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Abstract for Review

Examination of Factors Associated with Fault Status in Multi-Vehicle Conflicts Using the SHRP2 Data

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Problem
Multi-vehicle crashes accounted for more than 14,000 fatalities in 2014, which represents over 40 percent of all traffic fatalities in the United States (*1*). In the majority of such collisions, one or both of the crash-involved drivers is found to have been at-fault for causing the collision. Prior research has shown that drivers were the critical factor in 93% of crashes (*2*). Among all types of errors, recognition error (e.g. driver's inattention, inadequate surveillance) was found to be the leading error type. The purpose of this study is to further research into those drivers that are associated with fault status.

Method
The Naturalistic Driving Study (NDS) data collected as a part of the second Strategic Highway Research Program (SHRP2) provides a comprehensive database with unparalleled detail regarding event information, as well as detailed participant information and trip data. The fidelity of these data have the potential to overcome some of the typical methodological limitations involved in assessing fault status.

The event subset of the NDS data includes a fault variable, which indicates whether the subject driver committed a leading error that contributed to the conflict. For the purpose of this study, a binary variable was introduced whose value is one if the subject driver (i.e. the NDS participant) was at fault and zero otherwise. Logistic regression models were developed to examine the research question. A variety of questionnaires were given to the participants that captured more detailed information as to the participants' behavior and characteristics. These questionnaires were the primary focus of this study. This allowed for an assessment of how the fault status assigned to the subject driver varies across drivers who exhibited different types of driving behaviors and risk profiles.

One concern that arises within the context of this study is the anticipated correlation between different events or conflicts associated with one single driver. For example, certain drivers may intrinsically be more or less likely to be at-fault during conflicts as compared to other similar drivers. To capture such correlations random effect binary logistic regression models were utilized to examine the likelihood of being involved in an at-fault crash.

Results

A series of logistic regression models were developed to examine the effect of different driver behaviors and attributes on the likelihood of being involved in a multi-vehicle conflict as an at-fault driver. Several sleep habits and risk perception factors were found to be associated with fault status. However, strong correlation was observed between the responses to various questions for individual drivers. The correlation among the risk perception questionnaire suggests that drivers fall into two general categories: (1) risk averse drivers who perceive various types of driving behaviors to be aggressive and high-risk; and (2) risk prone drivers who exhibited fairly consistent responses that suggested various illegal driving behaviors were of lower risk for crash involvement. In addition, similar patterns were observed among different responses to the sleep habit questionnaire which reveals that certain sleep habits and other characteristics are more prevalent among those who reported to feel fatigued. These drivers were found to be generally more likely to be at fault.

Discussion

The findings from this study revealed interesting trends as to how particular driving behaviors and attributes may affect the probability of involvement in an at-fault crash. The research questions are as follows:

1. Are drivers who are more cautious or risk-averse less likely to be crash-involved?
2. Do drivers' sleep habits or daily feelings have any impact on the risk of involvement in an at-fault crash?
3. What factors, or combinations of factors, are reflective of the highest (or lowest) rates of at-fault crash-involvement?

The nature of the study design allowed for results that can be broadly generalized. However, there were potential limitations that need to be addressed. First, several important data elements were not available. While most behavioral information were available for study participants, similar information was not available for other involved drivers who were not participants in the NDS. For instance, there is no information available as to how other involved drivers perceive the examined risk taking behaviors or what demographic characteristics they had. There were also a number of conflicts where either fault status or other data elements were missing. Also, there were some drivers for whom the questionnaire results or/and parts of demographic information were not available. Consequently, these events were discarded from the analysis dataset.

Summary

The focus of the study introduced herein was to assess those factors associated with fault status among drivers involved in multi-vehicle conflicts, which include both crash and near-crash events over the duration of the Naturalistic Driving Study (NDS). Ultimately, the findings of this study provide insights as to those factors that contribute to multi-vehicle conflicts and more importantly to those that are more prevalent among at-fault drivers. Identification of such factors may help to inform subsequent policies and programs aimed at reducing traffic crashes, injuries, and fatalities. In addition, the findings provide insights for policy makers to establish countermeasures, as well as to develop and improve programs, and public education/outreach as a whole.

References

1. National Highway Traffic Safety Administration, 2010. Fatality Analysis Reporting System: Query FARS Data, Available from http://www-fars.nhtsa.gov/QueryTool/QuerySection/SelectYear.aspx (accessed 08.25.2016).
2. National Highway Traffic Safety Administration, 2008. National Motor Vehicle Crash Causation Survey: Report to Congress, DOT HS 811 059, 47 pgs.