Critical Reasons for Crashes Investigated in the National Motor Vehicle Crash Causation Survey

Summary
The National Motor Vehicle Crash Causation Survey (NMVCCS), conducted from 2005 to 2007, was aimed at collecting on-scene information about the events and associated factors leading up to crashes involving light vehicles. Several facets of crash occurrence were investigated during data collection, namely the pre-crash movement, critical pre-crash event, critical reason, and the associated factors. A weighted sample of 5,470 crashes was investigated over a period of two and a half years, which represents an estimated 2,189,000 crashes nationwide. About 4,031,000 vehicles, 3,945,000 drivers, and 1,982,000 passengers were estimated to have been involved in these crashes. The critical reason, which is the last event in the crash causal chain, was assigned to the driver in 94 percent (±2.2%) of the crashes. In about 2 percent (±0.7%) of the crashes, the critical reason was assigned to a vehicle component’s failure or degradation, and in 2 percent (±1.3%) of crashes, it was attributed to the environment (slick roads, weather, etc.). Among an estimated 2,046,000 drivers who were assigned critical reasons, recognition errors accounted for about 41 percent (±2.1%), decision errors 33 percent (±3.7%), and performance errors 11 percent (±2.7%) of the crashes.

Introduction
Databases such as the National Automotive Sampling System (NASS) Crashworthiness Data System (CDS) do not provide information on pre-crash scenarios and the reason underlying the critical pre-crash events. In 2005, the National Highway Traffic Safety Administration (NHTSA) was authorized under Section 2003(c) of the Safe, Accountable, Flexible, Efficient, Transportation Equity Act: A Legacy for Users (SAFETEA-LU) to conduct a national survey to collect on-scene data pertaining to events and associated factors that possibly contributed to crash occurrence. NHTSA’s National Center for Statistics and Analysis (NCSA) conducted NMVCCS from July 3, 2005, to December 31, 2007. Crashes were investigated at the crash scene to collect driver, vehicle, and environment-related information pertaining to crash occurrence, with a focus on driver’s role. The targeted information was captured mainly through four data elements: (i) movement prior to critical pre-crash event (i.e., the movement of the vehicle immediately before the occurrence of the critical event); (ii) critical pre-crash event (i.e., the circumstance that led to vehicle’s first impact); (iii) critical reason for the critical pre-crash event (i.e., the immediate reason for the critical event, which is often the last failure in the causal chain of events leading up to the crash); and (iv) the crash-associated factors (i.e., the factors that are likely to add to the probability of crash occurrence). This was done with reference to the crash envelope that comprises of a sequence of events, referring to the above data elements, which eventually led to the crash.

This Crash•Stats presents some statistics related to one of the four data elements, namely “critical reason for the critical pre-crash event.” The data obtained through the sample of 5,470 NMVCCS crashes and the weights associated with them were used to obtain national estimates of frequencies and percentages along with their 95-percent confidence limits, as presented in the following sections.

Critical Reasons for the Critical Pre-Crash Event
The critical reason is the immediate reason for the critical pre-crash event and is often the last failure in the causal chain of events leading up to the crash. Although the critical reason is an important part of the description of events leading up to the crash, it is not intended to be interpreted as the cause of the crash nor as the assignment of the fault to the driver, vehicle, or environment.

A critical reason can be assigned to a driver, vehicle, or environment. Normally, one critical reason was assigned per crash, based upon NMVCCS researcher’s crash assessment. The critical reason was assigned to the driver in an estimated 94 percent (±2.2%) of the crashes (Table 1). In addition, the critical reason was assigned to the vehicle in an estimated 2 percent (±0.7%) and to the environment in about 2 percent (±1.3%) of the crashes.

Table 1. Driver-, Vehicle-, and Environment-Related Critical Reasons

<table>
<thead>
<tr>
<th>Critical Reason Attributed to</th>
<th>Estimated</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
</tr>
<tr>
<td>Drivers</td>
<td>2,046,000</td>
</tr>
<tr>
<td>Vehicles</td>
<td>44,000</td>
</tr>
<tr>
<td>Environment</td>
<td>52,000</td>
</tr>
<tr>
<td>Unknown Critical Reasons</td>
<td>47,000</td>
</tr>
<tr>
<td>Total</td>
<td>2,189,000</td>
</tr>
</tbody>
</table>

*Percentages are based on unrounded estimated frequencies (Data Source: NMVCCS 2005–2007)

The critical reasons related statistics are presented in detail in Table 2 for drivers, Table 3 for vehicles, and Table 4 for environment.

Critical reason attributed to drivers
The critical reason was assigned to drivers in an estimated 2,046,000 crashes that comprise 94 percent of the NMVCCS crashes at the national level. However, in none of these cases was the assignment intended to blame the driver for causing the crash. The driver-
Critical reason attributed to vehicles

The critical reason was assigned to vehicles in an estimated 44,000 crashes comprising about 2 percent of the NMVCCS crashes, though none of these reasons implied a vehicle causing the crash. There were no detailed inspections of vehicles during the NMVCCS on-scene crash investigation; the vehicle-related critical reasons were mainly inferred through external visual inspection of the vehicle components. This resulted in only mostly external, easily visible factors (tires, brakes, steering column, etc.) that were cited as the few vehicle-related critical reasons. The related statistics may not, therefore, be representative of the role of other internal vehicle related problems that might have led to the crash. Of the small percentage (2%) of the crashes in which the critical reason was assigned to the vehicle, the tire problem accounted for about 35 percent (±11.4%) of the crashes. Brake related problems as critical reasons accounted for about 22 percent (±15.4%) of such crashes. Steering/suspension/transmission/engine-related problems were assigned as critical reasons in 3 percent (±3.3%) of such crashes. Other vehicle-related problems coded as critical reasons were assigned in about 40 percent (±24.0%) of such crashes.

Critical reason attributed to environment

The critical reason was assigned to about 2 percent of the estimated 2,189,000 NMVCCS crashes. However, none of these is suggestive of the cause of the crash. Table 4 presents statistics related to crashes in which the critical reason was attributed to roadway and atmospheric conditions. In about 50 percent (±14.5%) of the 52,000 crashes the critical reason was attributed to slick roads. Glare as a critical reason accounted for about 17 percent (±16.7%) of the environment-related crashes, and view obstruction was assigned in 11 percent (±7.2%) of the crashes. Signs and signals accounted for 3 percent (±2.5%) of such crashes. In addition, in 52,000 of the crashes with a critical reason attributed to the environment, the weather condition (fog/rain/snow) was cited in 4 percent (±2.9%) of the crashes.

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