Assessing the Impact of Non-Preventable Crashes on CSA Scores

November 2015

Prepared by the American Transportation Research Institute
ATRI BOARD OF DIRECTORS

Ms. Judy McReynolds  
Chairman of the ATRI Board  
President & CEO  
ArcBest Corporation  
Fort Smith, AR

Mr. Michael S. Card  
President  
Combined Transport, Inc.  
Central Point, OR

Mr. Michael L. Ducker  
President & CEO  
FedEx Freight  
Memphis, TN

Mr. Rich Freeland  
President & COO  
Cummins Inc.  
Columbus, IN

Mr. Hugh H. Fugleberg  
President & COO  
Great West Casualty Company  
South Sioux City, NE

Mr. Jack Holmes  
President  
UPS Freight  
Richmond, VA

Mr. Dave Huneryager  
President & CEO  
Tennessee Trucking Association  
Nashville, TN

Mr. Derek Leathers  
President and COO  
Werner Enterprises  
Omaha, NE

Mr. Chris Lofgren  
President & CEO  
Schneider National, Inc.  
Green Bay, WI

Mr. Jeffrey J. McCaig  
President & CEO  
Trimac Transportation, Inc.  
Houston, TX

Mr. Gregory L. Owen  
Head Coach & CEO  
Ability/ Tri-Modal Transportation Services  
Carson, CA

Ms. Annette Sandberg  
President & CEO  
Transsafe Consulting, LLC  
Davenport, WA

Mr. Douglas W. Stotlar  
Retired CEO of Conway Inc.  
Ann Arbor, MI

Mr. Steve Williams  
Chairman & CEO  
Maverick USA, Inc.  
Little Rock, AR

Ms. Rebecca M. Brewster  
President & COO  
American Transportation Research Institute  
Atlanta, GA

Hon. Bill Graves  
President & CEO  
American Trucking Associations  
Arlington, VA
ATRI RESEARCH ADVISORY COMMITTEE

Mr. Steve L. Niswander  
RAC Chairman  
VP, Safety Policy & Regulatory Relations  
Groendyke Transport, Inc.

Mr. Doug Bennett  
Director, Operations & Business Development  
U.S. AutoLogistics, L.L.C.

Ms. Amy Boerger  
Vice President – North American Engine Business  
Cummins Inc.

Mr. Andrew Boyle  
Executive VP & CFO  
Boyle Transportation

Mr. Randy Boyles  
Senior Vice President, Tailored Solutions  
PeopleNet

Mr. Tom Cuthbertson  
Omnitracs, LLC  
Vice President, Regulatory Compliance

Ms. Cheryl Bynum  
Manager, SmartWay Transport Partnership  
U.S. Environmental Protection Agency

Mr. Louis Campion  
President  
Maryland Motor Truck Association, Inc.

Mr. Michael Conyngham  
Director of Research  
International Brotherhood of Teamsters

Mr. Bob Costello  
Chief Economist and Senior VP  
American Trucking Associations

Mr. Dennis Dellinger  
President  
Cargo Transporters

Mr. Duke Drinkard  
Energy Manager  
Southeastern Freight Lines

Mr. Chip Duden  
Vice President, Strategic Business Analytics  
Werner Enterprises

Mr. Chad England  
Chief Executive Officer  
C.R. England

Mr. Paul J. Enos  
Chief Executive Officer  
Nevada Trucking Association

Ms. Sherri Garner Brumbaugh  
President/CEO  
Garner Transportation Group

Dr. David W. Guess  
Executive Vice President, Safety and Regulatory Affairs  
Usher Transport, Inc.

Mr. Sanford Hodes  
Senior Vice President and Deputy General Counsel  
Ryder System, Inc.

Ms. Barbara Ivanov  
Director, Freight Systems  
Washington State DOT

Mr. Kevin X. Jones  
Vice President, Inbound Transportation  
Wal-Mart Stores, Inc.

Mr. Shannon Lively  
Vice President – Planning and Engineering  
ABF Freight System, Inc.

Ms. Michelle D. Livingstone  
Vice President – Transportation  
The Home Depot

Mr. Vladimir Livshits, Ph.D.  
System Analysis Program Manager  
Maricopa Association of Governments

Mr. Chris McLoughlin  
Cargo Risk Manager  
C.H. Robinson

Mr. Scott Mugno  
Vice President, Safety and Maintenance  
FedEx Ground

Ms. Brenda Neville  
President  
Iowa Motor Truck Association

Mr. Dean Newell  
Vice President, Safety  
Maverick USA, Inc.

Major David L. Palmer  
Major, Texas Hwy Patrol Division  
Texas Dept. of Public Safety

Mr. Jonathan R. Peters, PhD  
Professor of Finance, Department of Business  
College of Staten Island – The City University of New York

Ms. Karen Rasmussen  
President and CEO  
HELP Inc.

Ms. Barbara Robinson  
Director  
American Truck Dealers (ATD)  
McLean, VA

Mr. Wellington F. Roemer, III  
President and CEO  
Wellington F. Roemer Insurance, Inc.

Mr. Steve Rogers  
Vice President, Truckload Operations  
J.B. Hunt Transport, Inc.

Mr. Brett A. Sant  
VP, Safety and Risk Management  
Knight Transportation, Inc.

Ms. Andrea Sequin  
Director, Regulatory Services  
Schneider National, Inc.

Mr. Brandon Shafer  
Founder  
Motor Carrier Service Inc.

Mr. Ronald Uriah  
Vice President, Safety  
Pitt-Ohio, LLC

Mr. Tom Weakley  
Director of Operations  
Owner-Operator Independent Drivers Association Foundation

Mr. Rusty Weiss  
Director, External Research  
DriveCam-Lytx

Mr. Geoffrey Wood  
VP, Operations & Safety  
Canadian Trucking Alliance
# TABLE OF CONTENTS

LIST OF TABLES AND FIGURES................................................................. i
LIST OF ACRONYMS ........................................................................... iii
BACKGROUND ...................................................................................... 1
INTRODUCTION .................................................................................... 3
  Crash Indicator BASIC.................................................................. 4
  Crash Responsibility Research..................................................... 8
  Research Objective................................................................. 9
METHODOLOGY .................................................................................. 10
  Assigning Crash Responsibility ............................................... 10
  Data Request Form ................................................................. 10
  Crash BASIC Calculation......................................................... 10
RESULTS ............................................................................................... 12
  Distribution of Primary Crash Causes...................................... 13
  Percent Change in Carrier Crash BASIC Measure................. 14
CONCLUSION ....................................................................................... 17
APPENDIX A: CRASH BASIC CALCULATION..................................... 18
APPENDIX B: MATCHING CASES ....................................................... 21
APPENDIX C: EXAMPLES OF NON-PREVENTABLE, NOT-AT-FAULT CRASHES ...... 23
APPENDIX D: PERSONAL VEHICLE LIABILITY LIMITS BY STATE .................. 25
LIST OF TABLES AND FIGURES

Table 1. CSA BASICs and Descriptions ................................................................. 2
Table 2. Carrier Non-Preventable Primary Crash Causes ...................................... 10
Table 3. Primary Industry Sector .................................................................. 12
Table 4. Average Length of Haul .................................................................... 12
Table 5. Fleet Size ......................................................................................... 12
Table 6. Primary Vehicle Configuration ......................................................... 12
Figure 1. Distribution of Crashes Removed from Carrier Records ......................... 13
Figure 2. Carrier Crash Preventability Distribution ............................................ 14
Table 7. Cost of Crashes Removed from Carrier Records ................................... 14
Figure 3. Percent Change in Carrier Crash BASIC Measure .............................. 15
Table 8. Changes in Rank ............................................................................ 16
Table 9. Time and Severity Weighting Schemes ................................................. 18
Table 10. Utilization Factors for Straight and Combination Fleets ..................... 19
Table 11. Crash BASIC Safety Event Groups ..................................................... 20
Figure 4. Process for Matching Carrier and MCMIS Records ........................... 22
Table 12. Minimum Insurance Liability Requirements - by State ....................... 25
# LIST OF ACRONYMS

<table>
<thead>
<tr>
<th>APU</th>
<th>Average Power Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATA</td>
<td>American Trucking Associations</td>
</tr>
<tr>
<td>ATRI</td>
<td>American Transportation Research Institute</td>
</tr>
<tr>
<td>BASIC</td>
<td>Behavioral Analysis and Safety Improvement Category</td>
</tr>
<tr>
<td>CMV</td>
<td>Commercial Motor Vehicle</td>
</tr>
<tr>
<td>CSA</td>
<td>Compliance, Safety, Accountability</td>
</tr>
<tr>
<td>DOT</td>
<td>Department of Transportation</td>
</tr>
<tr>
<td>FARS</td>
<td>Fatality Analysis Reporting System</td>
</tr>
<tr>
<td>FMCSA</td>
<td>Federal Motor Carrier Safety Administration</td>
</tr>
<tr>
<td>FMCSR</td>
<td>Federal Motor Carrier Safety Regulation</td>
</tr>
<tr>
<td>GAO</td>
<td>Government Accountability Office</td>
</tr>
<tr>
<td>HazMat</td>
<td>Hazardous Materials</td>
</tr>
<tr>
<td>MCMIS</td>
<td>Motor Carrier Management Information System</td>
</tr>
<tr>
<td>NMVCCS</td>
<td>National Motor Vehicle Crash Causation Study</td>
</tr>
<tr>
<td>OV</td>
<td>Other Vehicle</td>
</tr>
<tr>
<td>PAR</td>
<td>Police Accident Report</td>
</tr>
<tr>
<td>PSP</td>
<td>Pre-Employment Screening Program</td>
</tr>
<tr>
<td>PU</td>
<td>Power Unit</td>
</tr>
<tr>
<td>RAC</td>
<td>Research Advisory Committee</td>
</tr>
<tr>
<td>SafeStat</td>
<td>Safety Status Measurement System</td>
</tr>
<tr>
<td>SMS</td>
<td>Safety Measurement System</td>
</tr>
<tr>
<td>UF</td>
<td>Utilization Factor</td>
</tr>
<tr>
<td>UMTRI</td>
<td>University of Michigan Transportation Research Institute</td>
</tr>
<tr>
<td>VMT</td>
<td>Vehicle Miles Traveled</td>
</tr>
</tbody>
</table>
**BACKGROUND**

In 2010, the Federal Motor Carrier Safety Administration (FMCSA) replaced its previous safety program, Safety Status Measurement System (SafeStat), with the newly developed Compliance, Safety, Accountability (CSA) program. CSA was intended to be a more targeted, robust system for identifying high-risk carriers and prioritizing carriers for intervention. While many in the industry have found CSA to be an improvement over SafeStat, there are concerns about CSA’s accuracy in predicting crash risk, among other issues.\(^1\) CSA has ranked at or near the top on the American Transportation Research Institute’s (ATRI) annual survey, *Critical Issues in the Trucking Industry*, since the implementation of CSA in 2010. In 2012, CSA was the highest ranked industry issue in the survey.\(^2\)

At its 2013 annual meeting, ATRI’s Research Advisory Committee (RAC) considered more than 30 different research initiatives.\(^3\) Evaluating the impact of assigning crash responsibility for the Crash Indicator Behavioral Analysis and Safety Improvement Category (BASIC) was ranked among the top ten research priorities by the RAC members.

Under CSA, both carriers and drivers receive safety scores across seven BASICs, as shown in Table 1.\(^4,5\) Currently, only five of the seven BASICs are publicly available, as indicated in Table 1. In response to critiques from industry and enforcement personnel, FMCSA has made a number of changes to CSA since its debut in 2010. Some of the changes included adjusting violation severity weights, reorganizing two of the BASICs, and clarifying certain data inputs.\(^6\) In August 2014, FMCSA implemented a new citation adjudication policy, which allows for the results of judicial proceedings that end in dismissed charges, reduced charges or a ruling of not guilty to be positively reflected in the Safety Measurement System (SMS) and the Pre-Employment Screening Program (PSP).\(^7\) This change aligns compliance scores with judicial proceedings.

Currently, FMCSA is considering more changes to the CSA program. Potential changes include: updating the utilization factor (UF)\(^8\) for commercial vehicles with over 200,000 miles driven per year; making the Hazardous Materials (HazMat) BASIC percentile rankings public; segmenting the HazMat BASIC by cargo tank and non-cargo tank carriers; and changing BASIC intervention thresholds.\(^9\)

---

3. ATRI’s RAC is comprised of industry stakeholders representing motor carriers, trucking industry suppliers, labor and driver groups, law enforcement, federal government and academia. The RAC is charged with annually recommending a research agenda for the Institute.
8. The utilization factor is a measure of exposure to normalize measures across carriers. Higher risk is associated with driving more miles, which allows for reasonable comparisons between carriers with different levels of exposure.
## Table 1. CSA BASICs and Descriptions

<table>
<thead>
<tr>
<th>BASIC</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Unsafe Driving BASIC</strong></td>
<td>Operation of commercial motor vehicles (CMVs) in a dangerous or careless manner. Example violations: speeding, reckless driving, improper lane change, and inattention (FMCSR Parts 392 and 397).</td>
</tr>
<tr>
<td><strong>Hours-of-Service Compliance BASIC</strong></td>
<td>Operation of CMVs by drivers who are ill, fatigued, or in non-compliance with the Hours-of-Service regulations. This BASIC includes violations of regulations pertaining to records of duty status as they relate to HOS requirements and the management of CMV driver fatigue. Example violations: exceeding HOS, maintaining an incomplete or inaccurate logbook, and operating a CMV while ill or fatigued (FMCSR Parts 392 and 395).</td>
</tr>
<tr>
<td><strong>Driver Fitness BASIC</strong></td>
<td>Operation of CMVs by drivers who are unfit to operate a CMV due to lack of training, experience, or medical qualifications. Example violations: failing to have a valid and appropriate commercial driver’s license and being medically unqualified to operate a CMV (FMCSR Parts 383 and 391).</td>
</tr>
<tr>
<td><strong>Controlled Substances/Alcohol BASIC</strong></td>
<td>Operation of CMVs by drivers who are impaired due to alcohol, illegal drugs, and misuse of prescription or over-the-counter medications. Example violations: use or possession of controlled substances or alcohol (FMCSR Parts 382 and 392).</td>
</tr>
<tr>
<td><strong>Vehicle Maintenance BASIC</strong></td>
<td>Failure to properly maintain a CMV and/or to properly prevent shifting loads. Example violations: brakes, lights, and other mechanical defects, and failure to make required repairs, and improper load securement (FMCSR Parts 392, 393 and 396).</td>
</tr>
<tr>
<td><strong>Hazardous Materials Compliance BASIC</strong></td>
<td>Unsafe handling of hazardous materials on a CMV. Release of hazardous materials from package, no shipping papers (carrier), and no placards/markings when required (FMCSR Part 397 and Hazardous Materials Regulations Parts 171, 172, 173, 177, 178, 179, and 180).</td>
</tr>
<tr>
<td><strong>Crash Indicator BASIC</strong></td>
<td>Crash history is not specifically a behavior. Rather, it is a consequence of a behavior and may indicate a problem with the carrier that warrants intervention. It is based on information from state-reported crash reports and identifies histories or patterns of high crash involvement, including frequency and severity.</td>
</tr>
</tbody>
</table>

*Carrier scores not publicly available as of the time of this publication.*
INTRODUCTION

Previous CSA Research

In 2012, ATRI analyzed the relationship between SMS data and crash data for approximately 471,000 carriers, revealing that both the Driver Fitness and Controlled Substances/Alcohol BASICs had inverse relationships to crash risk. In addition, the research indicated that rating carrier safety performance by the cumulative number of alerts across BASICs could better identify high risk carriers than the percentile metrics currently used. In 2014, ATRI investigated the impact that enforcement disparities across the lower 48 states had on carrier BASIC scores. This study confirmed anecdotal evidence that certain states issue violations at rates considerably higher than national averages. Furthermore, the research documented that carrier BASIC scores were affected by disparate enforcement activities across the United States.

Similar to enforcement disparities, states exhibit differences in reporting crashes to FMCSA’s Motor Carrier Management Information System (MCMIS). The University of Michigan Transportation Research Institute (UMTRI) has investigated the disparate crash reporting rates of many states, and their most recent investigations show that crash reporting rates to MCMIS are highly inconsistent among states. The UMTRI analyses of 2010 MCMIS data for Delaware, New Jersey, and Utah revealed MCMIS reporting rates of 71.6 percent, 75.3 percent and 71.4 percent respectively. In addition to data integrity issues, the statistical validity of the SMS has been called into question. The Government Accountability Office’s (GAO) review of the CSA program concluded that violations are so rare that validating the relationship between crash risk and violations is difficult. Additionally, the GAO found that most carriers do not have sufficient safety performance information to make reliable comparisons between carriers. These studies exposed issues within the SMS; however the fact that the Crash Indicator BASIC calculation includes all crashes—regardless of preventability—warrants further examination. The current report addresses certain stakeholder concerns that the failure to account for preventability in the Crash Indicator BASIC misrepresents carrier safety.

16 During the 2 year period the GAO examined, 593 of the 750 regulations they investigated were violated by less than 1% of carriers. Of the remaining regulations, 13 violations had some association with crash risk and only two had sufficient data to establish statistical validity.
17 The GAO uses the illustrative example of an additional violation for a carrier with 5 inspections and a carrier with 100 inspections. The change in BASIC measure for the carrier with 5 inspections could be as much as 20 times more than the carrier with 100 inspections.
18 FMCSA defines a preventable crash as a “crash (1) that involved a commercial motor vehicle, and (2) that could have been averted but for an act, or failure to act, by the motor carrier or the driver.” Available Online: http://www.fmcsa.dot.gov/regulations/title49/section/385.3
Crash Indicator BASIC

The “Crash BASIC” evaluates a carrier’s crash involvement history for the previous 24 months. Only state-reported crashes coded as “Department of Transportation (DOT) reportable” are assessed in the Crash BASIC. Under the current SMS methodology all DOT-reportable crashes count against a carrier regardless of preventability determinations. Despite the Crash BASIC measure being restricted from the public, all DOT-reportable crashes that are used to calculate a carrier’s Crash BASIC measure are available to the public.

Many industry stakeholders have noted that not including a preventability determination in the BASIC formula may mislead conclusions about a carrier’s actual safety performance. For example, if a legally parked commercial motor vehicle (CMV) is struck by another vehicle and qualifies as a DOT-reportable crash, this negatively impacts a carrier’s Crash BASIC measure. In this scenario, neither the driver of the CMV nor the carrier could have prevented the crash, yet the crash creates the misperception that the carrier is less safe. More examples of non-preventable, DOT-reportable crashes that adversely impact carrier Crash BASIC measures are described in Appendix C.

According to FMCSA’s Crash BASIC factsheet, “carriers should be aware that crashes in the previous 24 months adversely affect carriers’ SMS results and only not having crashes will improve carriers’ percentile ranking.” In the previous crash scenario the aforementioned policy is both untenable and harmful, warranting further investigation into assigning crash responsibility and its impact on a carrier’s Crash BASIC measure.

Some safety advocates support the inclusion of all crashes, regardless of preventability, due to the correlation between past crashes and future crash risk. However, this effect is likely due to the statistical strength of the correlation between historical preventable crashes and future preventable crash risk; removing non-preventable crashes from the all-crash database

19 Appendix A provides a detailed discussion on the calculation of the carrier Crash Indicator BASIC measure.
21 Ibid.
22 A DOT-reportable crash involves at least one fatality, one injury where an individual is taken to a medical facility for treatment, or one vehicle that is towed due to damage incurred from the crash. Available Online: http://www.fmcsa.dot.gov/regulations/title49/section/390.5
would ostensibly elucidate this hypothesis. So while the Crash BASIC has a correlation to future crash involvement, it does not distinguish between causation and involvement.\textsuperscript{29} Failing to account for the difference between involvement and causation may result in an inaccurate representation of driver and carrier safety by failing to control for exposure to other, unsafe drivers.

CSA influences the economic viability of motor carriers\textsuperscript{30} therefore an exposure adjustment should be included in the Crash BASIC that acknowledges the role of the driver in the crash. Removing non-preventable crashes from the Crash BASIC would serve as an exposure adjustment, by removing all instances where involvement in a crash was the result of exposure to an unsafe but non-preventable externality. Thus the change would then better align Crash BASIC calculations with FMCSA’s mandate to identify carriers and drivers that pose the greatest risk to public safety.\textsuperscript{31}

Despite Crash BASIC measures being restricted from the public, they can still impact carriers and drivers significantly. Potential areas of impact include:

- Economic harm. Shippers can, and often do, require the disclosure of Crash BASIC measures and percentiles to assess the safety of a carrier.\textsuperscript{32,33} All other things being equal, carriers with a “bad” Crash BASIC score may be less likely to receive freight contracts than a “safer” carrier.\textsuperscript{34}
- Higher insurance costs. It is well understood that carrier BASIC scores are used as actuarial inputs for insurance risk assessments and determinations of premium levels.
- Legal consequences. Plaintiff attorneys may cite BASIC scores in legal proceedings, as an indicator of negligence and culpability.
- Lost productivity from more frequent inspections. The Inspection Selection System (ISS), a tool for selecting CMVs to inspect, is influenced by BASIC scores.\textsuperscript{35}

The influence that BASIC scores have on the productivity and viability of a carrier make it paramount for the measures to accurately reflect a carrier’s safety performance. In addition to the economic viability of carriers, the absence of preventability determinations in crash reporting procedures creates impacts across a number of industry stakeholders.

\textit{Stakeholder Impacts from Absence of Preventability Determinations}

\textbf{Large Motor Carriers}. As most medium to large fleets utilize high deductibles or self-insurance programs, non-preventable crashes generate a variety of direct and indirect crash costs that are often borne directly by the carrier. Since the large majority of non-preventable crash costs

\textsuperscript{29}Ibid.
across all three crash types – fatality, injury, or property damage only – fall well below deductible and/or self-insurance minimums, “dollar one” of every crash is paid for directly by the carrier, over and above whatever insurance limits are possessed by the automobile driver.

### Large Motor Carriers

<table>
<thead>
<tr>
<th>Impact</th>
<th>Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle and property damage</td>
<td></td>
</tr>
<tr>
<td>- New and used tractor costs may exceed $100,000.</td>
<td></td>
</tr>
<tr>
<td>- New and used trailer costs may exceed $25,000.</td>
<td>High Cost</td>
</tr>
<tr>
<td>Workers’ Compensation</td>
<td></td>
</tr>
<tr>
<td>- Truck driver injuries associated with crashes are often chronic in nature and can generate a variety of long-term health costs.</td>
<td>High Cost</td>
</tr>
<tr>
<td>- Insurance industry data for a range of crash-related driver injuries averaged $36,000 in 2014.</td>
<td></td>
</tr>
</tbody>
</table>

### Small Motor Carriers

**Small Motor Carriers.** Owner-operators and small fleets rely heavily on insurance policies to moderate the impact of crash costs. Previous research conducted by ATRI for the FMCSA indicates that small fleets often tolerate two to three crash filings against their policies before premium increases become challenging. Furthermore, the smaller the fleet, the lower the average deductible, with many small entities utilizing no or low deductibles (a function of little to no available liquidity for unexpected crash costs).

<table>
<thead>
<tr>
<th>Impact</th>
<th>Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle and property damage</td>
<td>Initially Low Cost (due to deductible)</td>
</tr>
<tr>
<td>Lost Wages</td>
<td></td>
</tr>
<tr>
<td>- Small fleet and owner-operator driver injuries associated with crashes are often catastrophic in terms of out-of-pocket expenses and lost wages. Data from the Bureau of Labor Statistics suggests that lost truck driver wages could average $793 per week.</td>
<td>High Cost</td>
</tr>
</tbody>
</table>

---


37 Based on a Bureau of Labor Statistics estimate of $41,240 as the annual wage for heavy and tractor-trailer truck drivers.
Commercial Motor Vehicle Drivers. Non-preventable crashes on a CMV driver’s record can easily impact a driver’s ability to find employment as most data sources used for employment screening (insurance loss data; Pre-Employment Screening Program [PSP] reports) do not differentiate preventable crashes from non-preventable crashes. The absence of preventability determinations on PSP potentially misrepresents the safety of a driver, and most carriers have some threshold for crash numbers and severity whereby a driver will not be hired.

<table>
<thead>
<tr>
<th>Commercial Motor Vehicle Drivers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impact</td>
</tr>
<tr>
<td>Lost Wages/Employment Ineligibility</td>
</tr>
</tbody>
</table>

Insurance Companies. For any truck driver or motor carrier that utilizes commercial insurance coverage, the expectation is that insurance will cover a large percentage of crash costs. Even fleets that “self-insure” have umbrella policies and re-insurance that cover losses over the self-insurance ceiling; when these policies are tapped, crash costs are ostensibly high, and the insurance payouts will be large. That said, the insurance industry must still recover all costs along with a reasonable operating margin. This is ultimately done through premiums and the use of carrier- or driver-paid deductibles. Like any industry, unexpected, unbudgeted costs can severely impact the financial health of the commercial insurance industry. This makes non-preventable crashes such a challenge for insurers; regardless of the safety management oversight, training and technical support that an insurer provides to its motor carrier customers, there is essentially no pre-emptive strategy for avoiding non-preventable crashes.

<table>
<thead>
<tr>
<th>Commercial Motor Vehicle Insurers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impact</td>
</tr>
<tr>
<td>Vehicle and property damage</td>
</tr>
<tr>
<td>Non-preventable crash payouts</td>
</tr>
<tr>
<td>• Minimum automobile insurance limits (see Appendix D) are often below the average crash cost. As a result, motor carrier policies will still often be sued for losses incurred by the claimant.</td>
</tr>
</tbody>
</table>

Personal Auto Insurance Companies / Automobile Drivers. Based on a relatively large delta between average crash costs and average minimum insurance levels, car drivers and personal auto insurers can bear high, unexpected costs associated with car-truck crashes that are non-preventable to the truck driver/motor carrier. For instance, to file a suit in a federal district court, a $75,000 minimum value must be met. This often leaves the car driver personally responsible for amounts over the state’s minimum insurance coverage level. It also opens personal auto insurers to litigation losses that may exceed the true crash cost losses. Raising minimum levels of insurance coverage for auto drivers could be financially beneficial to both the car drivers and their insurers.
**Crash Responsibility Research**

In 2012, FMCSA responded to industry concerns surrounding crash preventability determinations by deploying a crash weighting research study. In the initial phase of its study, FMCSA conducted a police accident report (PAR) coding test. Two researchers independently coded 1,221 crash records across five severity categories to determine whether it is feasible to assign crash responsibility based solely on PARs. Results from this analysis indicated that the coders reached 93.2 percent agreement when assigning responsibility. These results suggest that consensus is often possible when determining which party caused a crash.

Subsequent study phases evaluated whether PAR data are adequately reliable and sufficient across the entire United States to be used to determine if the CMV driver was responsible for the crash (by cross-referencing PARs with records that are included in the Fatality Analysis Reporting System [FARS] and the National Motor Vehicle Crash Causation Study [NMVCCS]). The analysis of PAR data found that 91 percent of the crashes examined had sufficient information to determine if a CMV was involved in the crash, if the CMV was regulated by FMCSA and if the crash was DOT-reportable. Of the PARs meeting these criteria, 61 percent had critical reasons that were not attributed to the CMV driver. The reliability of PARs was tested by comparing them to FARS records. There were significant inconsistencies between PAR and FARS data for areas critical to determining culpability; 82 percent of the PARs were missing driver contributing factors and 47.5 percent of the PARs were missing the first harmful event. Consistency between PARs and NMVCCS was better; with 90 percent of the crashes researchers examined had critical reason determinations that matched.

In 2015, FMCSA released the final Crash Weighting Analysis report, which attempted to quantify the effect that including preventability determinations in the Crash BASIC would have on predicting future crash risk. FMCSA concluded that including preventability determinations did not significantly improve the predictive power of the Crash BASIC measure. The

---

40 Ibid.
42 A critical reason is defined as “the immediate reason for the critical event, which is often the last failure in the causal chain of events leading up to the crash”. Available Online: http://www-nrd.nhtsa.dot.gov/pubs/812115.pdf
43 Ibid.
methodology used in the FMCSA report, called the effectiveness test,\textsuperscript{44} compares the future crash rates of carriers prioritized for intervention with a baseline crash rate (the crash rate of carriers prioritized for intervention under the current methodology). However, using all future crashes (not just preventable crashes) to assess the impact of including preventability determinations in the Crash BASIC fails to address whether using only preventable crashes identifies the carriers most likely to cause crashes in the future.

Additionally, FMCSA estimated that identifying and incorporating at-fault determinations to the Crash BASIC would cost between $3.9 and $11.2 million annually, with an initial startup cost of $1.1 million dollars.\textsuperscript{45} The variation in yearly cost estimates results from different projections of appeal rates, between 10 percent and 50 percent. However, these numbers may be overinflated due to the fact that FMCSA assumes crash responsibility determinations would be made by compiling PARs from states, then reviewing PARs to make crash responsibility determinations. Some industry stakeholders suggest that FMCSA does not need to bear all responsibility for the process of determining crash preventability. The Oregon DOT Motor Carrier Transportation Division suggested that state organizations that already investigate crash causes and report crashes to MCMIS could add reporting preventability determinations to processes already in place.\textsuperscript{46} Some states (like Oregon) already review crashes to determine which party was responsible for causing the crash.\textsuperscript{47}

FMCSA’s Crash Weighting Report examines the costs FMCSA would incur by assigning crash preventability, but does not assess the cost to industry stakeholders by not incorporating preventability into the Crash BASIC calculation. The cost of non-preventable crashes is examined later in this analysis.

Research Objective

The objective of this research is to examine what impact assigning crash responsibility has on carrier safety performance as measured by the Crash BASIC.


\textsuperscript{46} McKane, D. (2015). Comments of the Oregon DOT Motor Carrier Transportation Division on the FMCSA notice on Crash Weighting Research Findings.

\textsuperscript{47} Ibid.
METHODOLOGY

Assigning Crash Responsibility

While a number of behavioral and environmental factors can contribute to a CMV-involved crash, the purpose of this research is to demonstrate the impact of removing non-preventable crashes from a carrier’s Crash BASIC measure. Therefore the ATRI research team was conservative in its analysis and selection of crash causes. ATRI researchers consulted multiple motor carriers to determine which crash types are rarely associated with truck driver negligence. Based on these discussions, ATRI researchers defined five primary non-preventable crash causes for this analysis (Table 2).

Table 2. Carrier Non-Preventable Primary Crash Causes

<table>
<thead>
<tr>
<th>Primary Crash Causes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Truck collided with animal in roadway</td>
</tr>
<tr>
<td>Other driver hits legally parked truck</td>
</tr>
<tr>
<td>Other driver ran red light or stop sign and hit truck</td>
</tr>
<tr>
<td>Other driver was under the influence of drugs or alcohol and hit truck</td>
</tr>
<tr>
<td>Truck-assisted suicide by pedestrian</td>
</tr>
</tbody>
</table>

Data Request Form

Crash BASIC percentile scores are restricted to the public and MCMIS does not include crash causes, so ATRI employed a carrier case study approach. ATRI researchers developed a data request form which solicited from carriers their FMCSA-generated data on their Crash BASIC. This data included percentile score, measure, safety event group and segment as provided by FMCSA on 9/26/2014. In addition, ATRI requested a detailed carrier crash history for the 24-month time period between September 2012 and September 2014. Among the crash record variables requested were the number of fatalities, injuries and vehicles towed, if HazMat were released, the primary crash cause and if the crash was coded as preventable according to FMCSA’s definition. After carrier records were received, crashes that fell into one of the 5 “primary cause” bins were isolated and matched with a crashes in the carrier’s MCMIS file.

Crash BASIC Calculation

ATRI researchers first corroborated their Crash BASIC calculation by replicating the carrier’s original CSA-generated Crash BASIC measure. Next, ATRI researchers removed the crashes

---

48 Descriptions of percentile scores, measures, safety event groups, and segments are available in Appendix A or Section 3.2 of Safety Measurement System Methodology. Available Online: https://csa.fmcsa.dot.gov/Documents/SMSMethodology.pdf

49 FMCSA defines a preventable crash as a “crash (1) that involved a commercial motor vehicle, and (2) that could have been averted but for an act, or failure to act, by the motor carrier or the driver.” Available Online: http://www.fmcsa.dot.gov/regulations/title49/section/385.3

that were coded as non-preventable based on its presence in at least one of the five primary cause bins listed in Table 2.\textsuperscript{51} As a final step, ATRI researchers recalculated the carrier’s Crash BASIC measure with the aforementioned crashes removed. The results of this analysis are presented in the next section.

\textsuperscript{51} In some instances, the primary crash factor coded for a crash matched one of those listed in Table 2, however it was also coded as preventable. When this occurred, ATRI researchers did not remove this crash from the carrier’s record.
RESULTS

Demographics

Seventeen carriers responded to ATRI’s Crash BASIC data request. Of the 17 carriers, 15 had sufficient information in their crash records to assign clear preventability and primary crash cause determinations. Of these 15 carriers, 60 percent provide truckload services (Table 3). Most carriers reported that their fleet’s average length of haul is 100 to 499 miles (40%) or 500 to 999 miles (40%) per trip (Table 4).

Table 3. Primary Industry Sector

<table>
<thead>
<tr>
<th>Business</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Truckload</td>
<td>60.0%</td>
</tr>
<tr>
<td>Less-Than-Truckload</td>
<td>20.0%</td>
</tr>
<tr>
<td>Flatbed</td>
<td>6.7%</td>
</tr>
<tr>
<td>Tanker</td>
<td>6.7%</td>
</tr>
<tr>
<td>Other</td>
<td>6.7%</td>
</tr>
</tbody>
</table>

Table 4. Average Length of Haul

<table>
<thead>
<tr>
<th>Average Length of Haul</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local (less than 100 miles per trip)</td>
<td>0.0%</td>
</tr>
<tr>
<td>Regional (100-499 miles per trip)</td>
<td>40.0%</td>
</tr>
<tr>
<td>Inter-Regional (500-999 miles per trip)</td>
<td>40.0%</td>
</tr>
<tr>
<td>Long Haul (1,000 or more miles per trip)</td>
<td>13.3%</td>
</tr>
<tr>
<td>No Response</td>
<td>6.7%</td>
</tr>
</tbody>
</table>

As displayed in Table 5, the smallest participating fleets had between 501 and 1,000 power units (13.3%), while the largest fleets had over 5,000 power units (26.7%). The distribution of fleet size in this sample is not representative of the industry at large, of which 93 percent of fleets have less than 20 power units (PU).\(^{52}\) The sample’s skew toward larger carriers is beneficial in that data insufficiency issues associated with small carriers do not influence the present analysis. The GAO’s recommended standards for data sufficiency\(^{53}\) were met by every carrier who participated in this study and the resulting Crash BASIC measures are more precise for the test population group than the BASIC measures of smaller carriers with fewer DOT-reportable crashes. The majority of carriers (60%) reported that their fleet primarily consists of dry vans, followed by refrigerated trailers (Table 6).

Table 5. Fleet Size

<table>
<thead>
<tr>
<th>Power Units</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>5,001+</td>
<td>26.7%</td>
</tr>
<tr>
<td>1,001-5,000</td>
<td>60.0%</td>
</tr>
<tr>
<td>501-1,000</td>
<td>13.3%</td>
</tr>
<tr>
<td>251-500</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

Table 6. Primary Vehicle Configuration

<table>
<thead>
<tr>
<th>Vehicle Configuration</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry Van</td>
<td>60.0%</td>
</tr>
<tr>
<td>Refrigerated Trailer</td>
<td>13.3%</td>
</tr>
<tr>
<td>Flatbed</td>
<td>6.7%</td>
</tr>
<tr>
<td>Tanker/HazMat</td>
<td>6.7%</td>
</tr>
<tr>
<td>Bulk/Food</td>
<td>0.0%</td>
</tr>
<tr>
<td>Straight Truck</td>
<td>0.0%</td>
</tr>
<tr>
<td>Doubles/Triples</td>
<td>6.7%</td>
</tr>
<tr>
<td>Other</td>
<td>6.7%</td>
</tr>
</tbody>
</table>


\(^{53}\) The GAO defined sufficient data as 20 crashes, rather than the FMCSA’s minimum of 2 DOT-reportable crashes.
Distribution of Primary Crash Causes

As noted, ATRI researchers identified five primary crash causes that would likely be removed from the calculation of a carrier’s Crash BASIC measure based on the FMCSA definition of non-preventable. The carriers in the sample had 241 crashes coded as non-preventable, with a genesis in at least one of the five crash cause bins.

As displayed in Figure 1, crashes where the other vehicle (OV) ran a red light or stop sign accounted for the largest percentage (47.1%) of crashes that could be removed from a carrier’s Crash BASIC measure, followed by animal crashes (28.5%).

Figure 1. Distribution of Crashes Removed from Carrier Records

Of the DOT-reportable crashes in carrier records, the crashes associated with ATRI’s five primary cause bins comprised a relatively small proportion of the total non-preventable crashes reported by carriers (Figure 2). For the 15 carriers, crashes associated with ATRI’s five primary cause bins comprised only 8.9 percent of the carriers’ total crash record database. Non-preventable crashes as a whole accounted for 61.0 percent of the carriers’ total crash record database.

54 One crash in the sample was the result of two of the five primary causes, and is counted twice in Figure 1.

55 The number of crashes with at least one of ATRI’s five primary cause bins in Figure 2 differs slightly from the rest of this analysis because this figure is based on carrier records, while Figure 1 and Figure 3 are based on MCMIS records.
ATRI developed an estimate of the total cost of the crashes removed from carrier records based on average crash cost data from FMCSA (Table 7). The average cost figures used in Table 7 are relatively high compared to industry figures, as they include many costs not borne directly by carriers, such as societal costs and the value of lost productivity. However, these cost calculations are prevalent in safety literature and therefore suitable in this context.

Table 7. Cost of Crashes Removed from Carrier Records\(^{56}\)

<table>
<thead>
<tr>
<th>Crash Type</th>
<th>Average Cost per Crash(^{57})</th>
<th>Total Cost of Removed Crashes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property Damage Only</td>
<td>$18,000</td>
<td>$2,646,000</td>
</tr>
<tr>
<td>Injury</td>
<td>$331,000</td>
<td>$29,459,000</td>
</tr>
<tr>
<td>Fatality</td>
<td>$7,200,000</td>
<td>$36,000,000</td>
</tr>
</tbody>
</table>

Percent Change in Carrier Crash BASIC Measure

The final step in ATRI’s analysis was recalculating a new Crash BASIC measure, by removing the MCMIS records for carrier crashes residing in the five primary cause bins. As shown in Figure 3, Carrier C experienced no decrease in their Crash BASIC measure (0.0%), while


\(^{57}\) Uses 2006 estimate adjusted to 2009 dollars and the 2009 value of a statistical life.
Carrier M experienced the largest percentage decrease in their Crash BASIC measure (14.2%). On average, Crash BASIC measures decreased by 5.3 percent.

The five primary cause crashes comprised a small proportion of each carrier’s non-preventable crashes, so the changes in Crash BASIC measures are a very conservative estimate of the impact that non-preventable crashes have on a carrier’s Crash BASIC score (see Table 2 and Figure 2).

**Figure 3. Percent Change in Carrier Crash BASIC Measure**

The carrier-reported Crash BASIC measure and percentile scores suggest that even small changes in a carrier’s measure could significantly impact the carrier’s percentile score. For example, two carriers reported identical FMCSA Crash BASIC measures of .16 on September 26, 2014, yet there was an 11 percentage point difference between the carriers’ percentile scores; this phenomenon was seen across multiple instances where identical measures generated different rankings (see sidebar). Therefore, even what ostensibly should be a small change in a carrier’s Crash BASIC measure could result in a large impact on the percentile ranking of a carrier.

Since carrier Crash BASIC measures and percentile scores are restricted from the public, ATRI was not able to model the impact that the change in the Crash BASIC measure would have on a carrier’s percentile ranking, which would have required access to the entire peer grouping for each carrier. ATRI researchers concluded that FMCSA is only distributing two decimal-place measures to carriers, when they are likely ranking carriers on three- or four-decimal place metrics. To eliminate the confounding effect whereby different carrier rankings accrue from “identical” two decimal-place measure scores, FMCSA should start distributing the exact measure used to develop a carrier’s percentile rank.

---

58 In ATRI’s *Enforcement Disparities* study, researchers were able to model the impact of changes in carrier measures and percentiles by reviewing the public BASICs according to carrier peer groups.
the same peer group, the relative ranking of carriers’ Crash BASICs can be compared in a manner similar to FMCSA’s method of assigning percentile scores. The ranking of carriers from FMCSA-provided and ATRI-calculated Crash BASIC measures are shown in Table 8. Like FMCSA’s percentile scoring, a lower value indicates better performance, while a higher value indicates worse performance. For simplicity, the rankings range from one to 14. Despite the relatively small changes to the carriers’ Crash BASIC measures, the relative ranking of most carriers did change. Four carriers experienced no change in rank, five carriers’ relative rank worsened, and the remaining five carriers’ relative ranks improved.

Table 8. Changes in Rank

<table>
<thead>
<tr>
<th>Carrier</th>
<th>C</th>
<th>D</th>
<th>M</th>
<th>J</th>
<th>F</th>
<th>A</th>
<th>N</th>
<th>K</th>
<th>I</th>
<th>H</th>
<th>L</th>
<th>B</th>
<th>G</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>FMCSA Rank</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
<td>13</td>
<td>14</td>
</tr>
<tr>
<td>Recalculated Rank</td>
<td>2</td>
<td>5</td>
<td>1</td>
<td>4</td>
<td>3</td>
<td>7</td>
<td>6</td>
<td>9</td>
<td>8</td>
<td>10</td>
<td>12</td>
<td>11</td>
<td>13</td>
<td>14</td>
</tr>
<tr>
<td>Change in Rank</td>
<td>–</td>
<td>–</td>
<td>+</td>
<td>0</td>
<td>+</td>
<td>–</td>
<td>+</td>
<td>–</td>
<td>+</td>
<td>0</td>
<td>–</td>
<td>+</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

The “FMCSA Rank” is an ATRI-generated ranking of the carriers within the participating fleets, based on the carriers’ self-reported percentile scores.

---

59 The “FMCSA Rank” is an ATRI-generated ranking of the carriers within the participating fleets, based on the carriers’ self-reported percentile scores.
CONCLUSION

The objective of this study was to model the impact of removing non-preventable crashes from a carrier’s Crash BASIC measure. These results demonstrate that even a conservative approach to defining and assessing preventability can impact a carrier’s Crash BASIC measure significantly. Additionally, this analysis found:

- Non-preventable crashes comprise the majority of the sample. Therefore, a broader definition of preventability than the five primary cause bin approach used in this report, such as the one utilized by the FMCSA, would likely result in dramatic changes to Crash BASIC measures.
- Small differences in Crash BASIC measures result in significantly different percentile rankings, with our sample having a maximum range of 11 percentage points for the same FMCSA-provided score.
- The composition of preventable and non-preventable crashes varies across carriers. A Crash BASIC that only considers preventable crashes would affect carriers differently.
- Small changes in Crash BASIC measures result in significant changes to Crash BASIC percentile rankings, given the range of percentile rankings resulting from a single FMCSA-reported score and the varied composition of preventable and non-preventable crashes across carriers.
- Assigning preventability could also rectify issues beyond the Crash BASIC, such as carrier costs, insurance premiums and driver safety records.

To better quantify the impact of non-preventable crashes on the trucking industry, ATRI will continue its work with trucking and insurance industry stakeholders to identify and mine additional crash and financial data sources. This Phase 2 activity will attempt to develop a cost-benefit analysis on an expanded population of non-preventable crash types.
Appendix A: Crash BASIC Calculation

Crash Measure

The Crash BASIC measure is calculated by weighting all applicable crashes based on when the crash occurred and how severe the crash was, then adjusting the sum of these weights based on the relative exposure a carrier has to crash risk. Crash risk exposure is determined by the carrier’s average power units (APU) and the utilization factor (UF). Carriers are segmented based on the proportion of the fleet comprised of straight trucks and combination trucks and the number of crashes in which they have been involved. Then, carriers are ranked by percentile within these groups.

Numerator

Time and severity weighting schema were developed to account for differences in crash magnitude for the Crash BASIC (Table 9). A crash severity weight is based on a scale from 1 (tow-away, no injuries or fatalities) to 2 (involves injuries or fatalities), with the possibility of an additional point if HazMat are released. Crash time weights are dependent on the date a crash occurred and based on a scale from 3 (most recent) to 1 (least recent) in which the time weight decreases at six month intervals. For each crash, the time and severity weights are multiplied, then added with other crash weights for the previous 24 months to create the numerator of the Crash BASIC.

Table 9. Time and Severity Weighting Schemes

<table>
<thead>
<tr>
<th>Time</th>
<th>Severity</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 (0-6 Months)</td>
<td>1 (tow-away, no injury or fatality)</td>
</tr>
<tr>
<td>2 (&gt;6-12 Months)</td>
<td>2 (injury or fatality)</td>
</tr>
<tr>
<td>1 (&gt;12-24 Months)</td>
<td>+1 (if Hazmat are released)</td>
</tr>
</tbody>
</table>

Denominator

The Crash BASIC ratio denominator is calculated by multiplying the APU by the UF. The APU is calculated by averaging the number of power units in a carrier’s fleet currently, six months previously and 18 months previously. The UF for each carrier is dependent on a carrier’s operating status in which a carrier is categorized as “straight truck” if more than 30 percent of its PUs are single unit vehicles or as “combination truck” if 70 percent or more of its fleet is comprised of combination vehicles.


61 Ibid.
The UF is determined by computing the average vehicle miles traveled (VMT) per APU and adjusts for exposure differences in carrier VMT (as reported on the MCS-150). Table 10 displays the UF applied for both straight and combination fleets.\(^{62}\)

ATRI’s analysis used the FMCSA’s calculation of the APU x UF measure, which is publicly available on the FMCSA’s SMS website within a carrier’s Unsafe Driving BASIC record.

<table>
<thead>
<tr>
<th>Utilization Factors</th>
<th>Straight Fleets</th>
<th>Combination Fleets</th>
</tr>
</thead>
<tbody>
<tr>
<td>VMT per APU</td>
<td>UF</td>
<td>VMT per APU</td>
</tr>
<tr>
<td>&lt; 20,000</td>
<td>1</td>
<td>&lt; 80,000</td>
</tr>
<tr>
<td>20,000 – 60,000</td>
<td>VMT per PU / 20,000</td>
<td>80,000 – 160,000</td>
</tr>
<tr>
<td>60,000 – 200,000</td>
<td>3</td>
<td>160,000 – 200,000</td>
</tr>
<tr>
<td>&gt; 200,000</td>
<td>1</td>
<td>&gt; 200,000</td>
</tr>
<tr>
<td>No recent VMT data</td>
<td>1</td>
<td>No recent VMT data</td>
</tr>
</tbody>
</table>

**Crash BASIC Measure Formula**

The Crash BASIC measure uses the inputs described in the previous section which discusses the ratio numerator and denominator.\(^{63}\) After calculating the Crash BASIC measure it is necessary to place a carrier into a specific safety event group so that carriers are compared to peers with similar safety performance and operational patterns.

\[
\text{Crash BASIC Measure} = \frac{\text{Sum of time and severity weighted applicable crashes}}{\text{APU x UF}}
\]

**Crash BASIC Safety Event Groups**

Carriers are placed in safety event groups based on the number of safety events (e.g., crashes) in which they have been involved. This tiered approach attempts to account for the variability inherent in rates based on small samples or limited levels of exposure. Table 11 displays the safety event groups for the Crash BASIC.\(^{64}\)

---

\(^{62}\) Ibid.

\(^{63}\) Ibid.

\(^{64}\) Ibid.
Table 11. Crash BASIC Safety Event Groups

<table>
<thead>
<tr>
<th>Safety Event Group</th>
<th>Combination Truck Segment</th>
<th>Straight Truck Segment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2-3</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>4-6</td>
<td>3-4</td>
</tr>
<tr>
<td>3</td>
<td>7-16</td>
<td>5-8</td>
</tr>
<tr>
<td>4</td>
<td>17-45</td>
<td>9-26</td>
</tr>
<tr>
<td>5</td>
<td>46+</td>
<td>27+</td>
</tr>
</tbody>
</table>

_Crash BASIC Percentile_

After a carrier’s Crash BASIC measure has been calculated and its safety event group determined, the carrier’s Crash BASIC measure is compared against all other peer carriers within the safety event group. Carriers are assigned a score between 1 and 100 which reflects their percentile rank relative to other carriers, with higher percentile rankings indicating worse safety performance.
Appendix B: Matching Cases

The differences between the carrier-provided crash data and MCMIS data were significant. The carrier-provided data was used to identify which crashes could be attributed to at least one of the five primary cause bins identified in Table 2. MCMIS data was used to calculate Crash BASIC measures and for validating the five-bin, non-preventable crashes represented in the MCMIS dataset. In our sample, more than 50 crashes with five-bin primary causes were unable to be matched to MCMIS records.

Explanations for Variance

There are a multitude of explanations for the variation between the two sources. One or more of the following issues is the likely basis for the inconsistencies between carrier and MCMIS data.

One explanation is the variation present in state accident reporting procedures. For example, not all states use the same definition of injury as FMCSA. Varying definitions among states influence whether states report applicable injuries to FMCSA. This issue is highlighted in UMTRI’s studies on MCMIS reporting rates. Colorado is a prime example; the Colorado accident report form uses the KABCN\textsuperscript{65} scale to classify the severity of an injury but does not identify if individuals were transported for medical treatment.\textsuperscript{66} Conversely, FMCSA defines an injury as “bodily injury to a person who, as a result of the injury, immediately receives medical treatment away from the scene of the accident.”\textsuperscript{67} The inconsistency between these two definitions of injury likely results in crashes that do not meet FMCSA’s criteria to be reported to MCMIS.

Another explanation for why carrier and MCMIS crash records differ relates to insurance. Carriers have knowledge of the full extent of injuries and property damage resulting from crashes as a result of insurance company involvement in CMV crashes and most likely have a definition of injury more broad than FMCSA’s definition. Conversely, FMCSA is a passive participant in the reporting process by only receiving information from state agencies.

Therefore, matching crash records requires some tolerance for ambiguity. To address the differences between the data sources, severity weights from MCMIS were used for Crash BASIC measure calculations. The process for matching crashes from the carrier file to MCMIS is described in Figure 4.

\textsuperscript{65} KABCN scale is comprised of fatal injury (K), incapacitating (A), non-incapacitating but evident (B), complaint of injury (C), and no injury (N).


\textsuperscript{67} Part 390. Federal Motor Carrier Safety Regulations; General. Available Online: https://www.fmcsa.dot.gov/regulations/title49/section/390.5
Figure 4. Process for Matching Carrier and MCMIS Records

1. Commence crash data validation

2. Is the carrier-reported crash DOT-reportable, non-preventable? Does the crash have a five-bin primary cause?
   - Yes
   - No
   - End review. No match found.

3. Does the carrier date match a crash date in MCMIS?
   - Yes
   - Does the MCMIS record have the same number of injuries and fatalities as the carrier record?
     - Yes
     - Does another carrier-reported crash (that is preventable and/or does not have a five-bin primary cause) have the same amount of injuries and fatalities?
       - Yes
       - End review. Match found in MCMIS.
       - No
       - Are there any other distinguishing characteristics for the five-bin primary cause, non-preventable crash? Example: carrier provided crash location
         - Yes
         - End review. Match found in MCMIS. Differences are attributed to accuracy issues.
         - No
         - End review. Match found in MCMIS. Differences are attributed to accuracy issues.
     - No
     - End review. No match found.
   - No
   - End review. No match found.
Appendix C: Examples of Non-Preventable, Not-at-Fault Crashes

Using industry media outlets, ATRI solicited industry stakeholders to provide examples of crashes that should not count against their Crash BASIC. Only a small sample of the received stories and scenarios are included herein, but illustrate why the inclusion of crashes that ignore culpability and preventability determinations can misrepresent whether a driver or carrier is safe.

- On a two lane highway, the driver of an eastbound passenger vehicle looks away from the road briefly to check their cell phone. The car driver drifts into the westbound lane, and strikes the car driver’s side of a CMV, spins around, then strikes a second westbound CMV. Due to the fact that the CMVs involved in this crash belong to the same carrier’s fleet, this crash is counted twice in the carrier’s Crash BASIC measure.

- Team drivers going south on an interstate see a pedestrian on the right shoulder of the road. The pedestrian looks directly at the truck, then runs into the truck’s path. There was not adequate time to stop the vehicle or make an evasive action, and the pedestrian dies in the resulting crash. The team drivers were extremely upset and the carrier incurred over $25,000 in costs and damages.

- While their team driver was in the sleeper berth, an on-duty CMV driver was exiting a highway. On the exit ramp, a passenger vehicle was driving at a high speed toward the CMV, going the wrong way on the exit ramp, and collided head-on with the CMV. The car driver was cited for operating under the influence of alcohol. The driver of the CMV was not injured, but the off-duty driver in the sleeper berth was injured. The CMV’s carrier incurred over $65,000 in damages as a result of this incident.

- On a snowy road, the cars ahead of a CMV stop to avoid hitting a car that slid into the wrong lane. The CMV manages to stop in time to avoid hitting the stopped vehicles in front of it, but is rear ended by the car following it, which then requires a tow. The driver of the car that hit the CMV is not cited by police due to weather conditions, but signs an exoneration card that states that the CMV driver was not responsible for causing the crash.

- A CMV is driving on a two-lane highway under construction, with only one lane in use. The CMV driver stops as directed by a flagman. A vehicle approaching from behind hits the rear end of the CMV at full highway speed. The injured CMV driver is flown to the closest medical facility.

- A passenger vehicle driving too fast for snowy conditions loses control and hits the rear end of a CMV in front of it. Neither vehicle sustained disabling damage. None of the individuals involved sustained injuries. This crash was not DOT-reportable, yet it was still added to MCMIS. The carrier had to launch a Data-Q to have the crash removed from their Crash BASIC.

- A CMV driver traveling on an interstate in snowy weather is notified that the interstate ahead is closed. Shortly after the notification, traffic on the interstate is stopped. The CMV pulls onto the shoulder, parks and turns on their flashers. A car loses control, strikes the trailer, and requires a tow from the scene.
• On the right lane of an interstate, a CMV is travelling behind another CMV. A tire and rim fall off of the first CMV and strike the second CMV. The CMV struck by the tire had inadequate time to evade the oncoming hazard and sustained disabling damage as a result of the incident.

• A police car travelling in front of a CMV pulls over to the side of the road, then attempts to make a U-turn. The police car turns directly into the path of the CMV and the CMV hits the police car. Both vehicles sustain disabling damage and no citations are issued.
Appendix D: Personal Vehicle Liability Limits by State

Laws concerning minimum auto insurance requirements vary from state to state. While minimum coverage levels may differ for different coverage types, bodily injury and property damage liability coverage is mandated by all states. Liability coverage protects the insured from claims made against them in accidents that result in property damage or injuries to another party.

Table 12 displays minimum liability coverage requirements by type and state. The numbers in the right column indicate the minimum coverage for bodily injury per person, maximum bodily injury per accident, and property damage per accident, respectively. For example, 25/50/25 indicates a minimum coverage of $25,000 per each person injured, to a maximum of $50,000 for injuries per accident, and $25,000 of coverage for property damage.

<table>
<thead>
<tr>
<th>State</th>
<th>Type(s) of Coverage Required</th>
<th>Minimum Coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>AL</td>
<td>Bodily Injury and Property Damage Liability</td>
<td>25/50/25</td>
</tr>
<tr>
<td>AK</td>
<td>Bodily Injury and Property Damage Liability</td>
<td>50/100/25</td>
</tr>
<tr>
<td>AZ</td>
<td>Bodily Injury and Property Damage Liability</td>
<td>15/30/10</td>
</tr>
<tr>
<td>AR</td>
<td>Bodily Injury and Property Damage Liability</td>
<td>25/50/25</td>
</tr>
<tr>
<td>CA</td>
<td>Bodily Injury and Property Damage Liability</td>
<td>15/30/5</td>
</tr>
<tr>
<td>CO</td>
<td>Bodily Injury and Property Damage Liability</td>
<td>25/50/15</td>
</tr>
<tr>
<td>CT</td>
<td>Bodily Injury and Property Damage Liability, Uninsured/Underinsured Motorist</td>
<td>20/40/10</td>
</tr>
<tr>
<td>DE</td>
<td>Bodily Injury and Property Damage Liability, Personal Injury Protection</td>
<td>15/30/10</td>
</tr>
<tr>
<td>DC</td>
<td>Bodily Injury and Property Damage Liability, Uninsured Motorist</td>
<td>25/50/10</td>
</tr>
<tr>
<td>FL</td>
<td>Property Damage Liability, Personal Injury Protection</td>
<td>10/20/10</td>
</tr>
<tr>
<td>GA</td>
<td>Bodily Injury and Property Damage Liability</td>
<td>25/50/25</td>
</tr>
<tr>
<td>HI</td>
<td>Bodily Injury and Property Damage Liability, Personal Injury Protection</td>
<td>20/40/10</td>
</tr>
<tr>
<td>ID</td>
<td>Bodily Injury and Property Damage Liability</td>
<td>25/50/15</td>
</tr>
<tr>
<td>IL</td>
<td>Bodily Injury and Property Damage Liability, Uninsured Motorist</td>
<td>20/40/15</td>
</tr>
<tr>
<td>IN</td>
<td>Bodily Injury and Property Damage Liability</td>
<td>25/50/10</td>
</tr>
<tr>
<td>IA</td>
<td>Bodily Injury and Property Damage Liability</td>
<td>20/40/15</td>
</tr>
<tr>
<td>KS</td>
<td>Bodily Injury and Property Damage Liability, Personal Injury Protection, Uninsured Motorist</td>
<td>25/50/10</td>
</tr>
<tr>
<td>KY</td>
<td>Bodily Injury and Property Damage Liability, Personal Injury Protection</td>
<td>25/50/10</td>
</tr>
<tr>
<td>LA</td>
<td>Bodily Injury and Property Damage Liability</td>
<td>15/30/25</td>
</tr>
<tr>
<td>ME</td>
<td>Bodily Injury and Property Damage Liability, Uninsured/Underinsured Motorist</td>
<td>50/100/25</td>
</tr>
<tr>
<td>MD</td>
<td>Bodily Injury and Property Damage Liability, Personal Injury Protection, Uninsured Motorist</td>
<td>20/40/15</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>State</th>
<th>Bodily Injury and Property Damage Liability, Personal Injury Protection, Uninsured Motorist</th>
<th>Bodily Injury and Property Damage Liability</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA</td>
<td>20/40/5</td>
<td></td>
</tr>
<tr>
<td>MI</td>
<td>20/40/10</td>
<td></td>
</tr>
<tr>
<td>MN</td>
<td>30/60/10</td>
<td></td>
</tr>
<tr>
<td>MS</td>
<td>25/50/25</td>
<td></td>
</tr>
<tr>
<td>MO</td>
<td>25/50/10</td>
<td></td>
</tr>
<tr>
<td>MT</td>
<td>25/50/10</td>
<td></td>
</tr>
<tr>
<td>NE</td>
<td>25/50/25</td>
<td></td>
</tr>
<tr>
<td>NV</td>
<td>15/30/10</td>
<td></td>
</tr>
<tr>
<td>NH</td>
<td>25/50/25</td>
<td></td>
</tr>
<tr>
<td>NJ</td>
<td>15/30/5</td>
<td></td>
</tr>
<tr>
<td>NM</td>
<td>25/50/10</td>
<td></td>
</tr>
<tr>
<td>NY</td>
<td>25/50/10</td>
<td></td>
</tr>
<tr>
<td>NC</td>
<td>30/60/25</td>
<td></td>
</tr>
<tr>
<td>ND</td>
<td>25/50/25</td>
<td></td>
</tr>
<tr>
<td>OH</td>
<td>12.5/25/7.5</td>
<td></td>
</tr>
<tr>
<td>OK</td>
<td>25/50/25</td>
<td></td>
</tr>
<tr>
<td>OR</td>
<td>25/50/10</td>
<td></td>
</tr>
<tr>
<td>PA</td>
<td>15/30/5</td>
<td></td>
</tr>
<tr>
<td>RI</td>
<td>25/50/25</td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>25/50/25</td>
<td></td>
</tr>
<tr>
<td>SD</td>
<td>25/50/25</td>
<td></td>
</tr>
<tr>
<td>TN</td>
<td>25/50/15</td>
<td></td>
</tr>
<tr>
<td>TX</td>
<td>25/50/25</td>
<td></td>
</tr>
<tr>
<td>UT</td>
<td>25/65/15</td>
<td></td>
</tr>
<tr>
<td>VT</td>
<td>25/50/10</td>
<td></td>
</tr>
<tr>
<td>VA</td>
<td>25/50/20</td>
<td></td>
</tr>
<tr>
<td>WA</td>
<td>25/50/10</td>
<td></td>
</tr>
<tr>
<td>WV</td>
<td>20/40/10</td>
<td></td>
</tr>
<tr>
<td>WI</td>
<td>50/100/15</td>
<td></td>
</tr>
<tr>
<td>WY</td>
<td>25/50/20</td>
<td></td>
</tr>
</tbody>
</table>
Assessing the Impact of Non-Preventable Crashes on CSA Scores

November 2015

Prepared by the American Transportation Research Institute

950 N. Glebe Road
Arlington, VA
(703) 838-1966
atri@trucking.org
www.atri-online.org