



# Predicting Truck Crash Involvement: A 2011 Update

## The Problem

Despite fatal truck crash totals reaching their lowest levels in U.S. DOT recorded history in 2009, both industry and government remain convinced there is room for improvement. Reacting to recent research which has highlighted the pivotal role that driver-related factors play in truck crashes, it is clear that efforts aimed at further reducing preventable crashes must focus in large part on driver behaviors.

In 2005, ATRI conducted research that identified specific truck driver behaviors that are most predictive of future truck crash involvement.<sup>1</sup> Numerous factors could have changed these relationships over the past five years, however. Therefore, an updated analysis was warranted to discern which truck driver behaviors from the original study continue to hold predictive value in terms of crash involvement.

## Research Goal

The main objective of this research was the identification of specific types of driver behaviors (violations, convictions and crashes) that are most highly correlated with future crash involvement. The Research Team examined to what extent drivers with certain driving records in one year (2008) were more likely to be involved in a truck crash in the following 12 months (2009), compared to drivers who did not have the same violations, convictions or prior crash history. Additionally, the Research Team sought to determine how the updated 2011 findings relate to those from ATRI's 2005 study.

## Methodology

This research replicated a first-of-its-kind ATRI study which analyzed several driver-specific databases to statistically relate those data to future crash probability at the driver level of analysis. Data sources included the Motor Carrier Management Information System (MCMIS) and the Commercial Drivers License Information System (CDLIS).

For the purposes of this research, crash involvement was used as the dependent variable. The independent variables were driver-specific performance indicators mined from the data including: specific road inspection violation information; driver traffic conviction information; as well as past crash involvement information.

Driver data were gathered from a two-year time frame (2008-2009) and analyzed across those years to determine the future crash predictability of violations, convictions and crashes which occurred the previous year. Individual chi-square analyses were used to assess whether there was a significant difference in future crash rates for drivers based on their past violations, convictions and/or crash information.

## Findings

This study's findings were based on data from 587,772 U.S. truck drivers. The analysis shows that a "failure to use/improper signal" conviction was the leading conviction associated with an increased likelihood of a future crash. When a truck driver was convicted of this offense, the driver's likelihood of a future crash increased 96 percent. Ten additional convictions were also significant crash predictors; of these, eight had an associated crash likelihood increase between 56 and

<sup>1</sup> American Transportation Research Institute. Predicting Truck Crash Involvement: Developing a Commercial Driver Behavior-Based Model and Recommended Countermeasures. Alexandria, VA. October 2005.

84 percent, while two registered between 36 to 40 percent.

In relation to driver violations, an improper passing violation had the strongest association with crash involvement. Drivers with this violation were 88 percent more likely than their peers to be involved in a crash. Seven additional violations had significant crash associations, with five ranging in magnitude between 38 and 45 percent and two between 18 and 21 percent.

Finally, the results indicated that drivers who had a past crash also had a significant 88 percent increase in their likelihood of a future crash. Table 1 ranks the top 10 driver events by the percentage increase in the likelihood of a future crash.

**Table 1**

If a driver had:	Increase in Crash Likelihood
A Failure to Use / Improper Signal conviction	96%
A Past Crash	88%
An Improper Passing violation	88%
An Improper Turn conviction	84%
An Improper or Erratic Lane Change conviction	80%
An Improper Lane / Location conviction	68%
A Failure to Obey Traffic Sign conviction	68%
A Speeding More Than 15 Miles over Speed Limit conviction	67%
Any conviction	65%
A Reckless / Careless / Inattentive / Negligent Driving conviction	64%

Conclusions drawn from this 2011 updated report include an acknowledgement that driver behaviors, while still associated with crash involvement, appear to be less strongly related than in ATRI's original report, when three predictors were found to more than double crash risk. Moreover, while many of the 2005 behaviors demonstrated similar patterns in the analysis update, a number of the most predictive behaviors from 2005 were replaced by new behaviors. Theories are proposed for these changes, with an emphasis on the finding that roadside inspected drivers generally had much safer records in the 2011 study, as evidenced by the lower proportion of drivers being issued violations (see Table 2).

**Table 2**

Violation:	Percent of Drivers with Violation (2005 Study)*	Percent of Drivers with Violation (2011 Study)*	Percent Change
Improper Passing	0.49%	0.11%	-76.82%
False or No Log Book	44.44%	20.10%	-54.77%
Speeding	25.04%	11.96%	-52.26%
Failure to Yield Right of Way	0.27%	0.14%	-49.07%
Disqualified Driver	1.65%	0.86%	-47.92%
Improper Turns	0.16%	0.08%	-46.86%
Following Too Close	1.42%	0.80%	-43.79%
Medical Certificate	10.59%	6.19%	-41.53%
Reckless Driving	0.10%	0.06%	-39.89%
Size and Weight	23.88%	14.52%	-39.19%
Moving	44.50%	27.49%	-38.23%
Improper Lane Change	1.02%	0.64%	-37.44%
Failure to Obey Traffic Control Device	3.44%	2.52%	-26.81%
Hours-of-Service	20.50%	17.32%	-15.51%
Any OOS violation	37.95%	34.74%	-8.45%

\*Figures are calculated using only those drivers in the study who had a Roadside Inspection in 2002-2003 and 2008, respectively

Finally, the report provides recommendations for how the industry can apply the current study's findings to continue to reduce the occurrence of crashes and crash-related behaviors. ATRI developed a formula for identifying "top tier" enforcement states, which highlight those states that contribute proportionally more to the nation's traffic enforcement activity totals than truck crash statistic totals.

Overall, the findings in this report suggest that driver interventions and industry innovations are capable of altering the magnitude and even the presence of the linkage between behaviors and future exposure to crashes. By becoming aware of problem behaviors, carriers and enforcement agencies are able to address those issues prior to them leading to serious consequences. The converse is also true, however, as lower priority behaviors, if ignored, may begin to play an increasing role in crash involvement.

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