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Crash • Stats

NHTSA

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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 for the critical pre-crash event, and the associated factors. In each investigated crash, these were assigned to driver, vehicle, or environment without suggesting that any of these was cause of the crash or assignment of fault to driver, vehicle, or other crash element. A sample of 5,470 NMVCCS-qualified crashes (i.e., the crashes meeting certain criteria listed in the section: Scope and Limitations of NMVCCS data) 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 reasons 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 the 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. Refer to the section Scope and Limitations of NMVCCS data.

This Crash•Stats presents some statistics related to one of the above-mentioned 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 without suggesting the cause of the crash or assignment of fault. The critical reason was assigned to the driver in an esti-

† 95% conf. limits: $\pm t_{\alpha/2;\,\text{deg. freedom}} \times$ Std. Dev. ($\alpha = 0.05$, t-value = 2.179)

mated 94 percent (±2.2%) of the NMVCCS-qualified 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

Critical Reason Attributed to	Estimated	
	Number	Percentage* ± 95% conf. limits
Drivers	2,046,000	94% ±2.2%
Vehicles	44,000	2% ±0.7%
Environment	52,000	2% ±1.3%
Unknown Critical Reasons	47,000	2% ±1.4%
Total	2,189,000	100%

*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 crashes was the assignment intended to blame the driver for causing the crash. The driver-related critical reasons are broadly classified into recognition errors, decision errors, performance errors, and non-performance errors. Statistics in Table 2 show that the recognition error, which included driver's inattention, internal and external distractions, and inadequate surveillance, was the most frequently assigned (41% ±2.2%) critical reason. Decision errors such as driving too fast for conditions, too fast for the curve, false assumption of others' actions, illegal maneuver and misjudgment of gap or others' speed accounted for about 33 percent (±3.7%) of the crashes. In about 11 percent (±2.7%) of the crashes, the critical reason was performance error such as overcompensation, poor directional control, etc. Sleep was the most common critical reason among non-performance errors that accounted for 7 percent (±1.0%) of the crashes. Other driver errors were recorded as critical reasons for about 8 percent (±1.9%) of the drivers.

Table 2. Driver-Related Critical Reasons

Critical Reason	Estimated (Based on 94% of the NMVCCS crashes)	
	Number	Percentage* ± 95% conf. limits
Recognition Error	845,000	41% ±2.2%
Decision Error	684,000	33% ±3.7%
Performance Error	210,000	11% ±2.7%
Non-Performance Error (sleep, etc.)	145,000	7% ±1.0%
Other	162,000	8% ±1.9%
Total	2,046,000	100%

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

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 were assigned as critical reason in about 40 percent (±24.0%) percent of such crashes.

Table 3. Vehicle-Related Critical Reasons

Critical Reason	Estimated (Based on 2% of the NMVCCS crashes)	
	Number	Percentage* ± 95% conf. limits
Tires /wheels-related	15,000	35% ± 11.4%
Brakes-related	10,000	22% ± 15.4%
Steering/suspension/transmission/ engine-related	2,000	3% ± 3.3%
Other/unknown vehicle-related problems	17,000	40% ± 24.0%
Total	44,000	100%

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

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.

Table 4. Environment-Related Critical Reasons

Critical Reason	Estimated (Based on 2% of the NMVCCS crashes)	
	Number	Percentage* ± 95% conf. limits
Slick roads (ice, loose debris, etc.)	26,000	50% ±14.5%
Glare	9,000	17% ±16.7%
View obstructions	6,000	11% ±7.2%
Other highway-related condition	5,000	9% (0, 9.9)††%
Fog/rain/snow	2,000	4% ±2.9%
Other weather-related condition	2,000	4% (0.0, 9.1)††%
Signs/signals	1,000	3% ± 2.5%
Road design	1,000	1% (0, 3.3)††%
Total	52,000	100%

*Percentages are based on unrounded estimated frequencies
††Conf. limits with lower limit 0
(Data Source: NMVCCS 2005–2007)

Scope and Limitations of NMVCS Data

NMVCCS data is restricted to crashes that occurred from 6 a.m. to midnight. In addition, the following criteria must be met by a crash to qualify for an on-scene investigation (NMVCCS-qualified crash):

- The crash must have resulted in a harmful event associated with a vehicle in transport on a trafficway.
- EMS must have been dispatched to the crash scene.
- At least one of the first three crash-involved vehicles must be present at the crash scene when the NMVCCS researcher arrives.
- The police must be present at the scene of the crash when the NMVCCS researcher arrives.
- At least one of the first three vehicles involved in the crash must be a light passenger vehicle that was towed or will be towed due to damage.
- A completed police accident report for this crash must be available.

It is important to note that the pre-crash assessment of crashes in terms of the critical event, critical reasons, and associated factors is neither suggestive of the cause of the crash nor of a fault to the driver, vehicle, or environment. Therefore, care needs to be taken in interpreting the results of the exploratory and descriptive analyses of the data or of the clinical investigation. Since NMVCCS only collects data on crashes that meet the above-mentioned criteria, the estimates based on NMVCCS data should not be compared with those from other databases such as NHTSA's General Estimates System (GES) or the NASS-CDS.

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State auto inspections are worthless and corrupt. It is a waste of resources from actions that would actually improve auto safety. Per the attached extensive study by NHTSA 96% of auto accidents are due to the driver, 2% due to weather, 2% unknown cause, and 2% due to the vehicle condition. In 2020, the most recent data is publicly available, 39% of all traffic fatalities the primary cause was alcohol. 29% due to excessive speed, 13% were unhelmeted motorcyclist. Per NHTSA 2% of the 164 fatalities would be from the vehicle condition. Why are we wasted our time and money with vehicle safety inspections? 35 other states have done away with them and Maine should as well. Safety inspections are nothing more than an opportunity to be taken advantage of by auto shops.