P_CRASH2 = 15 AND Vx_P_CRASH2 = 54, 62, 63 TRAF_CON = 1 AND Vx_MANEUV_I = 11 AND Vx_MANEUV_I not 10 AND ACC_TYPE = 74, 75 TRAF_CON = 1 AND ACC_TYPE = 78 - 81 TRAF_CON = 1 AND MANEUV_I = 10 AND P_CRASH2 = 65 - 68	
30	LTAP/OD @ non signal	TRAF_CON = 1 AND Vx_P_CRASH2 = 16 AND Vx_P_CRASH2 = 65 - 68 TRAF_CON = 1 AND Vx_MANEUV_I = 10 AND ACC_TYPE = 74, 75, 84, 85 TRAF_CON not 1 AND ACC_TYPE = 68, 69 TRAF_CON not 1 AND MANEUV_I = 11 AND P_CRASH2 = 54, 62, 63 TRAF_CON not 1 AND Vx_P_CRASH2 = 15 AND Vx_P_CRASH2 = 54, 62, 63 TRAF_CON not 1 AND ACC_TYPE = 86 - 91	
31	SCP @ non signal	TRAF_CON not 1 AND P_CRASH2 = 66, 71 TRAF_CON not 1 AND MANEUV_I not 10 - 12 AND P_CRASH2 = 65 - 68, 70 - 78 TRAF_CON not 1 AND Vx_P_CRASH2 not 15, 16 AND Vx_P_CRASH2 = 65 - 68, 70 - 78	
32	Turn @ non signal	TRAF_CON not 1 AND ACC_TYPE = 74 - 85 TRAF_CON not 1 AND MANEUV_I = 10 - 12 AND P_CRASH2 = 65 - 68, 70 - 78 TRAF_CON not 1 AND Vx_P_CRASH2 = 15, 16 AND Vx_P_CRASH2 = 65 - 68, 70 - 78	
33	Avoidance/maneuver	ACC_TYPE = 3, 8 AND MANEUV_I = 6, 8 - 13, 15 - 97 P_CRASH2 = 50 - 78 AND MANEUV_I = 6, 8 - 13, 15 - 97 ACC_TYPE = 3, 8 AND MANEUV_I = 1 - 5, 7, 14 P_CRASH2 = 50 - 78 AND MANEUV_I = 1 - 5, 7, 14	
34	Avoidance/no maneuver		

No.	Scenario	Single-Vehicle Crashes (VEH_INVL = 1)	Multi-Vehicle Crashes (VEH_INVL >= 2), First Event
35	Rollover	ROLLOVER=10 OR EVENT1_I=1	
36	Noncollision - No Impact	EVENT1_I=2 - 10 ACC_TYPE = 00	
37	Object/maneuver	P_CRASH2 = 90, 91, 92 AND MANEUV_I = 6, 8 - 13, 15 - 97 ACC_TYPE = 12 AND MANEUV_I = 6, 8 - 13, 15 - 97 ACC_TYPE = 11 AND MANEUV_I = 6, 8 - 13, 15 - 97 EVENT1_I = 21 - 29, 31 - 59 AND MANEUV_I = 6, 8 - 13, 15 - 97	
38	Object/no maneuver	P_CRASH2 = 90, 91, 92 AND MANEUV_I = 1 - 5, 7, 14 ACC_TYPE = 12 AND MANEUV_I = 1 - 5, 7, 14 ACC_TYPE = 11 AND MANEUV_I = 1 - 5, 7, 14 EVENT1_I = 21 - 29, 31 - 59 AND MANEUV_I = 1 - 5, 7, 14	
39	Hit-and-run	HITRUN_I = 1	
40	Other - Rear-End		ACC_TYPE = 20 - 43
41	Other - SideSwipe		ACC_TYPE = 44 - 49
42	Other - Opposite Direction		ACC_TYPE = 50 - 67
43	Other - Turn Across Path		ACC_TYPE = 68 - 75
44	Other - Turn Into Path		ACC_TYPE = 76 - 85
45	Other - Straight Paths		ACC_TYPE = 86 - 91
46	Other		

## APPENDIX B. CRASH CHARACTERISTICS OF PRE-CRASH SCENARIOS

### Vehicle Failure

#### *Driving Environment*

#### *Driver*

#### *Vehicle*

<b>Lighting</b>	Daylight	67%	<b>Alcohol</b>	Yes	2%	<b>Contributing Factors</b>	Yes 99%
	Dark Lighted	12%		No	98%		No -
	Dark	15%	<b>Vision Obscured</b>	No Obstruction	83%		Unknown 1%
	Dawn/Dusk	6%		Vision Obscured	1%	<b>Rollover</b>	Yes 22%
<b>Weather</b>	Clear	87%		Unknown	16%		No 78%
	Adverse	13%	<b>Driver Distracted</b>	Inattention	2%		No Driver Present -
<b>Road Surface</b>	Dry	83%		Sleepy	0.01%		Going Straight 75%
	Wet/Slippery	17%		Not Distracted	54%		Decelerating in Traffic Lane 2%
<b>Road Alignment</b>	Straight	76%		Unknown	43%		Accelerating in Traffic Lane 0.2%
	Curve	24%	<b>Speeding</b>	Yes	8%		Starting in Traffic Lane 0.2%
<b>Road Profile</b>	Level	71%		No	91%		Stopped in Traffic Lane 1%
	Other	29%		Unknown	1%		Passing Another Vehicle 1%
<b>Land Use</b>	Rural	64%	<b>Violation</b>	Speeding	-		Parked in Travel Lane 1%
	Urban	36%		Reckless	1%		Leaving a Parked Position 0.02%
<b>Day</b>	Weekday	73%		None	77%	<b>Pre-Event Movement</b>	Entering a Parked Position -
	Weekend	27%		Other	22%		Turning Right 2%
<b>Relation to Roadway</b>	On Roadway	27%		Unknown	1%		Turning Left 4%
	Shoulder/Parking Lane	5%	<b>Impairment</b>	Ill/Blackout	-		Making U-turn -
	Off Roadway	67%		Drowsy	0.01%		Backing Up 1%
	Left Turn Lane	-		None	97%		Negotiating a Curve 10%
	Unknown	1%		Other	1%		Changing Lanes 1%
<b>Relation to Junction</b>	Non-Junction	81%		Unknown	2%		Merging 0.2%
	Intersection	4%	<b>Gender</b>	Male	64%		Prior Corrective Action 0.1%
	Intersection-Related	9%		Female	36%		Other 2%
	Driveway/Alley	2%	<b>Age</b>	Younger <= 24	39%	<b>Driver Avoidance Maneuver</b>	Object in Road -
	Entrance/Exit Ramp	3%		Middle = 25 to 64	57%		Poor Road Conditions 0.1%
	Rail Grade Crossing	1%		Older >= 65	4%		Animal in Road -
	Other/Unknown	1%					Vehicle in Road 1%
<b>Posted Speed Limit (mph)</b>	<= 20	1%					Non-Motorist in Road -
	25	8%					Hit and Run 2%
	30	5%					No Driver Present -
	35	10%					Other Avoidance Maneuver -
	40	5%					Unknown 55%
	45	13%					None 41%
	50	3%					Phantom Vehicle -
	>= 55	55%				<b>Corrective Action Attempted</b>	No Driver Present -
<b>Traffic Control Device</b>	No Traffic Controls	81%					No Avoidance Maneuver 18%
	Traffic Signal	9%					Braking 6%
	Stop/Yield Sign	3%					Releasing Brakes -
	Other	8%					Steering 7%
							Braked and Steered 2%
							Accelerated 0.02%
							Accelerated and Steered -
							Other 2%
							Unknown 67%

Driver and vehicle statistics represent the light vehicle with a component failure.

## Control Loss With Prior Vehicle Action

Driving Environment			Driver		Vehicle			
Lighting	Daylight	54%	Alcohol	Yes	13%	Contributing Factors	Yes	2%
	Dark Lighted	24%		No	87%		No	85%
	Dark	16%	Vision Obscured	No Obstruction	66%		Unknown	13%
	Dawn/Dusk	6%		Vision Obscured	1%	Rollover	Yes	12%
	Clear	60%		Unknown	33%		No	88%
	Adverse	40%	Driver Distracted	Inattention	11%	Pre-Event Movement	No Driver Present	-
	Dry	41%		Sleepy	0.1%		Going Straight	-
	Wet/Slippery	59%		Not Distracted	45%		Decelerating in Traffic Lane	14%
	Straight	87%		Unknown	44%		Accelerating in Traffic Lane	1%
Road Alignment	Curve	13%	Speeding	Yes	56%		Starting in Traffic Lane	1%
	Level	73%		No	41%		Stopped in Traffic Lane	-
	Other	27%		Unknown	3%		Passing Another Vehicle	8%
Land Use	Rural	53%	Violation	Speeding	0.2%		Parked in Travel Lane	-
	Urban	47%		Reckless	2%		Leaving a Parked Position	3%
Day	Weekday	71%		None	49%		Entering a Parked Position	0.1%
	Weekend	29%		Other	43%		Turning Right	21%
Relation to Roadway	On Roadway	28%		Unknown	6%		Turning Left	26%
	Shoulder/Parking Lane	4%	Impairment	Ill/Blackout	1%		Making U-turn	1%
	Off Roadway	68%		Drowsy	0.4%		Backing Up	1%
	Left Turn Lane	-		None	86%		Negotiating a Curve	-
	Unknown	0.2%		Other	8%		Changing Lanes	14%
Relation to Junction	Non-Junction	34%		Unknown	5%		Merging	4%
	Intersection	5%	Gender	Male	65%		Prior Corrective Action	1%
	Intersection-Related	45%		Female	35%		Other	5%
	Driveway/Alley	7%	Age	Younger <= 24	53%	Driver Avoidance Maneuver	Object in Road	-
	Entrance/Exit Ramp	7%		Middle = 25 to 64	43%		Poor Road Conditions	0.4%
	Rail Grade Crossing	0.4%		Older >= 65	3%		Animal in Road	1%
Posted Speed Limit (mph)	Other/Unknown	2%					Vehicle in Road	6%
	<= 20	2%					Non-Motorist in Road	0.004%
	25	16%					Hit and Run	12%
	30	10%					No Driver Present	-
	35	15%					Other Avoidance Maneuver	0.1%
	40	6%					Unknown	52%
	45	13%					None	29%
	50	4%					Phantom Vehicle	1%
Traffic Control Device	>= 55	34%				Corrective Action Attempted	No Driver Present	-
	No Traffic Controls	67%					No Avoidance Maneuver	12%
	Traffic Signal	14%					Braking	8%
	Stop/Yield Sign	11%					Releasing Brakes	-
	Other	7%					Steering	7%

Driver and vehicle statistics represent the light vehicle that lost control.

## Control Loss Without Prior Vehicle Action

Driving Environment			Driver		Vehicle			
Lighting	Daylight	53%	Alcohol	Yes	12%	Contributing Factors	Yes	2%
	Dark Lighted	14%		No	88%		No	90%
	Dark	27%	Vision Obscured	No Obstruction	70%		Unknown	8%
	Dawn/Dusk	5%		Vision Obscured	2%	Rollover	Yes	23%
	Clear	56%		Unknown	29%		No	77%
	Adverse	44%	Driver Distracted	Inattention	11%	Pre-Event Movement	No Driver Present	-
	Dry	38%		Sleepy	2%		Going Straight	65%
	Wet/Slippery	62%		Not Distracted	44%		Decelerating in Traffic Lane	-
	Straight	58%		Unknown	43%		Accelerating in Traffic Lane	-
Road Alignment	Curve	42%	Speeding	Yes	58%		Starting in Traffic Lane	-
	Level	65%		No	39%		Stopped in Traffic Lane	-
	Other	35%		Unknown	2%		Passing Another Vehicle	-
Land Use	Rural	66%	Violation	Speeding	0.2%		Parked in Travel Lane	-
	Urban	34%		Reckless	2%		Leaving a Parked Position	-
Day	Weekday	69%		None	59%		Entering a Parked Position	-
	Weekend	31%		Other	35%		Turning Right	-
Relation to Roadway	On Roadway	11%		Unknown	3%		Turning Left	-
	Shoulder/Parking Lane	4%	Impairment	Ill/Blackout	2%		Making U-turn	-
	Off Roadway	85%		Drowsy	2%		Backing Up	-
	Left Turn Lane	-		None	83%		Negotiating a Curve	35%
	Unknown	0.3%		Other	7%		Changing Lanes	-
Relation to Junction	Non-Junction	88%		Unknown	6%		Merging	-
	Intersection	0.5%	Gender	Male	61%		Prior Corrective Action	-
	Intersection-Related	4%		Female	39%		Other	-
	Driveway/Alley	0.3%	Age	Younger <= 24	45%	Driver Avoidance Maneuver	Object in Road	0.4%
	Entrance/Exit Ramp	4%		Middle = 25 to 64	52%		Poor Road Conditions	1%
	Rail Grade Crossing	0.2%		Older >= 65	3%		Animal in Road	1%
Posted Speed Limit (mph)	Other/Unknown	2%					Vehicle in Road	3%
	<= 20	2%					Non-Motorist in Road	0.03%
	25	8%					Hit and Run	6%
	30	7%					No Driver Present	-
	35	11%					Other Avoidance Maneuver	0.1%
	40	5%					Unknown	46%
	45	14%					None	43%
	50	3%					Phantom Vehicle	1%
Traffic Control Device	>= 55	50%				Corrective Action Attempted	No Driver Present	-
	No Traffic Controls	89%					No Avoidance Maneuver	14%
	Traffic Signal	1%					Braking	6%
	Stop/Yield Sign	1%					Releasing Brakes	0.03%
	Other	8%					Steering	11%

Driver and vehicle statistics represent the light vehicle that lost control.

## Running Red Light

		<i>Driving Environment</i>		<i>Driver</i>		<i>Vehicle</i>	
Lighting	Daylight	75%	Contributing Factors	Alcohol	Yes	4%	Yes 1%
	Dark Lighted	19%		Alcohol	No	96%	No 95%
	Dark	3%		Vision Obscured	No Obstruction	71%	Unknown 5%
	Dawn/Dusk	3%			Vision Obscured	3%	Yes 2%
	Weather	Clear 88%			Unknown	26%	No 98%
	Adverse	12%		Driver Distracted	Inattention	32%	No Driver Present -
	Road Surface	Dry 81%			Sleepy	0.2%	Going Straight 85%
	Wet/Slippery	19%			Not Distracted	37%	Decelerating in Traffic Lane 2%
	Road Alignment	Straight 94%			Unknown	31%	Accelerating in Traffic Lane 0.05%
	Road Profile	Curve 6%		Speeding	Yes	3%	Starting in Traffic Lane 1.8%
	Level	82%			No	96%	Stopped in Traffic Lane 0.1%
	Other	18%			Unknown	1%	Passing Another Vehicle 1%
Land Use	Rural	40%	Pre-Event Movement	Violation	Speeding	0.1%	Parked in Travel Lane -
	Urban	60%			Reckless	0.2%	Leaving a Parked Position -
	Day	Weekday 75%			None	-	Entering a Parked Position -
	Weekend	25%			Other	100%	Turning Right 2%
Relation to Roadway	On Roadway	100%			Unknown	-	Turning Left 7%
	Shoulder/Parking Lane	-		Impairment	Ill/Blackout	0.2%	Making U-turn 0.03%
	Off Roadway	0.2%			Drowsy	0.2%	Backing Up -
	Left Turn Lane	0.2%			None	96%	Negotiating a Curve 1%
	Unknown	-			Other	2%	Changing Lanes 0.4%
Relation to Junction	Non-Junction	-			Unknown	1%	Merging -
	Intersection	93%		Gender	Male	53%	Prior Corrective Action -
	Intersection-Related	3%			Female	47%	Other 0.5%
	Driveway/Alley	2%		Age	Younger <= 24	32%	Object In Road -
	Entrance/Exit Ramp	2%			Middle = 25 to 64	55%	Poor Road Conditions -
	Rail Grade Crossing	0.05%			Older >= 65	13%	Animal In Road -
	Other/Unknown	1%					Vehicle In Road 7%
Posted Speed Limit (mph)	<= 20	1%	Driver Avoidance Maneuver	Driver Avoidance Maneuver			Non-Motorist In Road 0.004%
	25	6%					Hit and Run 2%
	30	13%					No Driver Present -
	35	33%					Other Avoidance Maneuver -
	40	15%					Unknown 68%
	45	22%					None 23%
	50	4%					Phantom Vehicle -
	>= 55	5%					
Traffic Control Device	No Traffic Controls	-		Corrective Action Attempted	No Driver Present	-	
	Traffic Signal	100%			No Avoidance Maneuver	21%	
	Stop/Yield Sign	-			Braking	6%	
	Other	-			Releasing Brakes	-	

Driver and vehicle statistics represent the violating light vehicle.

## Running Stop Sign

Driving Environment			Driver		Vehicle	
Lighting	Daylight	73%	Alcohol	Yes	7%	Contributing Factors
	Dark Lighted	15%		No	93%	
	Dark	9%	Vision Obscured	No Obstruction	72%	
	Dawn/Dusk	3%		Vision Obscured	4%	
	Clear	88%		Unknown	24%	
	Adverse	12%	Driver Distracted	Inattention	25%	
	Dry	83%		Sleepy	0.1%	
	Wet/Slippery	17%		Not Distracted	33%	
	Straight	93%		Unknown	42%	
Road Alignment	Curve	7%	Speeding	Yes	5%	Pre-Event Movement
Road Profile	Level	83%		No	93%	
Road Profile	Other	17%		Unknown	2%	
Land Use	Rural	60%	Violation	Speeding	-	
Land Use	Urban	40%		Reckless	0.4%	
Day	Weekday	74%		None	-	
Day	Weekend	26%		Other	100%	
Relation to Roadway	On Roadway	92%		Unknown	-	
Relation to Roadway	Shoulder/Parking Lane	0.3%	Impairment	Ill/Blackout	-	Driver Avoidance Maneuver
Relation to Roadway	Off Roadway	8%		Drowsy	0.1%	
Relation to Roadway	Left Turn Lane	-		None	92%	
Relation to Roadway	Unknown	0.01%		Other	6%	
Relation to Junction	Non-Junction	0.1%		Unknown	2%	
Relation to Junction	Intersection	91%	Gender	Male	61%	
Relation to Junction	Intersection-Related	8%		Female	39%	
Posted Speed Limit (mph)	<= 20	2%	Age	Younger <= 24	36%	Corrective Action Attempted
Posted Speed Limit (mph)	25	29%		Middle = 25 to 64	50%	
Posted Speed Limit (mph)	30	18%		Older >= 65	13%	
Posted Speed Limit (mph)	35	20%	Traffic Control Device	Object in Road	-	
Posted Speed Limit (mph)	40	7%		Poor Road Conditions	0.2%	
Posted Speed Limit (mph)	45	9%		Animal in Road	0.2%	
Posted Speed Limit (mph)	50	1%		Vehicle in Road	5%	
Posted Speed Limit (mph)	>= 55	13%		Non-Motorist in Road	-	
Traffic Control Device	No Traffic Controls	-		Hit and Run	3%	
Traffic Control Device	Traffic Signal	-		No Driver Present	-	
Traffic Control Device	Stop/Yield Sign	100%		Other Avoidance Maneuver	-	
Traffic Control Device	Other	-		Unknown	68%	

Driver and vehicle statistics represent the violating light vehicle.

## Road Edge Departure With Prior Vehicle Maneuver

### *Driving Environment*

### *Driver*

### *Vehicle*

<b>Lighting</b>	Daylight	45%	<b>Vision Obscured</b>	<b>Alcohol</b>	Yes	21%	<b>Contributing Factors</b>	Yes	1%
	Dark Lighted	32%			No	79%		No	69%
	Dark	17%		<b>Driver Distracted</b>	No Obstruction	47%		Unknown	30%
	Dawn/Dusk	6%			Vision Obscured	5%		Yes	6%
<b>Weather</b>	Clear	89%			Unknown	48%		No	94%
	Adverse	11%	<b>Speeding</b>	Inattention	23%	<b>Pre-Event Movement</b>	No Driver Present	-	
<b>Road Surface</b>	Dry	84%		Sleepy	0.4%		Going Straight	-	
	Wet/Slippery	16%		Not Distracted	21%		Decelerating in Traffic Lane	-	
<b>Road Alignment</b>	Straight	86%		Unknown	55%		Accelerating in Traffic Lane	-	
	Curve	14%	<b>Violation</b>	Yes	14%		Starting in Traffic Lane	-	
<b>Road Profile</b>	Level	81%		No	73%		Stopped in Traffic Lane	-	
	Other	19%		Unknown	13%		Passing Another Vehicle	6%	
<b>Land Use</b>	Rural	55%	<b>Impairment</b>	Speeding	1%	<b>Pre-Event Movement</b>	Parked in Travel Lane	-	
	Urban	45%		Reckless	2%		Leaving a Parked Position	5%	
<b>Day</b>	Weekday	66%		None	41%		Entering a Parked Position	9%	
	Weekend	34%		Other	38%		Turning Right	25%	
<b>Relation to Roadway</b>	On Roadway	1%		Unknown	18%		Turning Left	28%	
	Shoulder/Parking Lane	33%	<b>Impairment</b>	Ill/Blackout	1%		Making U-turn	1%	
	Off Roadway	66%		Drowsy	1%		Backing Up	-	
	Left Turn Lane	-		None	75%		Negotiating a Curve	-	
	Unknown	-		Other	12%		Changing Lanes	9%	
<b>Relation to Junction</b>	Non-Junction	35%		Unknown	11%		Merging	3%	
	Intersection	-	<b>Gender</b>	Male	65%		Prior Corrective Action	3%	
	Intersection-Related	50%		Female	35%		Other	11%	
	Driveway/Alley	9%	<b>Age</b>	Younger <= 24	42%	<b>Driver Avoidance Maneuver</b>	Object in Road	0.01%	
	Entrance/Exit Ramp	3%		Middle = 25 to 64	51%		Poor Road Conditions	0.02%	
	Rail Grade Crossing	0.2%		Older >= 65	7%		Animal in Road	1%	
	Other/Unknown	2%	<b>Driver Avoidance Maneuver</b>	Vehicle in Road	5%		Vehicle in Road	5%	
<b>Posted Speed Limit (mph)</b>	<= 20	4%		Non-Motorist in Road	-		Non-Motorist in Road	-	
	25	35%		Hit and Run	28%		Hit and Run	28%	
	30	10%		No Driver Present	-		No Driver Present	-	
	35	16%		Other Avoidance Maneuver	0.1%		Other Avoidance Maneuver	0.1%	
	40	7%		Unknown	36%		Unknown	36%	
	45	9%		None	29%		None	29%	
	50	3%		Phantom Vehicle	1%		Phantom Vehicle	1%	
	>= 55	16%		No Driver Present	-	<b>Corrective Action Attempted</b>	No Driver Present	-	
<b>Traffic Control Device</b>	No Traffic Controls	71%	<b>Corrective Action Attempted</b>	No Avoidance Maneuver	19%		No Avoidance Maneuver	19%	
	Traffic Signal	9%		Braking	1%		Braking	1%	
	Stop/Yield Sign	10%		Releasing Brakes	-		Releasing Brakes	-	
	Other	9%		Steering	8%		Steering	8%	

Driver and vehicle statistics represent the light vehicle departing the road edge.

## Road Edge Departure Without Prior Vehicle Maneuver

Driving Environment			Driver			Vehicle		
Lighting	Daylight	44%	Alcohol	Yes	28%	Contributing Factors	Yes	2%
	Dark Lighted	25%		No	72%		No	80%
	Dark	28%		No Obstruction	60%		Unknown	18%
	Dawn/Dusk	3%	Vision Obscured	Vision Obscured	3%	Rollover	Yes	12%
	Clear	88%		Unknown	37%		No	88%
	Adverse	12%	Driver Distracted	Inattention	27%	Pre-Event Movement	No Driver Present	-
	Dry	82%		Sleepy	12%		Going Straight	83%
	Wet/Slippery	18%		Not Distracted	15%		Decelerating in Traffic Lane	1%
	Straight	74%		Unknown	46%		Accelerating in Traffic Lane	0.2%
Road Alignment	Curve	26%	Speeding	Yes	16%		Starting in Traffic Lane	0.1%
	Level	76%		No	74%		Stopped in Traffic Lane	-
Road Profile	Other	24%		Unknown	10%		Passing Another Vehicle	-
	Rural	61%	Violation	Speeding	1%		Parked in Travel Lane	-
Land Use	Urban	39%		Reckless	2%		Leaving a Parked Position	-
	Weekday	63%		None	43%		Entering a Parked Position	-
Day	Weekend	37%		Other	44%		Turning Right	-
	On Roadway	1%		Unknown	10%		Turning Left	-
Relation to Roadway	Shoulder/Parking Lane	27%	Impairment	Ill/Blackout	3%	Driver Avoidance Maneuver	Making U-turn	-
	Off Roadway	72%		Drowsy	12%		Backing Up	-
	Left Turn Lane	-		None	56%		Negotiating a Curve	16%
	Unknown	0.1%		Other	19%		Changing Lanes	-
	Non-Junction	89%		Unknown	11%		Merging	-
Relation to Junction	Intersection	0.04%	Gender	Male	68%		Prior Corrective Action	-
	Intersection-Related	8%		Female	32%		Other	-
	Driveway/Alley	0.2%	Age	Younger <= 24	41%		Object in Road	0.1%
	Entrance/Exit Ramp	2%		Middle = 25 to 64	53%		Poor Road Conditions	0.1%
	Rail Grade Crossing	0.1%		Older >= 65	6%		Animal in Road	1%
Posted Speed Limit (mph)	Other/Unknown	1%	Corrective Action Attempted	Vehicle in Road			Vehicle in Road	1%
	<= 20	3%		Non-Motorist in Road			Non-Motorist in Road	0.01%
	25	22%		Hit and Run			Hit and Run	18%
	30	10%		No Driver Present			No Driver Present	-
	35	16%		Other Avoidance Maneuver			Other Avoidance Maneuver	0.1%
	40	6%		Unknown			Unknown	45%
	45	12%		None			None	34%
	50	3%		Phantom Vehicle			Phantom Vehicle	1%
Traffic Control Device	>= 55	28%		No Driver Present		Corrective Action Attempted	No Driver Present	-
	No Traffic Controls	86%		No Avoidance Maneuver			No Avoidance Maneuver	18%
	Traffic Signal	2%		Braking			Braking	3%
	Stop/Yield Sign	4%		Releasing Brakes			Releasing Brakes	-
	Other	8%		Steering			Steering	5%
				Braked and Steered			Braked and Steered	0.3%
				Accelerated			Accelerated	0.04%
				Accelerated and Steered			Accelerated and Steered	0.02%
				Other			Other	0.2%
				Unknown			Unknown	73%

Driver and vehicle statistics represent the light vehicle departing the road edge.

## Road Edge Departure While Backing Up

Driving Environment			Driver		Vehicle	
Lighting	Daylight	69%	Alcohol	Yes	8%	Contributing Factors
	Dark Lighted	18%		No	92%	
	Dark	10%	Vision Obscured	No Obstruction	58%	
	Dawn/Dusk	4%		Vision Obscured	3%	
	Clear	93%		Unknown	39%	
	Adverse	7%	Driver Distracted	Inattention	32%	
	Dry	85%		Sleepy/Fell Asleep	0.02%	
	Wet/Slippery	15%		Not Distracted	14%	
	Straight	94%		Unknown	53%	
	Curve	6%	Speeding	Yes	1%	Pre-Event Movement
Road Surface	Level	83%		No	87%	
	Other	17%		Unknown	12%	
Land Use	Rural	49%	Violation	Speeding	-	
	Urban	51%		Reckless	1%	
Day	Weekday	70%		None	49%	
	Weekend	30%		Other	32%	
Relation to Roadway	On Roadway	5%		Unknown	19%	
	Shoulder/Parking Lane	85%	Impairment	Ill/Blackout	-	
	Off Roadway	10%		Sleepy/Drowsy	1%	
	Left Turn Lane	-		None	85%	
	Unknown	0.4%		Other Impairment	3%	
Relation to Junction	Non-Junction	35%	Gender	Unknown	11%	Driver Avoidance Maneuver
	Intersection	0.5%		Male	56%	
	Intersection-Related	3%		Female	44%	
	Driveway/Alley	59%	Age	Younger <= 24	34%	
	Entrance/Exit Ramp	-		Middle = 25 to 64	57%	
	Rail Grade Crossing	0.1%		Older >= 65	9%	
Posted Speed Limit (mph)	Other/Unknown	3%	Corrective Action Attempted	Object in Road	-	Corrective Action Attempted
	<= 20	31%		Poor Road Conditions	-	
	25	46%		Animal in Road	-	
	30	9%		Vehicle in Road	1%	
	35	8%		Non-Motorist in Road	-	
	40	1%		Hit and Run	24%	
	45	1%		No Driver Present	-	
	50	1%		Other Avoidance Maneuver	-	
	>= 55	4%		Unknown	42%	
Traffic Control Device	No Traffic Controls	92%		None	33%	
	Traffic Signal	1%		Phantom Vehicle	0.03%	
	Stop/Yield Sign	1%		No Driver Present	-	Corrective Action Attempted
	Other	6%		No Avoidance Maneuver	29%	

Driver and vehicle statistics represent the backing light vehicle.

## Animal Crash With Prior Vehicle Maneuver

### *Driving Environment*

### *Driver*

### *Vehicle*

<b>Lighting</b>	Daylight	50%	<b>Alcohol</b>	Yes	2%	<b>Contributing Factors</b>	Yes	-
	Dark Lighted	10%		No	98%		No	69%
	Dark	35%		No Obstruction	32%		Unknown	31%
	Dawn/Dusk	4%	<b>Vision Obscured</b>	Vision Obscured	-	<b>Rollover</b>	Yes	5%
<b>Weather</b>	Clear	87%		Unknown	68%		No	95%
	Adverse	13%		<b>Driver</b>	Inattention	3%	<b>Pre-Event Movement</b>	No Driver Present
<b>Road Surface</b>	Dry	41%	<b>Speeding</b>	Sleepy	-	Going Straight	-	
	Wet/Slippery	59%		Not Distracted	19%	Decelerating in Traffic Lane	-	
<b>Road Alignment</b>	Straight	89%		Unknown	77%	Accelerating in Traffic Lane	-	
	Curve	11%	<b>Speeding</b>	Yes	1%	Starting in Traffic Lane	-	
<b>Road Profile</b>	Level	80%		No	87%	Stopped in Traffic Lane	-	
	Other	20%		Unknown	12%	Passing Another Vehicle	6%	
<b>Land Use</b>	Rural	79%	<b>Violation</b>	Speeding	-	Parked in Travel Lane	-	
	Urban	21%		Reckless	-	Leaving a Parked Position	21%	
<b>Day</b>	Weekday	68%		None	95%	Entering a Parked Position	-	
	Weekend	32%		Other	5%	Turning Right	1%	
<b>Relation to Roadway</b>	On Roadway	83%		Unknown	-	Turning Left	1%	
	Shoulder/Parking Lane	2%	<b>Impairment</b>	Ill/Blackout	-	Making U-turn	-	
	Off Roadway	14%		Sleepy/Drowsy	-	Backing Up	-	
	Left Turn Lane	-		None	94%	Negotiating a Curve	-	
<b>Relation to Junction</b>	Unknown	1%		Other	2%	Changing Lanes	3%	
	Non-Junction	90%		Unknown	4%	Merging	-	
	Intersection	-	<b>Gender</b>	Male	50%	Prior Corrective Action	14%	
	Intersection-Related	3%		Female	50%	Other	53%	
	Driveway/Alley	1%	<b>Age</b>	Younger <= 24	24%	<b>Driver Avoidance Maneuver</b>	Object in Road	-
	Entrance/Exit Ramp	4%		Middle = 25 to 64	70%		Poor Road Conditions	-
	Rail Grade Crossing	-		Older >= 65	5%		Animal in Road	19%
	Other/Unknown	2%					Vehicle in Road	-
<b>Posted Speed Limit (mph)</b>	<= 20	2%					Non-Motorist in Road	-
	25	9%					Hit and Run	-
	30	4%					No Driver Present	-
	35	5%					Other Avoidance Maneuver	-
	40	2%					Unknown	78%
	45	9%					None	2%
	50	23%					Phantom Vehicle	1%
	>= 55	46%						
<b>Traffic Control Device</b>	No Traffic Controls	30%	<b>Corrective Action Attempted</b>	No Driver Present	-	<b>Corrective Action Attempted</b>	No Driver Present	-
	Traffic Signal	5%		No Avoidance Maneuver	1%		No Avoidance Maneuver	1%
	Stop/Yield Sign	-		Braking	0.1%		Braking	0.1%
	Other	65%		Releasing Brakes	-		Releasing Brakes	-

## Animal Crash Without Prior Vehicle Maneuver

<i><b>Driving Environment</b></i>			<i><b>Driver</b></i>			<i><b>Vehicle</b></i>		
<b>Lighting</b>	Daylight	24%	<b>Alcohol</b>	Yes	1%	<b>Contributing Factors</b>	Yes	0.1%
	Dark Lighted	8%		No	99%		No	96%
	Dark	58%	<b>Vision Obscured</b>	No Obstruction	87%		Unknown	4%
	Dawn/Dusk	9%		Vision Obscured	1%		Yes	2%
	Clear	91%		Unknown	13%		No	98%
	Adverse	9%	<b>Driver Distracted</b>	Inattention	1%		No Driver Present	-
	Dry	82%		Sleepy	-		Going Straight	94%
	Wet/Slippery	18%		Not Distracted	74%		Decelerating in Traffic Lane	0.4%
	Straight	89%		Unknown	25%		Accelerating in Traffic Lane	0.1%
<b>Road Alignment</b>	Curve	11%	<b>Speeding</b>	Yes	2%		Starting in Traffic Lane	0.1%
	Level	74%		No	97%		Stopped in Traffic Lane	0.3%
<b>Road Profile</b>	Other	26%		Unknown	1%		Passing Another Vehicle	-
	Rural	79%	<b>Violation</b>	Speeding	-		Parked in Travel Lane	-
<b>Land Use</b>	Urban	21%		Reckless	0.1%		Leaving a Parked Position	-
	Weekday	70%		None	97%		Entering a Parked Position	-
	Weekend	30%		Other	3%		Turning Right	-
	On Roadway	90%		Unknown	0.1%		Turning Left	-
<b>Relation to Roadway</b>	Shoulder/Parking Lane	0.4%	<b>Impairment</b>	Ill/Blackout	-	<b>Pre-Event Movement</b>	Making U-turn	-
	Off Roadway	9%		Drowsy	-		Backing Up	-
	Left Turn Lane	-		None	98%		Negotiating a Curve	5%
	Unknown	0.1%		Other	0.3%		Changing Lanes	-
<b>Relation to Junction</b>	Non-Junction	97%	<b>Gender</b>	Unknown	2%		Merging	-
	Intersection	1%		Male	61%		Prior Corrective Action	-
	Intersection-Related	1%		Female	39%		Other	-
	Driveway/Alley	-	<b>Age</b>	Younger <= 24	20%	<b>Driver Avoidance Maneuver</b>	Object in Road	-
	Entrance/Exit Ramp	1%		Middle = 25 to 64	74%		Poor Road Conditions	-
	Rail Grade Crossing	-		Older >= 65	5%		Animal in Road	17%
	Other/Unknown	1%					Vehicle in Road	0.03%
<b>Posted Speed Limit (mph)</b>	<= 20	1%					Non-Motorist in Road	-
	25	5%					Hit and Run	0.3%
	30	2%					No Driver Present	-
	35	8%					Other Avoidance Maneuver	-
	40	4%					Unknown	69%
	45	12%					None	13%
	50	5%					Phantom Vehicle	0.1%
	>= 55	62%					No Driver Present	-
<b>Traffic Control Device</b>	No Traffic Controls	91%	<b>Corrective Action Attempted</b>	No Avoidance Maneuver	8%		No Avoidance Maneuver	-
	Traffic Signal	1%		Braking	4%		Braking	4%
	Stop/Yield Sign	0.02%		Releasing Brakes	-		Releasing Brakes	-
	Other	8%		Steering	10%		Steering	10%

## Pedestrian Crash With Prior Vehicle Maneuver

Driving Environment			Driver		Vehicle	
Lighting	Daylight	64%	Alcohol	Yes	6%	Contributing Factors
	Dark Lighted	28%		No	94%	
	Dark	6%	Vision Obscured	No Obstruction	47%	
	Dawn/Dusk	2%		Vision Obscured	10%	
	Clear	85%		Unknown	43%	
	Adverse	15%	Driver Distracted	Inattention	25%	
	Dry	78%		Sleepy	-	
	Wet/Slippery	22%		Not Distracted	28%	
	Straight	96%		Unknown	48%	
Road Alignment	Curve	4%	Speeding	Yes	4%	Pre-Event Movement
	Level	91%		No	87%	
	Other	9%		Unknown	9%	
Land Use	Rural	27%	Violation	Speeding	-	
	Urban	73%		Reckless	0.3%	
Day	Weekday	81%		None	64%	
	Weekend	19%		Other	26%	
Relation to Roadway	On Roadway	97%		Unknown	10%	
	Shoulder/Parking Lane	1%	Impairment	Ill/Blackout	-	
	Off Roadway	1%		Drowsy	-	
	Left Turn Lane	1%		None	84%	
	Unknown	-		Other	2%	
Relation to Junction	Non-Junction	8%	Gender	Unknown	14%	Driver Avoidance Maneuver
	Intersection	44%		Male	62%	
	Intersection-Related	37%		Female	38%	
	Driveway/Alley	9%	Age	Younger <= 24	16%	
	Entrance/Exit Ramp	2%		Middle = 25 to 64	72%	
	Rail Grade Crossing	-		Older >= 65	12%	
	Other/Unknown	1%				
Posted Speed Limit (mph)	<= 20	2%				
	25	28%				
	30	17%				
	35	36%				
	40	5%				
	45	7%				
	50	1%				
	>= 55	3%				
Traffic Control Device	No Traffic Controls	29%				Corrective Action Attempted
	Traffic Signal	50%				
	Stop/Yield Sign	12%				
	Other	9%				

### ***Pedestrian***

<b>Location</b>	Intersection – In crosswalk	40%
	Intersection – On roadway	40%
	Intersection – Other	0.1%
	Intersection – Unknown Location	1%
	Non-Intersection – In Crosswalk	0.5%
	Non-Intersection – On Roadway	17%
	Non-Intersection – Other	1%
	Non-Intersection – Unknown Location	0.1%
	In Crosswalk – Unknown if Intersection	-
	Other Location	0.5%
<b>Action</b>	Unknown Location	0.2%
	No Action	69%
	Running Into Road	6%
	Improper Crossing of Roadway	7%
	Inattentive	-
	Jogging	0.2%
	Pushing Vehicle	-
	Walking With Traffic	0.2%
	Walking Against Traffic	0.2%
	Playing in Roadway	9%
	Other Action	1%
	Unknown Action	7%

## Pedestrian Crash Without Prior Vehicle Maneuver

		<i>Driving Environment</i>		<i>Driver</i>		<i>Vehicle</i>	
<b>Lighting</b>	Daylight	60%	<b>Alcohol</b>	Yes	5%	<b>Contributing Factors</b>	Yes 0.1%
	Dark Lighted	24%		No	95%		No 84%
	Dark	9%		No Obstruction	45%		Unknown 16%
	Dawn/Dusk	7%		Vision Obscured	20%		Yes 0.1%
	Clear	86%		Unknown	35%		No 100%
	Adverse	14%		Inattention	13%		No Driver Present -
	Dry	83%		Sleepy	0.04%		Going Straight 92%
	Wet/Slippery	17%		Not Distracted	42%		Decelerating in Traffic Lane 1%
	Straight	92%		Unknown	45%		Accelerating in Traffic Lane 0.2%
	Curve	8%		Yes	4%		Starting in Traffic Lane 3%
<b>Road Profile</b>	Level	87%	<b>Speeding</b>	No	89%	<b>Pre-Event Movement</b>	Stopped in Traffic Lane 1%
	Other	13%		Unknown	8%		Passing Another Vehicle -
<b>Land Use</b>	Rural	39%	<b>Violation</b>	Speeding	0.2%		Parked in Travel Lane -
	Urban	61%		Reckless	1%		Leaving a Parked Position -
<b>Day</b>	Weekday	79%		None	74%		Entering a Parked Position -
	Weekend	21%		Other	13%		Turning Right -
<b>Relation to Roadway</b>	On Roadway	96%		Unknown	11%		Turning Left -
	Shoulder/Parking Lane	1%	<b>Impairment</b>	Ill/Blackout	-		Making U-turn -
	Off Roadway	1%		Drowsy	-		Backing Up -
	Left Turn Lane	0.2%		None	90%		Negotiating a Curve 3%
	Unknown	1%		Other	2%		Changing Lanes -
<b>Relation to Junction</b>	Non-Junction	55%	<b>Gender</b>	Unknown	8%	<b>Driver Avoidance Maneuver</b>	Merging -
	Intersection	19%		Male	60%		Prior Corrective Action -
	Intersection-Related	24%		Female	40%		Other -
	Driveway/Alley	2%		Younger <= 24	29%		Object in Road -
	Entrance/Exit Ramp	0.3%		Middle = 25 to 64	60%		Poor Road Conditions -
	Rail Grade Crossing	-		Older >= 65	11%		Animal in Road 0.1%
<b>Posted Speed Limit (mph)</b>	Other/Unknown	0.4%	<b>Age</b>	Unknown	8%		Vehicle in Road 1%
	<= 20	4%		Unknown	8%		Non-Motorist in Road 22%
	25	31%		Unknown	8%		Hit and Run 13%
	30	16%		Unknown	8%		No Driver Present -
	35	24%		Unknown	8%		Other Avoidance Maneuver 0.1%
	40	7%		Unknown	8%		Unknown 47%
	45	11%		Unknown	8%		None 17%
	50	1%		Unknown	8%		Phantom Vehicle -
<b>Traffic Control Device</b>	>= 55	6%	<b>Corrective Action Attempted</b>	Unknown	8%	<b>Corrective Action Attempted</b>	No Driver Present -
	No Traffic Controls	68%		Unknown	8%		No Avoidance Maneuver 15%
	Traffic Signal	19%		Unknown	8%		Braking 14%
	Stop/Yield Sign	6%		Unknown	8%		Releasing Brakes -
	Other	7%		Unknown	8%		Steering 6%
	Unknown	8%		Unknown	8%		Braked and Steered 4%
	Unknown	8%		Unknown	8%		Accelerated 0.04%
	Unknown	8%		Unknown	8%		Accelerated and Steered 0.1%
	Unknown	8%		Unknown	8%		Other 1%
	Unknown	8%		Unknown	8%		Unknown 61%

## ***Pedestrian***

<b>Location</b>	Intersection – In Crosswalk	13%
	Intersection – On Roadway	25%
	Intersection – Other	1%
	Intersection – Unknown Location	1%
	Non-Intersection – In Crosswalk	1%
	Non-Intersection – On Roadway	57%
	Non-Intersection – Other	1%
	Non-Intersection – Unknown Location	0.1%
	In Crosswalk – Unknown if Intersection	-
	Other Location	1%
<b>Action</b>	Unknown Location	1%
	No Action	17%
	Running Into Road	36%
	Improper Crossing of Roadway	26%
	Inattentive	1.3%
	Jogging	0.1%
	Pushing Vehicle	0.04%
	Walking With Traffic	2.4%
	Walking Against Traffic	1.0%
	Playing in Roadway	8%
	Other Action	6%
	Unknown Action	2%

## Pedalcyclist Crash With Prior Vehicle Maneuver

Driving Environment			Driver		Vehicle	
Lighting	Daylight	78%	Alcohol	Yes	3%	Contributing Factors
	Dark Lighted	14%		No	97%	
	Dark	2%	Vision Obscured	No Obstruction	45%	
	Dawn/Dusk	6%		Vision Obscured	11%	
	Clear	97%		Unknown	44%	
	Adverse	3%	Driver Distracted	Inattention	25%	
	Dry	93%		Sleepy	-	
	Wet/Slippery	7%		Not Distracted	35%	
	Straight	91%		Unknown	40%	
Road Alignment	Curve	9%	Speeding	Yes	0.1%	Pre-Event Movement
	Level	83%		No	89%	
	Other	17%		Unknown	11%	
Land Use	Rural	47%	Violation	Speeding	-	
	Urban	53%		Reckless	-	
Day	Weekday	81%		None	60%	
	Weekend	19%		Other	26%	
Relation to Roadway	On Roadway	97%		Unknown	13%	
	Shoulder/Parking Lane	1%	Impairment	Ill/Blackout	-	
	Off Roadway	1%		Drowsy	-	
	Left Turn Lane	0.2%		None	91%	
	Unknown	0.1%		Other	1%	
Relation to Junction	Non-Junction	2%	Gender	Male	61%	Driver Avoidance Maneuver
	Intersection	47%		Female	39%	
	Intersection-Related	30%		Unknown	7%	
	Driveway/Alley	19%	Age	Younger <= 24	28%	
	Entrance/Exit Ramp	0.2%		Middle = 25 to 64	58%	
	Rail Grade Crossing	-		Older >= 65	14%	
Posted Speed Limit (mph)	>= 55	2%	Corrective Action Attempted	No Driver Present	-	Corrective Action Attempted
	<= 20	8%		No Avoidance Maneuver	23%	
	25	30%		Braking	4%	
	30	17%		Releasing Brakes	-	
	35	28%		Steering	0.3%	
	40	6%		Braked and Steered	0.1%	
	45	8%		Accelerated	0.4%	
Traffic Control Device	50	2%		Accelerated and Steered	-	
	>= 55	2%		Other	0.2%	
	No Traffic Controls	33%		Unknown	72%	
	Traffic Signal	34%				
	Stop/Yield Sign	26%				
	Other	8%				

### *Pedalcyclist*

<b>Location</b>	Intersection – In Crosswalk	31%
	Intersection – On Roadway	43%
	Intersection – Other	2%
	Intersection – Unknown Location	1%
	Non-Intersection – In Crosswalk	1%
	Non-Intersection – On Roadway	19%
	Non-Intersection – Other	0.3%
	Non-Intersection – Unknown Location	0.4%
	In Crosswalk – Unknown If Intersection	-
	Other Location	1%
<b>Action</b>	Unknown Location	1%
	No Action	48%
	Failing to Have Lights On	1%
	Operating Without Required Equipment	1%
	Improper Lane Changing	-
	Failure to Keep in Proper Lane or Road	0.4%
	Making Improper Entry/Exit	0.2%
	Operating the Vehicle in Reckless Manner	1%
	Failure to Yield Right-of-Way	13%
	Failure to Obey Traffic Signs	2%
	Making Other Improper Turn	0.1%
	Driving on Wrong Side of Road	24%
	Other Action	6%
	Unknown Action	4%

## Pedalcyclist Crash Without Prior Vehicle Maneuver

Driving Environment			Driver			Vehicle				
Lighting	Daylight	73%	Alcohol	Yes	4%	Contributing Factors	Yes	0.1%		
	Dark Lighted	17%		No	96%		No	91%		
	Dark	5%		Vision Obscured	No Obstruction		Unknown	9%		
	Dawn/Dusk	5%			Vision Obscured		Yes	0.2%		
	Clear	93%			Unknown		No	100%		
	Adverse	7%		Driver Distracted	Inattention		No Driver Present	-		
	Road Surface	90%			Sleepy		Going Straight	80%		
	Wet/Slippery	10%			Not Distracted		Decelerating in Traffic Lane	1%		
	Road Alignment	Straight			Unknown		Accelerating in Traffic Lane	0.1%		
	Curve	9%	Speeding	Yes	2%		Starting in Traffic Lane	9%		
	Road Profile	Level		No	Stopped in Traffic Lane		6%			
	Other	20%		Unknown	Passing Another Vehicle		-			
Land Use	Rural	45%	Violation	Speeding	-	Pre-Event Movement	Parked in Travel Lane	-		
	Urban	55%		Reckless	0.3%		Leaving a Parked Position	-		
	Day	Weekday		None	75%		Entering a Parked Position	-		
	Weekend	28%		Other	17%		Turning Right	-		
Relation to Roadway	On Roadway	97%		Unknown	8%		Turning Left	-		
	Shoulder/Parking Lane	1%		Ill/Blackout	-		Making U-turn	-		
	Off Roadway	2%		Drowsy	-		Backing Up	-		
	Left Turn Lane	-		None	93%		Negotiating a Curve	3%		
	Unknown	0.4%		Other	1%		Changing Lanes	-		
Relation to Junction	Non-Junction	31%	Impairment	Unknown	6%		Merging	-		
	Intersection	40%		Gender	Male		Prior Corrective Action	-		
	Intersection-Related	15%			Female		Other	-		
	Driveway/Alley	13%		Age	Younger <= 24		Driver Avoidance Maneuver	Object in Road		
	Entrance/Exit Ramp	0.1%			Middle = 25 to 64			Poor Road Conditions		
	Rail Grade Crossing	-			Older >= 65			Animal in Road		
	Other/Unknown	2%			Vehicle in Road					
Posted Speed Limit (mph)	<= 20	6%			1%					
	25	32%			Non-Motorist in Road					
	30	13%			Hit and Run					
	35	22%			No Driver Present					
	40	5%			Other Avoidance Maneuver					
	45	14%			Unknown					
	50	0.4%			None					
	>= 55	7%			Phantom Vehicle					
Traffic Control Device	No Traffic Controls	53%	Corrective Action Attempted				No Driver Present	-		
	Traffic Signal	17%					No Avoidance Maneuver	23%		
	Stop/Yield Sign	26%					Braking	9%		
	Other	4%					Releasing Brakes	-		

***Pedalcyclist***

<b>Location</b>	Intersection – In Crosswalk	6%
	Intersection – On Roadway	47%
	Intersection – Other	1%
	Intersection – Unknown Location	0.1%
	Non-Intersection – In Crosswalk	2%
	Non-intersection – On Roadway	43%
	Non-Intersection – Other	0.2%
	Non-Intersection – Unknown Location	0.2%
	In Crosswalk – Unknown If Intersection	0.1%
	Other Location	0.1%
<b>Action</b>	Unknown Location	0.5%
	No Action	19%
	Failing to Have Lights On	3%
	Operating Without Required Equipment	2%
	Improper Lane Changing	2%
	Failure to Keep in Proper Lane or Road	1%
	Making Improper Entry/Exit	4%
	Operating the Vehicle in Reckless Manner	2%
	Failure to Yield Right-of-Way	46%
	Failure to Obey Traffic Signs	1%
	Making Other Improper Turn	1%
	Driving on Wrong Side of Road	6%
	Other Action	7%
	Unknown Action	5%

## Backing Up Into Another Vehicle

### *Driving Environment*

### *Driver*

### *Vehicle*

Lighting	Daylight	83%	Alcohol	Yes	2%	Contributing Factors	Yes	0.4%
	Dark Lighted	11%		No	98%		No	90%
	Dark	4%		No Obstruction	59%		Unknown	9%
	Dawn/Dusk	2%		Vision Obscured	10%		Rollover	-
Weather	Clear	89%	Vision Obscured	Unknown	31%		Yes	-
	Adverse	11%		Inattention	34%	Pre-Event Movement	No Driver Present	0.2%
Road Surface	Dry	83%		Sleepy	0.2%		Going Straight	0.02%
	Wet/Slippery	17%		Not Distracted	22%		Decelerating in Traffic Lane	-
Road Alignment	Straight	93%		Unknown	43%		Accelerating in Traffic Lane	-
	Curve	7%	Speeding	Yes	1%		Starting in Traffic Lane	0.2%
Road Profile	Level	81%		No	96%		Stopped in Traffic Lane	6%
	Other	19%		Unknown	4%		Passing Another Vehicle	-
Land Use	Rural	48%	Violation	Speeding	-		Parked in Travel Lane	-
	Urban	52%		Reckless	0.1%		Leaving a Parked Position	11%
Day	Weekday	80%		None	54%		Entering a Parked Position	2%
	Weekend	20%		Other	40%		Turning Right	-
Relation to Roadway	On Roadway	98%		Unknown	6%		Turning Left	-
	Shoulder/Parking Lane	1%	Impairment	Ill/Blackout	-		Making U-turn	-
	Off Roadway	0.4%		Drowsy	0.2%		Backing Up	79%
	Left Turn Lane	0.2%		None	94%		Negotiating a Curve	-
	Unknown	0.1%		Other	2%		Changing Lanes	-
Relation to Junction	Non-Junction	25%	Gender	Unknown	4%		Merging	-
	Intersection	5%		Male	62%		Prior Corrective Action	-
	Intersection-Related	27%		Female	38%		Other	2%
	Driveway/Alley	38%	Age	Younger <= 24	24%	Driver Avoidance Maneuver	Object in Road	-
	Entrance/Exit Ramp	2%		Middle = 25 to 64	66%		Poor Road Conditions	-
	Rail Grade Crossing	1%		Older >= 65	10%		Animal in Road	-
	Other/Unknown	3%					Vehicle in Road	1%
Posted Speed Limit (mph)	<= 20	8%					Non-Motorist in Road	-
	25	38%					Hit and Run	7%
	30	13%					No Driver Present	0.2%
	35	19%					Other Avoidance Maneuver	0.004%
	40	5%					Unknown	56%
	45	7%					None	35%
	50	1%					Phantom Vehicle	0.2%
	>= 55	8%				Corrective Action Attempted	No Driver Present	0.2%
Traffic Control Device	No Traffic Controls	66%					No Avoidance Maneuver	31%
	Traffic Signal	16%					Braking	0.5%
	Stop/Yield Sign	11%					Releasing Brakes	-
	Other	6%					Steering	-

Driver and vehicle statistics represent the backing light vehicle.

## Vehicle(s) Turning – Vehicles Traveling in Same Direction

Driving Environment			Driver		Vehicle	
Lighting	Daylight	79%	Contributing Factors	Yes	2%	Yes 1%
	Dark Lighted	14%		No	98%	No 93%
	Dark	4%		No Obstruction	73%	Unknown 6%
	Dawn/Dusk	3%		Vision Obscured	1%	Yes 0.2%
	Clear	90%		Unknown	26%	No 100%
	Adverse	10%		Inattention	14%	No Driver Present -
	Dry	84%		Sleepy	0.1%	Going Straight -
	Wet/Slippery	16%		Not Distracted	42%	Decelerating in Traffic Lane -
	Straight	92%		Unknown	44%	Accelerating in Traffic Lane -
	Curve	8%		Speeding	1%	Starting in Traffic Lane -
Road Surface	Level	83%	Pre-Event Movement	No	96%	Stopped in Traffic Lane -
	Other	17%		Violation	3%	Passing Another Vehicle -
Land Use	Rural	49%		Speeding	-	Parked in Travel Lane -
	Urban	51%		Reckless	0.4%	Leaving a Parked Position -
Day	Weekday	79%		None	69%	Entering a Parked Position -
	Weekend	21%		Other	28%	Turning Right 40%
Relation to Roadway	On Roadway	99%		Unknown	3%	Turning Left 52%
	Shoulder/Parking Lane	1%	Driver Avoidance Maneuver	Impairment	Ill/Blackout	Making U-turn 8%
	Off Roadway	0.2%		Drowsy	0.1%	Backing Up -
	Left Turn Lane	1%		None	96%	Negotiating a Curve -
	Unknown	0.1%		Other	1%	Changing Lanes -
Relation to Junction	Non-Junction	6%		Unknown	3%	Merging -
	Intersection	37%		Gender	Male	Prior Corrective Action -
	Intersection-Related	22%		Female	41%	Other -
	Driveway/Alley	28%		Age	Younger <= 24	Object in Road -
	Entrance/Exit Ramp	1%			Middle = 25 to 64	Poor Road Conditions -
Posted Speed Limit (mph)	Rail Grade Crossing	-			Older >= 65	Animal in Road -
	Other/Unknown	5%				Vehicle in Road 1%
	<= 20	2%				Non-Motorist in Road -
	25	17%				Hit and Run 4%
	30	16%				No Driver Present -
	35	27%				Other Avoidance Maneuver -
	40	9%				Unknown 70%
	45	16%				None 25%
Traffic Control Device	50	3%				Phantom Vehicle -
	>= 55	11%	Corrective Action Attempted			No Driver Present -
	No Traffic Controls	60%				No Avoidance Maneuver 21%
	Traffic Signal	29%				Braking 0.5%
Weather	Stop/Yield Sign	6%				Releasing Brakes -
	Other	5%				Steering 0.2%
						Braked and Steered 0.03%

Driver and vehicle statistics represent the turning light vehicle.

## Vehicle(s) Parking – Vehicles Traveling in Same Direction

Driving Environment			Driver			Vehicle			
Lighting	Daylight	82%	Alcohol	Yes	2%	Contributing Factors	Yes	0.01%	
	Dark Lighted	12%		No	98%		No	94%	
	Dark	5%	Vision Obscured	No Obstruction	57%		Unknown	6%	
	Dawn/Dusk	1%		Vision Obscured	4%	Rollover	Yes	0.3%	
	Clear	85%		Unknown	39%		No	100%	
	Adverse	15%	Driver Distracted	Inattention	22%	Pre-Event Movement	No Driver Present	0.3%	
	Dry	76%		Sleepy	-		Going Straight	3%	
	Wet/Slippery	24%		Not Distracted	37%		Decelerating in Traffic Lane	-	
	Straight	91%		Unknown	41%		Accelerating in Traffic Lane	-	
Road Alignment	Curve	9%	Speeding	Yes	3%		Starting in Traffic Lane	-	
	Level	85%		No	93%		Stopped in Traffic Lane	0.04%	
Road Profile	Other	15%		Unknown	4%		Passing Another Vehicle	2%	
Land Use	Rural	39%	Violation	Speeding	-		Parked in Travel Lane	-	
	Urban	61%		Reckless	0.3%		Leaving a Parked Position	68%	
Day	Weekday	84%		None	65%		Entering a Parked Position	8%	
	Weekend	16%		Other	30%		Turning Right	1%	
Relation to Roadway	On Roadway	97%		Unknown	4%		Turning Left	0.5%	
	Shoulder/Parking Lane	1%	Impairment	Ill/Blackout	-		Making U-turn	10%	
	Off Roadway	1%		Drowsy	-		Backing Up	-	
	Left Turn Lane	0.2%		None	96%		Negotiating a Curve	2%	
	Unknown	0.5%		Other	1%		Changing Lanes	0.02%	
Relation to Junction	Non-Junction	74%	Gender	Unknown	3%	Driver Avoidance Maneuver	Merging	5%	
	Intersection	3%		Male	59%		Prior Corrective Action	-	
	Intersection-Related	10%		Female	41%		Other	1%	
	Driveway/Alley	2%	Age	Younger <= 24	27%		Object in Road	-	
	Entrance/Exit Ramp	5%		Middle = 25 to 64	63%		Poor Road Conditions	-	
	Rail Grade Crossing	-		Older >= 65	10%		Animal in Road	-	
	Other/Unknown	5%					Vehicle in Road	4%	
Posted Speed Limit (mph)	<= 20	2%					Non-Motorist in Road	-	
	25	27%					Hit and Run	5%	
	30	12%					No Driver Present	0.3%	
	35	21%					Other Avoidance Maneuver	-	
	40	6%					Unknown	76%	
	45	10%					None	14%	
	50	1%					Phantom Vehicle	-	
	>= 55	20%							
Traffic Control Device	No Traffic Controls	81%	Corrective Action Attempted				No Driver Present	0.3%	
	Traffic Signal	9%					No Avoidance Maneuver	9%	
	Stop/Yield Sign	3%					Braking	1%	
	Other	7%					Releasing Brakes	-	

Driver and vehicle statistics represent the parking light vehicle.

## Vehicle(s) Changing Lanes – Vehicles Traveling in Same Direction

Driving Environment			Driver			Vehicle		
Lighting	Daylight	74%	Alcohol	Yes	3%	Contributing Factors	Yes 1%	
	Dark Lighted	17%		No	97%		No 86%	
	Dark	6%		Vision Obscured	No Obstruction 65%		Unknown 14%	
	Dawn/Dusk	3%			Vision Obscured 2%	Rollover	Yes 2%	
	Clear	89%			Unknown 33%		No 98%	
	Adverse	11%		Driver Distracted	Inattention 22%	Pre-Event Movement	No Driver Present -	
	Dry	83%			Sleepy 0.1%		Going Straight 6%	
	Wet/Slippery	17%			Not Distracted 29%		Decelerating in Traffic Lane 0.002%	
	Straight	90%			Unknown 49%		Accelerating in Traffic Lane -	
Road Alignment	Curve	10%	Speeding	Yes 4%	Starting in Traffic Lane -			
	Level	81%		No 88%	Stopped in Traffic Lane -			
	Other	19%		Unknown 7%	Passing Another Vehicle 15%			
Land Use	Rural	46%	Violation	Speeding -	Driver Avoidance Maneuver		Parked in Travel Lane -	
	Urban	54%		Reckless 1%			Leaving a Parked Position -	
Day	Weekday	78%		None 53%			Entering a Parked Position -	
	Weekend	22%		Other 37%			Turning Right -	
Relation to Roadway	On Roadway	90%		Unknown 9%			Turning Left 0.1%	
	Shoulder/Parking Lane	1%	Impairment	Ill/Blackout 0.1%			Making U-turn -	
	Off Roadway	8%		Drowsy 0.1%			Backing Up -	
	Left Turn Lane	1%		None 92%			Negotiating a Curve 1%	
	Unknown	0.1%		Other 1%			Changing Lanes 69%	
Relation to Junction	Non-Junction	69%	Gender	Unknown 6%			Merging 8%	
	Intersection	4%		Male 59%			Prior Corrective Action 1%	
	Intersection-Related	15%		Female 41%			Other -	
	Driveway/Alley	1%	Age	Younger <= 24 32%			Object in Road 0.1%	
	Entrance/Exit Ramp	9%		Middle = 25 to 64 58%			Poor Road Conditions 0.01%	
Posted Speed Limit (mph)	Rail Grade Crossing	0.1%		Older >= 65 10%			Animal in Road -	
	Other/Unknown	2%					Vehicle in Road 11%	
	<= 20	1%					Non-Motorist in Road -	
	25	7%					Hit and Run 11%	
	30	6%					No Driver Present -	
	35	20%					Other Avoidance Maneuver -	
	40	10%					Unknown 55%	
	45	17%					None 22%	
	50	4%					Phantom Vehicle 2%	
Traffic Control Device	>= 55	34%	Corrective Action Attempted				No Driver Present -	
	No Traffic Controls	79%					No Avoidance Maneuver 19%	
	Traffic Signal	11%					Braking 1%	
	Stop/Yield Sign	2%					Releasing Brakes -	
	Other	8%					Steering 11%	
							Braked and Steered 1%	
							Accelerated 0.001%	
							Accelerated and Steered 0.002%	
							Other 0.02%	
							Unknown 68%	

Driver and vehicle statistics represent the light vehicle changing lanes.

## Vehicle(s) Drifting – Vehicles Traveling in Same Direction

Driving Environment			Driver			Vehicle		
Lighting	Daylight	74%	Alcohol	Yes	4%	Contributing Factors	Yes	1%
	Dark Lighted	18%		No	96%		No	88%
Weather	Dark	5%	Vision Obscured	No Obstruction	71%		Unknown	11%
	Dawn/Dusk	4%		Vision Obscured	1%		Rollover	Yes 1%
	Clear	84%		Unknown	28%		No	99%
Road Surface	Dry	78%	Driver Distracted	Inattention	10%	Pre-Event Movement	No Driver Present	2%
	Wet/Slippery	22%		Sleepy	1%		Going Straight	68%
Road Alignment	Straight	87%		Not Distracted	43%		Decelerating in Traffic Lane	7%
	Curve	13%		Unknown	47%		Accelerating in Traffic Lane	0.1%
Road Profile	Level	80%	Speeding	Yes	8%		Starting in Traffic Lane	1%
	Other	20%		No	84%		Stopped in Traffic Lane	12%
Land Use	Rural	45%		Unknown	8%		Passing Another Vehicle	-
	Urban	55%		Speeding	-		Parked in Travel Lane	1%
Day	Weekday	80%	Violation	Reckless	1%		Leaving a Parked Position	-
	Weekend	20%		None	70%		Entering a Parked Position	-
Relation to Roadway	On Roadway	99%		Other	21%		Turning Right	-
	Shoulder/Parking Lane	0.01%		Unknown	9%		Turning Left	-
	Off Roadway	0.3%		Impairment	Ill/Blackout		Making U-turn	-
	Left Turn Lane	1%		Drowsy	1%		Backing Up	-
	Unknown	0.2%		None	91%		Negotiating a Curve	5%
Relation to Junction	Non-Junction	64%	Gender	Other	2%		Changing Lanes	-
	Intersection	5%		Male	60%		Merging	-
	Intersection-Related	21%		Female	40%		Prior Corrective Action	2%
	Driveway/Alley	2%	Age	Younger <= 24	27%		Other	3%
	Entrance/Exit Ramp	5%		Middle = 25 to 64	64%		Object in Road	1%
Posted Speed Limit (mph)	Rail Grade Crossing	1%		Older >= 65	9%		Poor Road Conditions	0.01%
	Other/Unknown	3%				Driver Avoidance Maneuver	Animal in Road	-
	<= 20	1%					Vehicle in Road	19%
	25	5%					Non-Motorist in Road	-
Traffic Control Device	30	8%					Hit and Run	8%
	35	22%					No Driver Present	2%
	40	9%					Other Avoidance Maneuver	0.01%
	45	17%					Unknown	47%
	50	4%					None	24%
	>= 55	33%					Phantom Vehicle	0.2%
	No Traffic Controls	73%				Corrective Action Attempted	No Driver Present	2%
Traffic Control Device	Traffic Signal	16%					No Avoidance Maneuver	19%
	Stop/Yield Sign	3%					Braking	3%
	Other	8%					Releasing Brakes	-
							Steering	16%

Driver and vehicle statistics represent all light vehicles involved.

## Vehicle(s) Making a Maneuver – Vehicles Traveling in Opposite Direction

Driving Environment			Driver		Vehicle				
Lighting	Daylight	60%	Alcohol	Yes	16%	Contributing Factors	Yes	3%	
	Dark Lighted	18%		No	84%		No	81%	
	Dark	21%		Vision Obscured			Unknown	16%	
	Dawn/Dusk	1%	Driver Distracted	No Obstruction	59%	Rollover	Yes	4%	
	Clear	82%		Vision Obscured	7%		No	96%	
	Adverse	18%		Unknown	34%		Pre-Event Movement		
Weather	Dry	73%	Speeding	Inattention	18%		No Driver Present	-	
	Wet/Slippery	27%		Sleepy	2%		Going Straight	-	
Road Alignment	Straight	87%		Not Distracted	35%		Decelerating in Traffic Lane	-	
	Curve	13%		Unknown	46%		Accelerating in Traffic Lane	-	
Road Profile	Level	70%	Violation	Yes	10%		Starting in Traffic Lane	-	
	Other	30%		No	83%		Stopped in Traffic Lane	-	
Land Use	Rural	53%		Unknown	7%		Passing Another Vehicle	34%	
	Urban	47%		Impairment			Parked in Travel Lane	-	
Day	Weekday	69%	Violation	Speeding	0.3%		Leaving a Parked Position	6%	
	Weekend	31%		Reckless	1%		Entering a Parked Position	2%	
Relation to Roadway	On Roadway	78%		None	51%		Turning Right	-	
	Shoulder/Parking Lane	3%		Other	38%		Turning Left	1%	
	Off Roadway	14%		Unknown	9%		Making U-turn	-	
	Left Turn Lane	5%		Ill/Blackout	1%		Backing Up	-	
	Unknown	-		Drowsy	2%		Negotiating a Curve	-	
Relation to Junction	Non-Junction	81%	Age	None	87%		Changing Lanes	12%	
	Intersection	7%		Other	9%		Merging	2%	
	Intersection-Related	10%		Unknown	2%		Prior Corrective Action	16%	
	Driveway/Alley	1%		Male	72%		Other	28%	
	Entrance/Exit Ramp	0.1%		Female	28%		Driver Avoidance Maneuver		
Posted Speed Limit (mph)	Rail Grade Crossing	-		Younger <= 24	65%		Object in Road	-	
	Other/Unknown	1%		Middle = 25 to 64	29%		Poor Road Conditions	-	
	<= 20	1%		Older >= 65	6%		Animal in Road	-	
	25	11%		Corrective Action Attempted			Vehicle in Road	26%	
	30	9%					Non-Motorist in Road	-	
Traffic Control Device	35	18%					Hit and Run	13%	
	40	6%					No Driver Present	-	
	45	20%					Other Avoidance Maneuver	-	
	50	6%					Unknown	45%	
	>= 55	29%					None	13%	
Traffic Control Device	No Traffic Controls	86%					Phantom Vehicle	2%	
	Traffic Signal	9%		Corrective Action Attempted			No Driver Present	-	
	Stop/Yield Sign	0.03%					No Avoidance Maneuver	9%	
	Other	5%					Braking	3%	

Driver and vehicle statistics represent the light vehicle making a maneuver.

## Vehicle(s) Not Making a Maneuver – Vehicles Traveling in Opposite Direction

Driving Environment			Driver			Vehicle	
Lighting	Daylight	65%	Alcohol	Yes	6%	Contributing Factors	Yes 1%
	Dark Lighted	11%		No	94%		No 90%
	Dark	18%	Vision Obscured	No Obstruction	68%		Unknown 9%
	Dawn/Dusk	6%		Vision Obscured	5%	Rollover	Yes 3%
	Clear	78%		Unknown	28%		No 97%
	Adverse	22%	Driver Distracted	Inattention	8%	Pre-Event Movement	No Driver Present 1%
	Dry	70%		Sleepy	2%		Going Straight 63%
Road Surface	Wet/Slippery	30%		Not Distracted	44%		Decelerating in Traffic Lane 1%
Straight	58%	Unknown		46%	Accelerating in Traffic Lane 0.01%		
Road Alignment	Curve	42%	Speeding	Yes	7%		Starting in Traffic Lane 0.2%
	Level	65%		No	88%		Stopped in Traffic Lane 3%
Road Profile	Other	35%		Unknown	5%		Passing Another Vehicle -
Land Use	Rural	66%	Violation	Speeding	0.2%		Parked in Travel Lane 0.2%
	Urban	34%		Reckless	1%		Leaving a Parked Position -
Day	Weekday	71%		None	71%		Entering a Parked Position -
	Weekend	29%		Other	22%		Turning Right -
Relation to Roadway	On Roadway	81%		Unknown	6%		Turning Left -
	Shoulder/Parking Lane	2%	Impairment	Ill/Blackout	0.4%		Making U-turn -
	Off Roadway	17%		Drowsy	2%		Backing Up -
	Left Turn Lane	0.3%		None	88%		Negotiating a Curve 32%
	Unknown	0.2%		Other	4%		Changing Lanes -
Relation to Junction	Non-Junction	88%	Gender	Unknown	6%		Merging -
	Intersection	3%		Male	63%		Prior Corrective Action -
	Intersection-Related	7%		Female	37%		Other -
	Driveway/Alley	0.4%	Age	Younger <= 24	29%	Driver Avoidance Maneuver	Object in Road 0.2%
	Entrance/Exit Ramp	0.1%		Middle = 25 to 64	64%		Poor Road Conditions 0.001%
	Rail Grade Crossing	0.2%		Older >= 65	7%		Animal in Road -
Posted Speed Limit (mph)	Other/Unknown	1%					Vehicle in Road 21%
	<= 20	3%					Non-Motorist in Road 0.1%
	25	17%					Hit and Run 6%
	30	11%					No Driver Present 1%
	35	21%					Other Avoidance Maneuver 0.1%
	40	5%					Unknown 56%
	45	13%					None 14%
	50	3%					Phantom Vehicle 2%
Traffic Control Device	>= 55	28%	Corrective Action Attempted				No Driver Present 1%
	No Traffic Controls	86%					No Avoidance Maneuver 10%
	Traffic Signal	4%					Braking 5%
	Stop/Yield Sign	1%					Releasing Brakes -
	Other	9%					Steering 18%

Driver and vehicle statistics represent all light vehicles involved.

## Following Vehicle Making a Maneuver and Approaching Lead Vehicle

Driving Environment			Driver			Vehicle		
Lighting	Daylight	76%	Alcohol	Yes	5%	Contributing Factors	Yes 1%	
	Dark Lighted	16%		No	95%		No 80%	
	Dark	3%		No Obstruction 64%			Unknown 20%	
	Dawn/Dusk	4%	Vision Obscured	Vision Obscured	2%	Rollover	Yes 0.1%	
	Clear	91%		Unknown	34%		No 100%	
	Adverse	9%		Inattention 29%			No Driver Present -	
	Dry	85%	Driver Distracted	Sleepy	0.3%		Going Straight -	
	Wet/Slippery	15%		Not Distracted	24%		Decelerating in Traffic Lane -	
	Straight	84%		Unknown	47%		Accelerating in Traffic Lane -	
Road Alignment	Curve	16%	Speeding	Yes	25%		Starting in Traffic Lane -	
	Level	80%		No	64%		Stopped in Traffic Lane -	
Road Profile	Other	20%		Unknown	11%		Passing Another Vehicle 9%	
Land Use	Rural	42%	Violation	Speeding	-	Pre-Event Movement	Parked in Travel Lane -	
	Urban	58%		Reckless	1%		Leaving a Parked Position 6%	
Day	Weekday	77%		None	44%		Entering a Parked Position 1%	
	Weekend	23%		Other	42%		Turning Right 22%	
Relation to Roadway	On Roadway	96%		Unknown	13%		Turning Left 7%	
	Shoulder/Parking Lane	1%	Impairment	Ill/Blackout	0.1%		Making U-turn 0.3%	
	Off Roadway	2%		Drowsy	0.2%		Backing Up -	
	Left Turn Lane	0.3%		None	88%		Negotiating a Curve -	
	Unknown	-		Other	2%		Changing Lanes 36%	
Relation to Junction	Non-Junction	36%	Gender	Unknown	10%		Merging 4%	
	Intersection	7%		Male	59%		Prior Corrective Action 3%	
	Intersection-Related	33%		Female	41%		Other 12%	
	Driveway/Alley	4%	Age	Younger <= 24	33%	Driver Avoidance Maneuver	Object in Road 0.2%	
	Entrance/Exit Ramp	6%		Middle = 25 to 64	62%		Poor Road Conditions -	
	Rail Grade Crossing	0.3%		Older >= 65	5%		Animal in Road -	
	Other/Unknown	14%		Vehicle in Road 12%			Vehicle in Road 12%	
Posted Speed Limit (mph)	<= 20	0.5%		Non-Motorist in Road -			Non-Motorist in Road -	
	25	8%		Hit and Run 17%			Hit and Run 17%	
	30	9%		No Driver Present -			No Driver Present -	
	35	25%		Other Avoidance Maneuver -			Other Avoidance Maneuver -	
	40	10%		Unknown 57%			Unknown 57%	
	45	19%		None 13%			None 13%	
	50	5%		Phantom Vehicle 0.01%			Phantom Vehicle 0.01%	
	>= 55	24%		No Driver Present -			No Driver Present -	
Traffic Control Device	No Traffic Controls	50%	Corrective Action Attempted	No Avoidance Maneuver 11%			No Avoidance Maneuver 11%	
	Traffic Signal	29%		Braking 5%			Braking 5%	
	Stop/Yield Sign	14%		Releasing Brakes -			Releasing Brakes -	
	Other	7%		Steering 8%			Steering 8%	
				Braked and Steered 1%			Braked and Steered 1%	

Driver and vehicle statistics represent the striking light vehicle.

## Following Vehicle Approaching an Accelerating Lead Vehicle

Driving Environment			Driver			Vehicle	
Lighting	Daylight	78%	Alcohol	Yes	3%	Contributing Factors	Yes 1%
	Dark Lighted	12%		No	97%		No 88%
	Dark	5%	Vision Obscured	No Obstruction	71%		Unknown 11%
	Dawn/Dusk	5%		Vision Obscured	1%		
	Clear	91%		Unknown	28%	Rollover	Yes 0.01%
	Adverse	9%		Inattention	39%		No 100%
	Dry	89%	Driver Distracted	Sleepy	2%		No Driver Present -
	Wet/Slippery	11%		Not Distracted	21%		Going Straight 54%
	Straight	91%		Unknown	38%		Decelerating in Traffic Lane 5%
	Curve	9%	Speeding	Yes	30%		Accelerating in Traffic Lane 3%
	Level	80%		No	64%		Starting in Traffic Lane 34%
	Other	20%		Unknown	6%		Stopped in Traffic Lane -
Land Use	Rural	47%	Violation	Speeding	-	Pre-Event Movement	Passing Another Vehicle -
	Urban	53%		Reckless	1%		Parked in Travel Lane -
Day	Weekday	78%		None	46%		Leaving a Parked Position -
	Weekend	22%		Other	46%		Entering a Parked Position -
	On Roadway	100%		Unknown	6%		Turning Right -
Relation to Roadway	Shoulder/Parking Lane	0%	Impairment	Ill/Blackout	0.4%		Turning Left -
	Off Roadway	0%		Drowsy	2%		Making U-turn -
	Left Turn Lane	0%		None	91%		Backing Up -
	Unknown	0%		Other	1%		Negotiating a Curve 3%
	Non-Junction	16%		Unknown	5%		Changing Lanes -
Relation to Junction	Intersection	6%	Gender	Male	53%		Merging -
	Intersection-Related	66%		Female	47%		Prior Corrective Action -
	Driveway/Alley	1%	Age	Younger <= 24	30%	Driver Avoidance Maneuver	Other -
	Entrance/Exit Ramp	6%		Middle = 25 to 64	65%		Object in Road -
	Rail Grade Crossing	1%		Older >= 65	5%		Poor Road Conditions -
	Other/Unknown	4%					Animal in Road -
Posted Speed Limit (mph)	<= 20	1%					Vehicle in Road 19%
	25	4%					Non-Motorist in Road -
	30	6%					Hit and Run 6%
	35	22%					No Driver Present -
	40	10%					Other Avoidance Maneuver -
	45	34%					Unknown 64%
	50	4%					None 12%
	>= 55	19%					Phantom Vehicle -
Traffic Control Device	No Traffic Controls	21%	Corrective Action Attempted	No Driver Present	-		
	Traffic Signal	58%		No Avoidance Maneuver	12%		
	Stop/Yield Sign	16%		Braking	15%		
	Other	5%		Releasing Brakes	-		

Driver and vehicle statistics represent the striking light vehicle.

## Following Vehicle Approaching Lead Vehicle Moving at Lower Constant Speed

Driving Environment			Driver			Vehicle		
Lighting	Daylight	76%	Alcohol	Yes	5%	Contributing Factors	Yes 1%	
	Dark Lighted	14%		No	95%		No 88%	
	Dark	7%		Vision Obscured	No Obstruction 68%		Unknown 11%	
	Dawn/Dusk	4%			Vision Obscured 2%	Rollover	Yes 1%	
	Clear	85%			Unknown 29%		No 99%	
	Adverse	15%	Driver Distracted	Inattention	25%		No Driver Present -	
	Dry	79%		Sleepy	2%		Going Straight 91%	
	Wet/Slippery	21%		Not Distracted	33%		Decelerating in Traffic Lane 5%	
	Straight	90%		Unknown	41%		Accelerating in Traffic Lane 0.1%	
Road Alignment	Curve	10%	Speeding	Yes	36%	Pre-Event Movement	Starting in Traffic Lane 2%	
	Level	78%		No	59%		Stopped in Traffic Lane 0.1%	
Road Profile	Other	22%		Unknown	5%		Passing Another Vehicle -	
Land Use	Rural	43%		Speeding	0.3%		Parked in Travel Lane -	
	Urban	57%		Reckless	1%		Leaving a Parked Position -	
Day	Weekday	80%	Violation	None	45%		Entering a Parked Position -	
	Weekend	20%		Other	47%		Turning Right -	
Relation to Roadway	On Roadway	99%		Unknown	7%		Turning Left 0.1%	
	Shoulder/Parking Lane	0.1%	Impairment	Ill/Blackout	0.2%		Making U-turn 0.1%	
	Off Roadway	1%		Drowsy	1%		Backing Up -	
	Left Turn Lane	0.1%		None	90%		Negotiating a Curve 1%	
	Unknown	0%		Other	3%		Changing Lanes -	
Relation to Junction	Non-Junction	61%		Unknown	5%	Driver Avoidance Maneuver	Merging -	
	Intersection	4%	Gender	Male	59%		Prior Corrective Action -	
	Intersection-Related	26%		Female	41%		Other -	
	Driveway/Alley	2%	Age	Younger <= 24	36%		Object in Road 0.002%	
	Entrance/Exit Ramp	3%		Middle = 25 to 64	60%		Poor Road Conditions -	
	Rail Grade Crossing	0.3%		Older >= 65	4%		Animal in Road -	
	Other/Unknown	3%					Vehicle in Road 27%	
Posted Speed Limit (mph)	<= 20	0.4%					Non-Motorist in Road -	
	25	6%					Hit and Run 9%	
	30	7%					No Driver Present -	
	35	20%					Other Avoidance Maneuver -	
	40	10%					Unknown 56%	
	45	21%					None 9%	
	50	4%					Phantom Vehicle 0.01%	
	>= 55	31%						
Traffic Control Device	No Traffic Controls	69%	Corrective Action Attempted	No Driver Present	-			
	Traffic Signal	20%		No Avoidance Maneuver	7%			
	Stop/Yield Sign	4%		Braking	23%			
	Other	7%		Releasing Brakes	-			
				Steering	3%			

Driver and vehicle statistics represent the striking light vehicle.

## Following Vehicle Approaching a Decelerating Lead Vehicle

Driving Environment			Driver		Vehicle	
Lighting	Daylight	84%	Alcohol	Yes	2%	Contributing Factors
	Dark Lighted	9%		No	98%	
	Dark	4%	Vision Obscured	No Obstruction	77%	
	Dawn/Dusk	3%		Vision Obscured	1%	
	Clear	84%		Unknown	22%	
	Adverse	16%	Driver Distracted	Inattention	32%	
	Dry	78%		Sleepy	0.3%	
	Wet/Slippery	22%		Not Distracted	29%	
	Straight	92%		Unknown	39%	
Road Alignment	Curve	8%	Speeding	Yes	43%	Pre-Event Movement
	Level	78%		No	54%	
	Other	22%		Unknown	3%	
Land Use	Rural	52%	Violation	Speeding	0.03%	
	Urban	48%		Reckless	1%	
Day	Weekday	83%		None	47%	
	Weekend	17%		Other	49%	
Relation to Roadway	On Roadway	98%		Unknown	3%	
	Shoulder/Parking Lane	0.1%	Impairment	Ill/Blackout	0.01%	
	Off Roadway	2%		Drowsy	0.3%	
	Left Turn Lane	0.02%		None	95%	
	Unknown	0%		Other	1%	
Relation to Junction	Non-Junction	53%	Gender	Male	60%	Driver Avoidance Maneuver
	Intersection	4%		Female	40%	
	Intersection-Related	30%		Unknown	3%	
	Driveway/Alley	7%	Age	Younger <= 24	39%	
	Entrance/Exit Ramp	4%		Middle = 25 to 64	56%	
Posted Speed Limit (mph)	Rail Grade Crossing	0.2%		Older >= 65	5%	
	Other/Unknown	2%	Corrective Action Attempted	Object in Road	0.1%	
	<= 20	1%		Poor Road Conditions	0.001%	
	25	6%		Animal in Road	-	
	30	5%		Vehicle in Road	24%	
	35	20%		Non-Motorist in Road	-	
	40	11%		Hit and Run	4%	
Traffic Control Device	45	21%		No Driver Present	-	
	50	6%		Other Avoidance Maneuver	-	
	>= 55	30%		Unknown	55%	
	No Traffic Controls	69%		None	16%	
Traffic Control Device	Traffic Signal	19%		Phantom Vehicle	0.3%	
	Stop/Yield Sign	4%		No Driver Present	-	
	Other	7%		No Avoidance Maneuver	13%	
				Braking	18%	

Driver and vehicle statistics represent the striking light vehicle.

## Following Vehicle Approaching a Stopped Lead Vehicle

### *Driving Environment*

### *Driver*

### *Vehicle*

Lighting	Daylight	81%	Alcohol	Yes	4%	Contributing Factors	Yes	1%
	Dark Lighted	12%		No	96%		No	90%
Weather	Dark	4%	Vision Obscured	No Obstruction	71%	Rollover	Unknown	9%
	Dawn/Dusk	3%		Vision Obscured	2%		Yes	0.1%
	Clear	85%		Unknown	27%		No	100%
Road Surface	Dry	79%	Driver Distracted	Inattention	37%	Pre-Event Movement	No Driver Present	-
	Wet/Slippery	21%		Sleepy	1%	Going Straight	77%	
Road Alignment	Straight	91%		Not Distracted	21%	Decelerating in Traffic Lane	12%	
	Curve	9%		Unknown	41%	Accelerating in Traffic Lane	1%	
Road Profile	Level	80%	Speeding	Yes	35%	Starting in Traffic Lane	8%	
	Other	20%		No	61%	Stopped in Traffic Lane	0.04%	
Land Use	Rural	49%		Unknown	4%	Passing Another Vehicle	-	
	Urban	51%	Violation	Speeding	0.1%	Parked in Travel Lane	-	
Day	Weekday	82%		Reckless	1%	Leaving a Parked Position	-	
	Weekend	18%		None	43%	Entering a Parked Position	-	
Relation to Roadway	On Roadway	99%		Other	51%	Turning Right	0.05%	
	Shoulder/Parking Lane	0.1%		Unknown	5%	Turning Left	-	
	Off Roadway	0.5%	Impairment	Ill/Blackout	0.1%	Making U-turn	-	
	Left Turn Lane	0.3%		Drowsy	1%	Backing Up	-	
	Unknown	0.03%		None	93%	Negotiating a Curve	2%	
Relation to Junction	Non-Junction	34%		Other	3%	Changing Lanes	-	
	Intersection	4%	Gender	Unknown	4%	Merging	-	
	Intersection-Related	50%		Male	58%	Prior Corrective Action	-	
	Driveway/Alley	3%	Age	Female	42%	Other	-	
	Entrance/Exit Ramp	5%		Younger <= 24	35%	Driver Avoidance Maneuver	Object in Road	0.01%
	Rail Grade Crossing	0.4%		Middle = 25 to 64	59%	Poor Road Conditions	0.04%	
	Other/Unknown	4%		Older >= 65	6%	Animal in Road	-	
Posted Speed Limit (mph)	<= 20	1%	Corrective Action Attempted	Vehicle in Road	18%	Vehicle in Road	18%	
	25	8%		Non-Motorist in Road	-	Non-Motorist in Road	-	
	30	7%		Hit and Run	6%	Hit and Run	6%	
	35	27%		No Driver Present	-	No Driver Present	-	
	40	13%		Other Avoidance Maneuver	-	Other Avoidance Maneuver	-	
	45	24%		Unknown	59%	Unknown	59%	
	50	5%		None	16%	None	16%	
	>= 55	15%		Phantom Vehicle	0.01%	Phantom Vehicle	0.01%	
Traffic Control Device	No Traffic Controls	45%		No Driver Present	-	No Driver Present	-	
	Traffic Signal	39%		No Avoidance Maneuver	13%	No Avoidance Maneuver	13%	
	Stop/Yield Sign	9%		Braking	16%	Braking	16%	
	Other	7%		Releasing Brakes	-	Releasing Brakes	-	

Driver and vehicle statistics represent the striking light vehicle.

## Left Turn Across Path From Opposite Directions at Signalized Junctions

<i><b>Driving Environment</b></i>			<i><b>Driver</b></i>			<i><b>Vehicle</b></i>		
<b>Lighting</b>	Daylight	24%	<b>Alcohol</b>	Yes	1%	<b>Contributing Factors</b>	Yes	0.1%
	Dark Lighted	8%		No	99%		No	96%
	Dark	58%	<b>Vision Obscured</b>	No Obstruction	87%		Unknown	4%
	Dawn/Dusk	9%		Vision Obscured	1%		Yes	2%
	Clear	91%		Unknown	13%		No	98%
	Adverse	9%	<b>Driver Distracted</b>	Inattention	1%		No Driver Present	-
	Dry	82%		Sleepy	-		Going Straight	94%
	Wet/Slippery	18%		Not Distracted	74%		Decelerating in Traffic Lane	0.4%
	Straight	89%		Unknown	25%		Accelerating in Traffic Lane	0.1%
	Curve	11%	<b>Speeding</b>	Yes	2%		Starting in Traffic Lane	0.1%
	Level	74%		No	97%		Stopped in Traffic Lane	0.3%
	Other	26%		Unknown	1%		Passing Another Vehicle	-
<b>Land Use</b>	Rural	79%	<b>Violation</b>	Speeding	-	<b>Pre-Event Movement</b>	Parked in Travel Lane	-
	Urban	21%		Reckless	0.1%		Leaving a Parked Position	-
<b>Day</b>	Weekday	70%		None	97%		Entering a Parked Position	-
	Weekend	30%		Other	3%		Turning Right	-
<b>Relation to Roadway</b>	On Roadway	90%		Unknown	0.1%		Turning Left	-
	Shoulder/Parking Lane	0.4%	<b>Impairment</b>	Ill/Blackout	-		Making U-turn	-
	Off Roadway	9%		Drowsy	-		Backing Up	-
	Left Turn Lane	-		None	98%		Negotiating a Curve	5%
	Unknown	0.1%		Other	0.3%		Changing Lanes	-
<b>Relation to Junction</b>	Non-Junction	97%	<b>Gender</b>	Unknown	2%		Merging	-
	Intersection	1%		Male	61%		Prior Corrective Action	-
	Intersection-Related	1%		Female	39%		Other	-
	Driveway/Alley	-	<b>Age</b>	Younger <= 24	20%	<b>Driver Avoidance Maneuver</b>	Object in Road	-
	Entrance/Exit Ramp	1%		Middle = 25 to 64	74%		Poor Road Conditions	-
	Rail Grade Crossing	-		Older >= 65	5%		Animal in Road	17%
	Other/Unknown	1%					Vehicle in Road	0.03%
<b>Posted Speed Limit (mph)</b>	<= 20	1%					Non-Motorist in Road	-
	25	5%					Hit and Run	0.3%
	30	2%					No Driver Present	-
	35	8%					Other Avoidance Maneuver	-
	40	4%					Unknown	69%
	45	12%					None	13%
	50	5%					Phantom Vehicle	0.1%
	>= 55	62%					No Driver Present	-
<b>Traffic Control Device</b>	No Traffic Controls	91%				<b>Corrective Action Attempted</b>	No Avoidance Maneuver	8%
	Traffic Signal	1%					Braking	4%
	Stop/Yield Sign	0.02%					Releasing Brakes	-
	Other	8%					Steering	10%

Driver and vehicle statistics represent the light vehicle turning left.

## Vehicle Turning Right at Signalized Junctions

Driving Environment			Driver		Vehicle			
Lighting	Daylight	71%	Alcohol	Yes	5%	Contributing Factors	Yes	1%
	Dark Lighted	24%		No	95%		No	82%
	Dark	3%	Vision Obscured	No Obstruction	60%		Unknown	18%
	Dawn/Dusk	2%		Vision Obscured	5%	Rollover	Yes	-
	Clear	80%		Unknown	34%		No	100%
	Adverse	20%	Driver Distracted	Inattention	16%	Pre-Event Movement	No Driver Present	-
	Dry	73%		Sleepy	0.02%		Going Straight	1%
	Wet/Slippery	27%		Not Distracted	28%		Decelerating in Traffic Lane	-
	Straight	93%		Unknown	56%		Accelerating in Traffic Lane	-
Road Alignment	Curve	7%	Speeding	Yes	8%		Starting in Traffic Lane	2%
	Level	81%		No	83%		Stopped in Traffic Lane	-
Road Profile	Other	19%		Unknown	8%		Passing Another Vehicle	-
	Rural	46%	Violation	Speeding	-		Parked in Travel Lane	-
Land Use	Urban	54%		Reckless	0.03%		Leaving a Parked Position	-
	Weekday	78%		None	53%		Entering a Parked Position	-
Day	Weekend	22%		Other	38%		Turning Right	97%
	On Roadway	99%		Unknown	10%		Turning Left	-
Relation to Roadway	Shoulder/Parking Lane	-	Impairment	Ill/Blackout	0.02%	Driver Avoidance Maneuver	Making U-turn	-
	Off Roadway	-		Drowsy	-		Backing Up	-
	Left Turn Lane	1%		None	89%		Negotiating a Curve	-
	Unknown	-		Other	2%		Changing Lanes	-
	Non-Junction	-		Unknown	9%		Merging	-
Relation to Junction	Intersection	54%	Gender	Male	58%		Prior Corrective Action	-
	Intersection-Related	37%		Female	42%		Other	-
	Driveway/Alley	4%	Age	Younger <= 24	35%		Object in Road	-
	Entrance/Exit Ramp	2%		Middle = 25 to 64	48%		Poor Road Conditions	-
	Rail Grade Crossing	-		Older >= 65	16%		Animal in Road	-
Posted Speed Limit (mph)	Other/Unknown	3%	Corrective Action Attempted	Vehicle in Road	1%		Vehicle in Road	-
	<= 20	1%		Non-Motorist in Road	-		Non-Motorist in Road	-
	25	10%		Hit and Run	12%		Hit and Run	12%
	30	10%		No Driver Present	-		No Driver Present	-
	35	29%		Other Avoidance Maneuver	-		Other Avoidance Maneuver	-
	40	16%		Unknown	69%		Unknown	69%
	45	26%		None	19%		None	19%
	50	4%		Phantom Vehicle	0.01%		Phantom Vehicle	0.01%
Traffic Control Device	>= 55	6%		No Driver Present	-	Corrective Action Attempted	No Driver Present	-
	No Traffic Controls	-		No Avoidance Maneuver	15%		No Avoidance Maneuver	15%
	Traffic Signal	100%		Braking	1%		Braking	1%
	Stop/Yield Sign	-		Releasing Brakes	-		Releasing Brakes	-
	Other	-		Steering	0.03%		Steering	0.03%
				Braked and Steered	1%		Braked and Steered	1%
				Accelerated	-		Accelerated	-
				Accelerated and Steered	-		Accelerated and Steered	-
				Other	-		Other	-
				Unknown	84%		Unknown	84%

Driver and vehicle statistics represent the light vehicle turning right.

## Left Turn Across Path From Opposite Directions at Non-Signalized Junctions

<i><b>Driving Environment</b></i>			<i><b>Driver</b></i>			<i><b>Vehicle</b></i>		
Lighting	Daylight	80%	Alcohol	Yes	3%	Contributing Factors	Yes	0.2%
	Dark Lighted	12%		No	97%		No	95%
Weather	Dark	4%	Vision Obscured	No Obstruction	58%		Unknown	5%
	Dawn/Dusk	3%		Vision Obscured	16%		Yes	1%
	Clear	89%		Unknown	26%		No	99%
Road Surface	Inattention	26%	Driver Distracted	Sleepy	0.01%	Pre-Event Movement	No Driver Present	-
	Not Distracted	33%		Not Distracted	33%		Going Straight	1%
Road Alignment	Unknown	41%		Unknown	41%		Decelerating in Traffic Lane	-
	Straight	93%	Speeding	Yes	1%		Accelerating in Traffic Lane	0.03%
Road Profile	Curve	7%		No	97%		Starting in Traffic Lane	0.2%
	Level	80%		Unknown	2%		Stopped in Traffic Lane	0.1%
Land Use	Passing Another Vehicle	-	Violation	Speeding	0.04%		Passing Another Vehicle	-
	Other	20%		Reckless	0.2%		Parked in Travel Lane	-
Day	Leaving a Parked Position	0.1%		None	46%		Entering a Parked Position	-
	Weekday	83%		Other	51%		Turning Right	0.1%
Relation to Roadway	Unknown	3%		Unknown	3%		Turning Left	98%
	On Roadway	99%	Impairment	Ill/Blackout	0.1%		Making U-turn	0.1%
	Shoulder/Parking Lane	1%		Drowsy	0.01%		Backing Up	-
	Off Roadway	0.1%		None	96%		Negotiating a Curve	0.2%
Relation to Junction	Left Turn Lane	0.1%		Other	2%		Changing Lanes	-
	Unknown	-		Unknown	2%		Merging	0.1%
	Non-Junction	0.3%		Gender	Male	Driver Avoidance Maneuver	Prior Corrective Action	-
	Intersection	56%		Female	44%		Other	0.1%
	Intersection-Related	2%		Age	Younger <= 24		Object in Road	-
Posted Speed Limit (mph)	Driveway/Alley	40%		Middle = 25 to 64	55%		Poor Road Conditions	-
	Entrance/Exit Ramp	0.4%		Older >= 65	15%		Animal in Road	-
	Rail Grade Crossing	-					Vehicle in Road	3%
	Other/Unknown	2%					Non-Motorist in Road	-
	<= 20	2%					Hit and Run	4%
Traffic Control Device	25	11%					No Driver Present	-
	30	11%					Other Avoidance Maneuver	-
	35	32%					Unknown	73%
	40	15%					None	21%
	45	17%					Phantom Vehicle	-
	50	3%				Corrective Action Attempted	No Driver Present	-
	>= 55	9%					No Avoidance Maneuver	19%
Traffic Control Device	No Traffic Controls	80%					Braking	1%
	Traffic Signal	2%					Releasing Brakes	-
	Stop/Yield Sign	10%					Steering	1%
	Other	9%					Braked and Steered	0.01%

Driver and vehicle statistics represent the light vehicle turning left.

## Straight Crossing Paths at Non-Signalized Junctions

Driving Environment			Driver			Vehicle		
Lighting	Daylight	81%	Contributing Factors	Alcohol	Yes	2%	Yes	0.5%
	Dark Lighted	11%		No	98%	No	93%	
	Dark	4%		Vision Obscured	No Obstruction	68%	Unknown	6%
	Dawn/Dusk	3%			Vision Obscured	6%	Yes	1%
	Clear	86%			Unknown	26%	No	99%
	Adverse	14%		Driver Distracted	Inattention	14%	No Driver Present	0.1%
	Dry	79%			Sleepy	0.1%	Going Straight	76%
	Wet/Slippery	21%			Not Distracted	45%	Decelerating in Traffic Lane	1%
	Straight	94%			Unknown	40%	Accelerating in Traffic Lane	0.2%
	Curve	6%		Speeding	Yes	2%	Starting in Traffic Lane	20%
Road Profile	Level	84%			No	96%	Stopped in Traffic Lane	0.5%
	Other	16%			Unknown	2%	Passing Another Vehicle	0.2%
Land Use	Rural	49%	Pre-Event Movement	Violation	Speeding	0.1%	Parked in Travel Lane	0.04%
	Urban	51%			Reckless	0.3%	Leaving a Parked Position	1%
Day	Weekday	77%			None	66%	Entering a Parked Position	0.01%
	Weekend	23%			Other	32%	Turning Right	-
Relation to Roadway	On Roadway	99%			Unknown	2%	Turning Left	0.1%
	Shoulder/Parking Lane	0.2%		Impairment	Ill/Blackout	0.03%	Making U-turn	0.1%
	Off Roadway	1%			Drowsy	0.05%	Backing Up	-
	Left Turn Lane	0.04%			None	96%	Negotiating a Curve	0.3%
	Unknown	-			Other	1%	Changing Lanes	0.1%
Relation to Junction	Non-Junction	0.4%		Gender	Unknown	3%	Merging	0.05%
	Intersection	87%			Male	52%	Prior Corrective Action	0.2%
	Intersection-Related	1%			Female	48%	Other	1%
	Driveway/Alley	10%	Age	Driver Avoidance Maneuver	Younger <= 24	30%	Object in Road	-
	Entrance/Exit Ramp	0.2%			Middle = 25 to 64	60%	Poor Road Conditions	-
	Rail Grade Crossing	0.1%			Older >= 65	11%	Animal in Road	-
Posted Speed Limit (mph)	Other/Unknown	0.2%	Corrective Action Attempted	Vehicle in Road	Vehicle in Road	9%	Vehicle in Road	9%
	<= 20	3%			Non-Motorist in Road	-	Non-Motorist in Road	-
	25	27%			Hit and Run	3%	Hit and Run	3%
	30	16%			No Driver Present	0.1%	No Driver Present	0.1%
	35	25%			Other Avoidance Maneuver	-	Other Avoidance Maneuver	-
	40	7%			Unknown	70%	Unknown	70%
	45	11%			None	19%	None	19%
	50	3%			Phantom Vehicle	0.05%	Phantom Vehicle	0.05%
Traffic Control Device	>= 55	9%		Driver Avoidance Maneuver	No Driver Present	0.1%	No Driver Present	0.1%
	No Traffic Controls	17%			No Avoidance Maneuver	15%	No Avoidance Maneuver	15%
	Traffic Signal	3%			Braking	5%	Braking	5%
	Stop/Yield Sign	77%			Releasing Brakes	-	Releasing Brakes	-
	Other	3%			Steering	2%	Steering	2%

Driver and vehicle statistics represent all light vehicles involved.

## Vehicle(s) Turning at Non-Signalized Junctions

Driving Environment			Driver		Vehicle					
Lighting	Daylight	79%	Alcohol	Yes	2%	Contributing Factors	Yes	0.1%		
	Dark Lighted	12%		No	98%		No	92%		
	Dark	5%	Vision Obscured	No Obstruction	62%		Unknown	8%		
	Dawn/Dusk	4%		Vision Obscured	12%		Rollover	Yes	0.3%	
	Clear	87%		Unknown	26%			No	100%	
	Adverse	13%	Driver Distracted	Inattention	26%		Pre-Event Movement	No Driver Present	0.02%	
	Dry	81%		Sleepy	-			Going Straight	1%	
	Wet/Slippery	19%		Not Distracted	31%			Decelerating in Traffic Lane	0.02%	
	Straight	93%		Unknown	43%			Accelerating in Traffic Lane	0.03%	
	Curve	7%	Speeding	Yes	2%			Starting in Traffic Lane	1%	
	Level	80%		No	95%			Stopped in Traffic Lane	0.1%	
	Other	20%		Unknown	3%			Passing Another Vehicle	-	
Land Use	Rural	51%	Violation	Speeding	0.2%		Impairment	Parked in Travel Lane	-	
	Urban	49%		Reckless	0.3%			Leaving a Parked Position	-	
Day	Weekday	80%		None	48%			Entering a Parked Position	-	
	Weekend	20%		Other	48%			Turning Right	22%	
Relation to Roadway	On Roadway	97%		Unknown	4%			Turning Left	74%	
	Shoulder/Parking Lane	0.2%		Ill/Blackout	0.1%			Making U-turn	0.5%	
	Off Roadway	2%		Drowsy	0.03%			Backing Up	-	
	Left Turn Lane	1%		None	95%			Negotiating a Curve	0.1%	
	Unknown	0.04%		Other	1%			Changing Lanes	0.03%	
Relation to Junction	Non-Junction	1%		Unknown	3%			Merging	-	
	Intersection	47%	Gender	Male	53%			Prior Corrective Action	0.3%	
	Intersection-Related	9%		Female	47%			Other	0.1%	
	Driveway/Alley	40%	Age	Younger <= 24	35%	Driver Avoidance Maneuver	Object in Road	-		
	Entrance/Exit Ramp	1%		Middle = 25 to 64	52%		Poor Road Conditions	-		
	Rail Grade Crossing	0.03%		Older >= 65	12%		Animal in Road	-		
	Other/Unknown	1%		Vehicle in Road	3%					
Posted Speed Limit (mph)	<= 20	3%		Non-Motorist in Road	-					
	25	15%		Hit and Run	5%					
	30	9%		No Driver Present	0.02%					
	35	28%		Other Avoidance Maneuver	-					
	40	13%		Unknown	68%					
	45	19%		None	23%					
	50	4%		Phantom Vehicle	0.1%					
	>= 55	9%								
Traffic Control Device	No Traffic Controls	47%	Corrective Action Attempted	No Driver Present				No Driver Present	0.02%	
	Traffic Signal	1%		No Avoidance Maneuver				No Avoidance Maneuver	20%	
	Stop/Yield Sign	46%		Braking				Braking	1%	
	Other	6%		Releasing Brakes				Releasing Brakes	0.1%	

Driver and vehicle statistics represent all turning light vehicles involved.

## Vehicle Taking Evasive Action With Prior Vehicle Maneuver

Driving Environment			Driver		Vehicle			
Lighting	Daylight	66%	Alcohol	Yes	4%	Contributing Factors	Yes	0.1%
	Dark Lighted	24%		No	96%		No	95%
	Dark	6%	Vision Obscured	No Obstruction	61%		Unknown	5%
	Dawn/Dusk	3%		Vision Obscured	2%		Yes	1%
	Clear	86%		Unknown	37%		No	99%
	Adverse	14%	Driver Distracted	Inattention	12%		No Driver Present	1%
	Dry	77%		Sleepy	-		Going Straight	19%
	Wet/Slippery	23%		Not Distracted	41%		Decelerating in Traffic Lane	3%
	Straight	86%		Unknown	47%		Accelerating in Traffic Lane	-
Road Alignment	Curve	14%	Speeding	Yes	7%		Starting in Traffic Lane	1%
	Level	85%		No	91%		Stopped in Traffic Lane	1%
Road Profile	Other	15%		Unknown	1%		Passing Another Vehicle	4%
Land Use	Rural	30%	Violation	Speeding	-	Pre-Event Movement	Parked in Travel Lane	-
	Urban	70%		Reckless	1%		Leaving a Parked Position	4%
Day	Weekday	68%		None	75%		Entering a Parked Position	-
	Weekend	32%		Other	19%		Turning Right	5%
Relation to Roadway	On Roadway	66%		Unknown	5%		Turning Left	10%
	Shoulder/Parking Lane	4%	Impairment	Ill/Blackout	-		Making U-turn	1%
	Off Roadway	28%		Drowsy	-		Backing Up	7%
	Left Turn Lane	-		None	95%		Negotiating a Curve	-
	Unknown	2%		Other	0.3%		Changing Lanes	4%
Relation to Junction	Non-Junction	34%	Gender	Unknown	5%		Merging	2%
	Intersection	7%		Male	68%		Prior Corrective Action	9%
	Intersection-Related	34%		Female	32%		Other	29%
	Driveway/Alley	11%	Age	Younger <= 24	32%	Driver Avoidance Maneuver	Object in Road	-
	Entrance/Exit Ramp	8%		Middle = 25 to 64	60%		Poor Road Conditions	-
	Rail Grade Crossing	-		Older >= 65	8%		Animal in Road	-
	Other/Unknown	7%					Vehicle in Road	25%
Posted Speed Limit (mph)	<= 20	6%					Non-Motorist in Road	-
	25	10%					Hit and Run	5%
	30	7%					No Driver Present	1%
	35	28%					Other Avoidance Maneuver	-
	40	7%					Unknown	52%
	45	21%					None	14%
	50	6%					Phantom Vehicle	3%
	>= 55	14%					No Driver Present	1%
Traffic Control Device	No Traffic Controls	58%	Corrective Action Attempted	No Avoidance Maneuver	12%		No Avoidance Maneuver	12%
	Traffic Signal	25%		Braking	5%		Braking	5%
	Stop/Yield Sign	10%		Releasing Brakes	-		Releasing Brakes	-
	Other	7%		Steering	21%		Steering	21%

Driver and vehicle statistics represent all light vehicles involved.

## Vehicle Taking Evasive Action Without Prior Vehicle Maneuver

Driving Environment			Driver		Vehicle	
Lighting	Daylight	72%	Alcohol	Yes	3%	Contributing Factors
	Dark Lighted	17%		No	97%	
	Dark	8%	Vision Obscured	No Obstruction	70%	
	Dawn/Dusk	3%		Vision Obscured	4%	
	Clear	86%		Unknown	26%	
	Adverse	14%	Driver Distracted	Inattention	14%	
	Dry	78%		Sleepy	-	
	Wet/Slippery	22%		Not Distracted	44%	
	Straight	86%		Unknown	42%	
Road Alignment	Curve	14%	Speeding	Yes	6%	Pre-Event Movement
	Level	77%		No	90%	
	Other	23%		Unknown	4%	
Land Use	Rural	44%	Violation	Speeding	-	
	Urban	56%		Reckless	1%	
Day	Weekday	78%		None	69%	
	Weekend	22%		Other	25%	
Relation to Roadway	On Roadway	65%		Unknown	5%	
	Shoulder/Parking Lane	3%	Impairment	Ill/Blackout	0.02%	
	Off Roadway	31%		Drowsy	-	
	Left Turn Lane	0.005%		None	94%	
	Unknown	0%		Other	2%	
Relation to Junction	Non-Junction	45%	Gender	Unknown	5%	Driver Avoidance Maneuver
	Intersection	14%		Male	58%	
	Intersection-Related	13%		Female	42%	
	Driveway/Alley	17%	Age	Younger <= 24	33%	
	Entrance/Exit Ramp	1%		Middle = 25 to 64	59%	
	Rail Grade Crossing	-		Older >= 65	8%	
Posted Speed Limit (mph)	Other/Unknown	9%	Corrective Action Attempted	No Driver Present	1%	Corrective Action Attempted
	<= 20	3%		No Avoidance Maneuver	7%	
	25	12%		Braking	5%	
	30	9%		Releasing Brakes	-	
	35	25%		Steering	18%	
	40	11%		Braked and Steered	2%	
	45	17%		Accelerated	-	
	50	3%		Accelerated and Steered	0.3%	
	>= 55	20%		Other	1%	
Traffic Control Device	No Traffic Controls	70%		Unknown	66%	
	Traffic Signal	15%				
	Stop/Yield Sign	9%				
	Other	6%				

Driver and vehicle statistics represent all light vehicles involved.

## Non-Collision Incident

Driving Environment			Driver			Vehicle	
Lighting	Daylight	80%	Alcohol	Yes	3%	Contributing Factors	Yes 42%
	Dark Lighted	6%		No	97%		No 48%
	Dark	12%		Vision Obscured	No Obstruction 77%		Unknown 10%
	Dawn/Dusk	2%			Vision Obscured 0.2%		
Weather	Clear	94%	Driver Distracted	Unknown	23%	Rollover	Yes 1%
	Adverse	6%		Inattention	4%		No 99%
Road Surface	Dry	89%		Sleepy	-	Pre-Event Movement	
Road Alignment	Wet/Slippery	11%		Not Distracted	55%	No Driver Present	
Road Profile	Straight	89%	Speeding	Unknown	41%	Going Straight	
Land Use	Curve	11%		Yes	4%	Decelerating in Traffic Lane	
	Level	74%		No	87%	Accelerating in Traffic Lane	
Relation to Roadway	Other	26%		Unknown	9%	Starting in Traffic Lane	
	Rural	63%	Violation	Speeding	0.1%	0.1%	
Day	Urban	37%		Reckless	0.04%	Stopped in Traffic Lane	
	Weekday	75%		None	69%	1%	
Relation to Junction	Weekend	25%		Other	25%	Passing Another Vehicle	
	On Roadway	90%		Unknown	6%	0.1%	
	Shoulder/Parking Lane	4%	Impairment	Ill/Blackout	-	Parked in Travel Lane	
	Off Roadway	6%		Drowsy	-	Leaving a Parked Position	
Posted Speed Limit (mph)	Left Turn Lane	-		None	95%	Entering a Parked Position	
	Unknown	0.4%		Other	2%	-	
	Non-Junction	89%		Unknown	4%	Turning Right	
	Intersection	1%	Gender	Male	70%	2%	
Traffic Control Device	Intersection-Related	6%		Female	30%	Turning Left	
	Driveway/Alley	1%		Younger <= 24	24%	Making U-turn	
	Entrance/Exit Ramp	2%		Middle = 25 to 64	72%	Backing Up	
	Rail Grade Crossing	-		Older >= 65	4%	Negotiating a Curve	
	Other/Unknown	0.1%					Changing Lanes 1%
Posted Speed Limit (mph)	<= 20	1%					Merging 0.1%
	25	6%					Prior Corrective Action -
	30	4%					Other 2%
	35	10%					Object in Road 2%
	40	2%					Poor Road Conditions -
	45	10%					Animal in Road -
	50	4%					Vehicle in Road 0.04%
Traffic Control Device	>= 55	63%					Non-Motorist in Road -
	No Traffic Controls	84%					Hit and Run 5%
	Traffic Signal	5%					No Driver Present -
	Stop/Yield Sign	2%					Other Avoidance Maneuver 0.01%
	Other	9%					Unknown 24%

## Vehicle Contacting Object With Prior Vehicle Maneuver

Driving Environment			Driver			Vehicle		
Lighting	Daylight	46%	Alcohol	Yes	21%	Contributing Factors	Yes	0.5%
	Dark Lighted	34%		No	79%		No	25%
	Dark	16%		No Obstruction	19%		Unknown	74%
	Dawn/Dusk	4%	Vision Obscured	Vision Obscured	1%	Rollover	Yes	1%
	Weather	Clear		Unknown	80%		No	99%
	Adverse	13%	Driver Distracted	Inattention	4%		No Driver Present	-
	Road Surface	Dry		Sleepy	-		Going Straight	-
	Wet/Slippery	36%		Not Distracted	6%		Decelerating in Traffic Lane	-
	Road Alignment	Straight		Unknown	90%		Accelerating in Traffic Lane	-
Road Profile	Curve	11%	Speeding	Yes	7%	Pre-Event Movement	Starting in Traffic Lane	-
	Level	82%		No	26%		Stopped in Traffic Lane	-
	Other	18%		Unknown	67%		Passing Another Vehicle	8%
Land Use	Rural	34%	Violation	Speeding	-		Parked in Travel Lane	-
	Urban	66%		Reckless	1%		Leaving a Parked Position	20%
Day	Weekday	65%		None	21%		Entering a Parked Position	6%
	Weekend	35%		Other	14%		Turning Right	9%
Relation to Roadway	On Roadway	3%		Unknown	65%		Turning Left	3%
	Shoulder/Parking Lane	64%	Impairment	Ill/Blackout	-		Making U-turn	5%
	Off Roadway	30%		Drowsy	-		Backing Up	2%
	Left Turn Lane	-		None	63%		Negotiating a Curve	-
	Unknown	4%		Other	6%		Changing Lanes	1%
Relation to Junction	Non-Junction	70%	Gender	Unknown	32%	Driver Avoidance Maneuver	Merging	0.4%
	Intersection	1%		Male	62%		Prior Corrective Action	1%
	Intersection-Related	13%		Female	38%		Other	46%
	Driveway/Alley	9%	Age	Younger <= 24	71%		Object in Road	1%
	Entrance/Exit Ramp	1%		Middle = 25 to 64	29%		Poor Road Conditions	-
	Rail Grade Crossing	0.02%		Older >= 65	0.1%		Animal in Road	-
	Other/Unknown	6%		Unknown	32%		Vehicle in Road	1%
Posted Speed Limit (mph)	<= 20	8%	Corrective Action Attempted	Non-Motorist in Road	-		Non-Motorist in Road	-
	25	39%		Hit and Run	75%		Hit and Run	75%
	30	13%		No Driver Present	-		No Driver Present	-
	35	16%		Other Avoidance Maneuver	1%		Other Avoidance Maneuver	1%
	40	3%		Unknown	18%		Unknown	18%
	45	5%		None	3%		None	3%
	50	4%		Phantom Vehicle	0.5%		Phantom Vehicle	0.5%
	>= 55	11%		No Driver Present	-		No Driver Present	-
Traffic Control Device	No Traffic Controls	82%		No Avoidance Maneuver	2%		No Avoidance Maneuver	2%
	Traffic Signal	4%		Braking	0.3%		Braking	0.3%
	Stop/Yield Sign	1%		Releasing Brakes	-		Releasing Brakes	-
	Other	14%		Steering	2%		Steering	2%

## Vehicle Contacting Object Without Prior Vehicle Maneuver

Driving Environment			Driver			Vehicle		
Lighting	Daylight	49%	Alcohol	Yes	11%	Contributing Factors	Yes	1%
	Dark Lighted	17%		No	89%		No	80%
	Dark	29%	Vision Obscured	No Obstruction	62%		Unknown	19%
	Dawn/Dusk	5%		Vision Obscured	4%		Rollover	Yes 5%
Weather	Clear	86%		Unknown	34%		No	95%
	Adverse	14%	Driver Distracted	Inattention	13%	Pre-Event Movement	No Driver Present	-
Road Surface	Dry	77%		Sleepy	2%		Going Straight	90%
	Wet/Slippery	23%		Not Distracted	40%		Decelerating in Traffic Lane	0.4%
Road Alignment	Straight	82%		Unknown	45%		Accelerating in Traffic Lane	0.01%
	Curve	18%	Speeding	Yes	10%		Starting in Traffic Lane	1%
Road Profile	Level	74%		No	72%		Stopped in Traffic Lane	1%
	Other	26%		Unknown	18%		Passing Another Vehicle	-
Land Use	Rural	53%	Violation	Speeding	0.4%		Parked in Travel Lane	-
	Urban	47%		Reckless	0.5%		Leaving a Parked Position	-
Day	Weekday	69%		None	68%		Entering a Parked Position	-
	Weekend	31%		Other	14%		Turning Right	-
Relation to Roadway	On Roadway	54%		Unknown	17%		Turning Left	-
	Shoulder/Parking Lane	14%	Impairment	Impaired	-		Making U-turn	-
	Off Roadway	30%		Drowsy	2%		Backing Up	-
	Left Turn Lane	-		None	81%		Negotiating a Curve	8%
Relation to Junction	Unknown	2%		Other	2%		Changing Lanes	-
	Non-Junction	86%		Unknown	14%		Merging	-
	Intersection	2%	Gender	Male	59%		Prior Corrective Action	-
	Intersection-Related	4%		Female	41%		Other	-
Posted Speed Limit (mph)	Driveway/Alley	0.3%	Age	Younger <= 24	36%	Driver Avoidance Maneuver	Object in Road	8%
	Entrance/Exit Ramp	3%		Middle = 25 to 64	57%		Poor Road Conditions	0.4%
	Rail Grade Crossing	4%		Older >= 65	7%		Animal in Road	0.2%
	Other/Unknown	2%	Corrective Action Attempted	Vehicle in Road	-		Vehicle in Road	1%
	<= 20	2%		Non-Motorist in Road	-		Non-Motorist in Road	-
	25	16%		Hit and Run	20%		Hit and Run	20%
	30	9%		No Driver Present	-		No Driver Present	-
	35	13%		Other Avoidance Maneuver	0.2%		Other Avoidance Maneuver	0.2%
	40	4%		Unknown	46%		Unknown	46%
	45	12%		None	24%		None	24%
	50	3%		Phantom Vehicle	0.4%		Phantom Vehicle	0.4%
Traffic Control Device	>= 55	41%	Corrective Action Attempted	No Driver Present	-	Corrective Action Attempted	No Driver Present	-
	No Traffic Controls	82%		No Avoidance Maneuver	16%		No Avoidance Maneuver	16%
	Traffic Signal	2%		Braking	2%		Braking	2%
	Stop/Yield Sign	1%		Releasing Brakes	-		Releasing Brakes	-
	Other	15%		Steering	7%		Steering	7%
				Braked and Steered	0.2%		Braked and Steered	0.2%
				Accelerated	-		Accelerated	-
				Accelerated and Steered	-		Accelerated and Steered	-
				Other	1%		Other	1%
				Unknown	75%		Unknown	75%

## Other

### *Driving Environment                      Driver                      Vehicle*

<b>Lighting</b>	Daylight	67%	<b>Alcohol</b>	Yes	4%	<b>Contributing Factors</b>	Yes	2%
	Dark Lighted	17%		No	96%		No	84%
	Dark	13%	<b>Vision Obscured</b>	No Obstruction	53%		Unknown	14%
	Dawn/Dusk	3%		Vision Obscured	1%		Yes	6%
<b>Weather</b>	Clear	89%		Unknown	46%		No	94%
	Adverse	11%	<b>Driver Distracted</b>	Inattention	11%	<b>Pre-Event Movement</b>	No Driver Present	11%
<b>Road Surface</b>	Dry	75%		Sleepy	1%		Going Straight	28%
	Wet/Slippery	25%		Not Distracted	36%		Decelerating in Traffic Lane	0.01%
<b>Road Alignment</b>	Straight	86%		Unknown	53%		Accelerating in Traffic Lane	-
	Curve	14%	<b>Speeding</b>	Yes	3%		Starting in Traffic Lane	0.4%
<b>Road Profile</b>	Level	72%		No	89%		Stopped in Traffic Lane	4%
	Other	28%		Unknown	8%		Passing Another Vehicle	2%
<b>Land Use</b>	Rural	43%	<b>Violation</b>	Speeding	-		Parked in Travel Lane	0.01%
	Urban	57%		Reckless	0.2%		Leaving a Parked Position	7%
<b>Day</b>	Weekday	69%		None	64%		Entering a Parked Position	0.4%
	Weekend	31%		Other	19%		Turning Right	3%
<b>Relation to Roadway</b>	On Roadway	81%		Unknown	17%		Turning Left	6%
	Shoulder/Parking Lane	7%	<b>Impairment</b>	Ill/Blackout	-		Making U-turn	14%
	Off Roadway	9%		Drowsy	1%		Backing Up	8%
	Left Turn Lane	1%		None	88%		Negotiating a Curve	1%
	Unknown	3%		Other	1%		Changing Lanes	1%
<b>Relation to Junction</b>	Non-Junction	41%	<b>Gender</b>	Unknown	9%	<b>Driver Avoidance Maneuver</b>	Merging	0.4%
	Intersection	16%		Male	59%		Prior Corrective Action	-
	Intersection-Related	15%		Female	41%		Other	14%
	Driveway/Alley	18%	<b>Age</b>	Younger <= 24	30%		Object in Road	0.2%
	Entrance/Exit Ramp	1%		Middle = 25 to 64	62%		Poor Road Conditions	-
	Rail Grade Crossing	0.4%		Older >= 65	8%		Animal in Road	-
	Other/Unknown	8%					Vehicle in Road	4%
<b>Posted Speed Limit (mph)</b>	<= 20	9%					Non-Motorist in Road	-
	25	24%					Hit and Run	8%
	30	9%					No Driver Present	11%
	35	20%					Other Avoidance Maneuver	0.1%
	40	6%					Unknown	58%
	45	12%					None	18%
	50	4%					Phantom Vehicle	-
<b>Traffic Control Device</b>	>= 55	16%	<b>Corrective Action Attempted</b>			<b>Corrective Action Attempted</b>	No Driver Present	11%
	No Traffic Controls	64%					No Avoidance Maneuver	15%
	Traffic Signal	17%					Braking	1%
	Stop/Yield Sign	5%					Releasing Brakes	-
	Other	14%					Steering	3%

Driver and vehicle statistics represent all light vehicles involved.



**DOT HS 810 767**  
**April 2007**



U.S. Department  
of Transportation

**National Highway  
Traffic Safety  
Administration**



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