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Center for Transportation Research and Education

Factors Contributing to Large Truck Lane Departure Crashes

tech transfer summary

IOWA STATE UNIVERSITY

> By understanding the factors contributing to large truck lane departure crashes, agencies can identify effective mitigation strategies.

Objectives

Investigate the factors that contribute to large truck lane departure crashes using data from the Federal Motor Carrier Safety Association's Large truck Crash Causation Study (LTCCS) Database.

Problem Statement

Though lane departure crashes account for a significant number of motor vehicle crashes and fatalities, information specific to large truck lane departures is not well documented. By understanding the factors that contribute to large truck lane departures, transportation agencies can determine specific countermeasures to mitigate large truck lane departure events.

The LTCCS data is especially useful for this type of analysis because the data provide a large amount of information about the physical events of each crash, as well as vehicle, driver, weather, and roadway condition information.

Research Description

Large truck drivers and vehicles involved in lane departure crashes were extracted from the LTCSS database. Drivers who were the most responsible in single- or multi-vehicle lane departure crashes were used as case studies, and non-responsible large truck drivers were used to determine exposure via the quasi-induced exposure method. Simple statistics, a simple odds ratio (OR), and logistic regression were used to evaluate the crashes in terms of driver, vehicle, environmental, and roadway factors.

Typical large truck lane departure crashes

Key Findings

The key results of the statistical, odds ratio, and logistic regression analyses are provided in the table below. Results are organized by single-vehicle and multi-vehicle crashes.

Key results of statistical, odds ratio, and logistic regression analyses

	Staistical Analysis	Odds Ratio	Logistic Regression
Large truck drivers resposible in single-vehicle lane departure crashes	The primary critical reason was driving too fast for curve or turn (25.0%). Another 8.7% of drivers responsible in single-vehicle crashes were also traveling too fast for conditions. In total, driving too fast for prevailing conditions accounted for more than one-third of all single-vehicle lane departure crashes. The next most critical reasons were "asleep" (14.7%) or "vehicle defect" (14.1%).	Drivers responsible in single-vehicle crashes were more likely than non-responsible drivers to have a jackknife occur (OR = 2.9), be fatigued (OR = 9.5), be upset (OR = 13.0), be unfamiliar with the roadway (OR = 2.1), be distracted (OR = 2.9), have a horizontal curve present (OR = 6.4), and have an up- or downgrade present (OR = 1.59).	Causal factors for large truck lane departure crashes were similar to the factors indicated by the simple odds ratio. Additionally, drivers responsible in single-vehicle crashes were less likely than non-responsible drivers to have any drugs involved (OR = 0.41) and were more likely to have a cargo shift (OR = 10.0), experience a driver distraction (OR = 10.4), have a curve present (OR = 3.8), or be on a roadway with narrow shoulders.
Large truck drivers resposible in multi-vehicle lane departure crashes	The most common critical reasons included inadequate surveillance (22.4%), driving too fast for conditions (13.2%), and inattention/distraction (12.5%).	Drivers responsible in multi-vehicle lane departure crashes were more likely than non-responsible drivers to have a jackknife occur (OR = 3.1), be fatigued (OR = 4.6), be distracted (OR = 3.7), be in a work zone (OR = 4.4), or have congestion present (OR = 2.9).	Causal factors for large truck lane departure crashes were similar to the factors indicated by the simple odds ratio.

Implementation Strategies

- Both speeding and inattention/distraction, major causes indicated by the simple statistical analysis, are driver-related factors. These would need to be addressed through policy, enforcement, or other measures directed at drivers.
- The only relevant vehicle factor evaluated was cargo shift, which increased the odds that a driver would be involved in a single-vehicle large truck lane departure crash. Cargo shift is also a human factor because failing to secure a load can be due to the inattention of the driver or handlers.
- Roadway factors that increase the likelihood of a driver's involvement in a large truck lane departure crash, according to the odds ratio analysis, are presence of a curve, up- or down-grade, and narrow shoulders. Strategies to reduce driver speeds on curves may be particularly promising. Other strategies may include better delineation of curves, addition of rumble strips, and addressing of design deficiencies.

Large truck lane departure crash in winter conditions