WHITE PAPER:
Compliance, Safety, Accountability:
Assessing the New Safety Measurement System and Its Implications – 2013 Update

January 2014

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</tbody>
</table>

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[Information about the committee members' roles is detailed above.]
# TABLE OF CONTENTS

**LIST OF TABLES AND FIGURES** .......................................................... ii  
**LIST OF ACRONYMS** ............................................................................ iv  
**EXECUTIVE SUMMARY** ...................................................................... 1  
**1.0 BACKGROUND** ............................................................................... 6  
**2.0 METHODOLOGY** ........................................................................... 9  
**3.0 DRIVER RESULTS** .......................................................................... 10  
  3.1 Driver Demographics ........................................................................ 10  
  3.2 CSA Impacts ................................................................................... 12  
  3.3 CSA Test Scores and Number of Training Sessions ....................... 17  
  3.4 CSA Test Scores and Self-Reported Knowledge ............................ 17  
  3.5 CSA Knowledge Test Results .......................................................... 18  
  3.6 CSA Attitudes ................................................................................ 22  
  3.7 Discussion of Findings .................................................................... 24  
**4.0 ENFORCEMENT PERSONNEL RESULTS** ................................... 25  
  4.1 Enforcement Personnel Demographics ......................................... 25  
  4.2 CSA Knowledge Test Results ......................................................... 25  
  4.3 Discussion of Findings .................................................................... 29  
**5.0 CONCLUSION** .............................................................................. 30  
**APPENDIX A** ...................................................................................... 32
LIST OF TABLES AND FIGURES

Table ES1. SafeStat versus CSA................................................................. 1
Table 1. CSA BASICs and Descriptions ..................................................... 7
Table 2. Driver Participants 2011-2013 ....................................................... 10
Table 3. Industry Sectors........................................................................... 11
Table 4. Participant Fleet Size..................................................................... 11
Table 5. Percentage of Correct Responses on Scale 1 Items......................... 19

Figure 1. Truck Driver Representativeness by Age.......................................... 10
Figure 2. Truck Driver Representativeness by Professional Tenure.................. 11
Figure 3. Employment Concerns Due to CSA.............................................. 12
Figure 4. Percent of Truck Drivers Accessing CSA Data................................. 12
Figure 5. Percent of Drivers Accessing PSP Data......................................... 13
Figure 6. Have You Rejected Loads or Equipment?........................................ 13
Figure 7. Do You Believe CSA Has Improved the Overall Quality of Truck Drivers?..... 14
Figure 8. In General, How Effective Do You Believe CSA Has Been in Making Our Roads Safer? ................................................................. 14
Figure 9. If You Think Industry Safety Has Improved As a Result of CSA, Which Factors Deserve the Most Credit? .................................................. 15
Figure 10. Since CSA, Have Deliberate HOS Violations Become Less Common? ...... 15
Figure 11. Employee-Driver Reported Levels of CSA Training and Education .... 16
Figure 12. Does Your Employer Offer Monetary Incentives for Positive Behaviors That Improve CSA Scores? .................................................. 16
Figure 13. CSA Training Session Frequency and Test Scores.......................... 17
Figure 14. Driver-Reported CSA Knowledge Level and Test Scores............... 18
Figure 15. Number of Items Correctly Answered............................................ 18
Figure 16. Percent of Drivers Correctly Answering Each Item......................... 19
Figure 17. Who Can Access Official Driver CSA Scores? ............................... 20
Figure 18. Which BASICs Are Publicly Accessible? ...................................... 20
Figure 19. What Can Influence Safety Event Group Comparisons? .................. 21
Figure 20. What Purpose Do High CSA Scores Serve? ................................... 21
Figure 21. What Are CSA Scores Weighted By? ............................................ 21
Figure 22. What Are the Most Important and Least Important BASICs? .......... 22
Figure 23. How Do You Feel About FMCSA and Enforcement Personnel Using CSA to Measure the Safety Performance of Drivers? ................................................................. 23

Figure 24. How Do You Feel About FMCSA and Enforcement Personnel Using CSA to Measure the Safety Performance of Motor Carriers? ...................................................... 23

Figure 25. Number of Items Correctly Answered ................................................................. 25

Figure 26. Percent of Enforcement Personnel Correctly Answering Each Item .................. 26

Figure 27. Who Can Access Official Driver CSA Scores? .................................................... 27

Figure 28. Which BASICs Are Publicly Accessible? ............................................................... 27

Figure 29. What Can Influence Safety Event Group Comparisons? ..................................... 28

Figure 30. What Purpose Do High CSA Scores Serve? ........................................................ 28

Figure 31. What Are CSA Scores Weighted By? ................................................................. 28

Figure 32. Comparison of the Number of Correct Responses Between Samples ......... 30
LIST OF ACRONYMS

ANOVA  Analysis of Variance
ATRI  American Transportation Research Institute
BASIC  Behavioral Analysis and Safety Improvement Category
BLS  Bureau of Labor Statistics
BMI  Body Mass Index
CDL  Commercial Driver’s License
CMV  Commercial Motor Vehicle
CSA  Compliance, Safety, Accountability
CVSA  Commercial Vehicle Safety Alliance
FMCSA  Federal Motor Carrier Safety Administration
FMCSR  Federal Motor Carrier Safety Regulations
HazMat  Hazardous Materials
HOS  Hours-of-Service
I-C  Independent Contractor
MATS  Mid-America Trucking Show
MCMIS  Motor Carrier Management Information System
MCSAP  Motor Carrier Safety Assistance Program
MPH  Miles-Per-Hour
O-O  Owner-Operator
OOS  Out-of-Service
PSP  Pre-Employment Screening Program
PU  Power Unit
RAC  Research Advisory Committee
RI  Roadside Inspection
RODS  Records of Duty Status
SafeStat  Safety Status Measurement System
SEA  Safety Evaluation Area
SMS  Safety Measurement System
VMT  Vehicle Miles Traveled
EXECUTIVE SUMMARY

Prior to 2010, the Federal Motor Carrier Safety Administration’s (FMCSA) Safety Status Measurement System (SafeStat) was responsible for monitoring motor carrier safety performance. However, critics of SafeStat highlighted program design flaws including measurement (e.g. selecting only certain traffic violations) and enforcement issues (e.g. sole focus on carriers). Due in part to these limitations, FMCSA introduced a new safety measurement system in 2010, Compliance, Safety, Accountability (CSA). Though CSA differs from SafeStat on six key areas, the Federal Motor Carrier Safety Regulations (FMCSR) did not change under CSA (Table ES1).

<table>
<thead>
<tr>
<th>SafeStat</th>
<th>CSA</th>
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<tbody>
<tr>
<td>Four Safety Evaluation Areas (SEA)</td>
<td>Seven Behavioral Analysis and Safety Improvement Categories (BASIC)</td>
</tr>
<tr>
<td>Identifies carriers for compliance reviews</td>
<td>Identifies carriers and drivers for targeted investigations</td>
</tr>
<tr>
<td>Accounts for out-of-service (OOS) and select moving violations</td>
<td>Accounts for all roadside inspections (RI) and violations (including OOS)</td>
</tr>
<tr>
<td>Does not influence safety ratings</td>
<td>Carrier scores are used to guide safety fitness determinations</td>
</tr>
<tr>
<td>Crash risk and violation weightings are not related</td>
<td>Crash risk and violation weightings are related</td>
</tr>
<tr>
<td>Evaluates carriers only</td>
<td>Evaluates carriers and drivers separately</td>
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Despite the changes implemented in FMCSA’s new safety program, many industry stakeholders have expressed concern over how CSA may affect the driver labor pool and carrier competitiveness. For example, certain stakeholders projected the elimination of

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approximately 175,000 drivers due to poor safety records. The removal of these drivers was viewed negatively since thousands of drivers would be placed out of work. Additionally, disparities between SafeStat and CSA methodologies may have unfairly characterized carriers as being “safety deficient” under the new system.

Finally, shippers have become more selective of the carriers they hire and are requesting both the publicly and non-publicly available BASIC scores under CSA. For example, a 2012 study by the American Transportation Research Institute (ATRI) found that 27.6 percent of shippers had terminated existing contracts with carriers based on their BASIC scores. Furthermore, 50.0 percent of shippers noted that poor BASIC scores have deterred them from entering into contracts with new customers even though FMCSA states that BASIC scores do not constitute actual safety ratings. Having shippers use BASIC scores as carrier selection criteria is potentially harmful to carriers’ business operations since ATRI found inverse relationships between collision involvement and carrier BASIC scores in the Driver Fitness and Controlled Substances/Alcohol BASICs.

CSA is still a major concern within the trucking industry as noted by its continued top or near-top ranking in ATRI’s “Top 10” critical issues research over the past three years. Of particular concern to the industry is the relationship between specific BASICs and crash risk, the lack of crash accountability and the need for more transparency in the development of the BASICs and the severity weightings assigned to the violations.

More recently, attention has focused on the disparate enforcement of the number and type of violations issued across states and the potential impact this has on carrier BASIC scores. For example, Transcore Freight Solutions identified that nine of the top 10 states with the highest percentage of carrier alerts for the Vehicle Maintenance BASIC are contiguous and in geographical proximity.

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10 Ibid.
12 Ibid.
the south.\textsuperscript{19} In another example, Vigillo analyzed 2012 violation data from the Motor Carrier Management Information System (MCMIS). Researchers at Vigillo found that at the national level, on average there were approximately 11.97 light violations for every one speeding violation.\textsuperscript{20} State-level comparisons reveal that in Texas there are 321.02 light violations for every speeding violation and in Indiana there are 1.91 light violations for every one speeding violation.\textsuperscript{21} These patterns of enforcement activity present a possible issue for carriers as their BASIC scores may not be wholly reflective of their safety performance, but rather a representation of the enforcement objectives within the states in which they operate. Amid 30 proposals in 2013, ATRI’s Research Advisory Committee (RAC) identified the evaluation of state enforcement disparities as the top research priority.\textsuperscript{22}

Given the ongoing debate surrounding CSA and its impact on industry safety, ATRI initiated a third year of data collection from commercial drivers to update its previous findings on truck driver perspectives on CSA. ATRI surveyed truck drivers in 2011 and 2012, as part of a comprehensive, longitudinal investigation of CSA knowledge, perceptions and impacts.\textsuperscript{23} In March 2013, truck drivers were asked once again to complete both the CSA survey and 14-item knowledge test. An analysis of the knowledge test results illustrates that drivers, on average, accurately answered 5.71 items (out of 14) in 2011, 6.55 items in 2012 and 5.94 items in 2013.

Driver responses averaged across the three-year period revealed:

- Truck drivers maintained a primarily negative perception of CSA as a tool to improve industry safety.
- Approximately one-third of drivers (33.9\%) had not received or participated in any form of CSA training.
- On average, only 5.7 percent of truck drivers were “very supportive” of FMCSA and enforcement personnel using CSA to measure driver safety performance.

On a more positive note, results from this 2013 assessment indicate that:

- More carriers are conducting CSA training and the number of per-carrier CSA training sessions has steadily increased since 2011.
- Approximately 27.6 percent of drivers indicated that their company offered monetary incentives for safe-driving behaviors – an increase from 23.2 percent in 2012 and 25.0 percent in 2011.

\begin{table}
\centering
\begin{tabular}{|c|c|c|}
\hline
Year & CSA Training & Monetary Incentives \\
\hline
2011 & 23.2\% & 25.0\% \\
2012 & 27.6\% & 27.6\% \\
2013 & 27.6\% & 27.6\% \\
\hline
\end{tabular}
\caption{Driver Responses to CSA and Monetary Incentives}
\end{table}

\textsuperscript{19} Ibid.\hfil \textsuperscript{20} Bryan, S. (2013). Is CSA Data Trustworthy? [Webinar]. In ATA’s Exploring the Reliability and Accuracy of CSA Data.\hfil \textsuperscript{21} Ibid.\hfil \textsuperscript{22} ATRI’s Research Advisory Committee (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.\hfil \textsuperscript{23} Lueck, M.D., & Brewster, R.M. (2012). Compliance, Safety, Accountability: Evaluating a New Safety Measurement System and Its Implications. Arlington, VA: American Transportation Research Institute.
• The percentage of truck drivers who were “extremely concerned” about remaining employed due to CSA has decreased by approximately 9.7 percent since 2011 (from 35.5% to 25.8%).

ATRI also initiated an additional data collection in 2013 from the law enforcement community. As stated by FMCSA, the goal of CSA is to create an efficient and effective nationwide safety initiative among its federal and state enforcement partners. This may be a difficult task since previous research conducted by ATRI suggests that uniformity is lacking in the amount and type of CSA training received by enforcement personnel. Among the study’s findings, nearly three-quarters of enforcement personnel noted a need for increased CSA training and education, with approximately one-tenth of participants never receiving any form of CSA training as of 2012.

Enforcement personnel knowledge of CSA is critical for the program to be effective. For example, clean roadside inspections (RI) can actually improve a carrier’s BASIC score and it is the responsibility of the enforcement officer to report clean RIs as well as those that result in violations. However in a previous ATRI survey of enforcement personnel, approximately 40 percent of respondents indicated they had not received any training on RI uniformity standards and processes. When asked about the reporting of clean RI, 6.8 percent of respondents never completed RI reports, while 10.4 percent “almost always” completed RI reports. If enforcement personnel are unaware of uniform RI reporting standards or how this influences carrier and driver BASIC scores, it can detract from CSA effectiveness.

Based on this apparent lack of adequate training among enforcement personnel and the ever-changing nature of CSA, ATRI sought to establish a baseline level of enforcement personnel CSA knowledge. Through a joint effort between ATRI and the Commercial Vehicle Safety Alliance (CVSA), the 14-item knowledge test was administered to enforcement personnel.

Enforcement personnel, on average, correctly responded to 9.32 (SD = 2.13) items. Approximately 20.2 percent of enforcement personnel incorrectly thought that the FMCSRs had changed under CSA, while 6.1 percent did not realize that clean RIs improve driver and carrier BASIC scores.

Future Directions

This report documents the findings of the third year of data collection from commercial drivers on their perceptions and knowledge of CSA. Furthermore, it establishes a baseline level of CSA knowledge among enforcement personnel.

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26 Ibid.
29 Ibid.
Based on the mixed findings from drivers, ATRI is now investigating the correlation between CSA training (content and quantity) and test scores, as well as the relationship between CSA perceptions, knowledge and carrier “safety culture.”

Additionally, the findings from the enforcement personnel knowledge test provide a foundation for future evaluation of these individuals’ knowledge of CSA and how that knowledge impacts enforcement activities.
1.0 BACKGROUND

In 2010, the Federal Motor Carrier Safety Administration’s (FMCSA) introduction of Compliance, Safety, Accountability (CSA) was met with a high level of concern from industry stakeholders. Significant issues relating to CSA included truck driver job security, the program’s accuracy in predicting crash risk and the ability of carriers to remain viable and competitive under the added scrutiny of CSA. Nearly three years later, CSA concerns continue to pervade the industry. In the 2012 American Transportation Research Institute (ATRI) survey on critical issues in the trucking industry, CSA was ranked number one.

CSA was designed to replace FMCSA’s Safety Status Measurement System (SafeStat) with a more targeted and robust system for monitoring known risk centers. CSA did not change the Federal Motor Carrier Safety Regulations (FMCSRs), but rather altered how safety measurements would be calculated. Under CSA, weighted information from crash data and safety violations – available through FMCSA’s Safety Measurement System (SMS) – provide the foundational data needed to assign safety scores. Carriers and drivers receive safety scores across the seven Behavioral Analysis and Safety Improvement Categories (BASICs) (Table 1). However, only five of the seven carrier BASIC scores are publicly available, while all seven of the driver BASIC scores are restricted to the public.

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34 Ibid.
Table 1. CSA BASICs and Descriptions\(^{36}\)

<table>
<thead>
<tr>
<th>BASIC</th>
<th>Description</th>
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<tr>
<td>Unsafe Driving BASIC</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>Hours-of-Service Compliance BASIC</td>
<td>Operation of CMVs by drivers who are ill, fatigued, or in non-compliance with the Hours-of-Service (HOS) regulations. This BASIC includes violations of regulations pertaining to records of duty status (RODS) 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>Driver Fitness BASIC</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>Controlled Substances/Alcohol BASIC</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>Vehicle Maintenance BASIC</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>Hazardous Materials Compliance BASIC*</td>
<td>Unsafe handling of hazardous materials on a CMV. Release of hazardous materials (HazMat) 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>Crash Indicator BASIC*</td>
<td>The Safety Measurement System (SMS) evaluates a motor carrier's crash history. 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>
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\(^{36}\)Carrier scores not publicly available as of the time of this publication.

In 2012, a number of changes were made to CSA which affected several BASIC classifications.\(^{37}\) First, the Hazardous Materials Compliance (HazMat) BASIC replaced the Cargo-Related BASIC.\(^{38}\) Previously, the Cargo-Related BASIC addressed failure to properly secure cargo or the unsafe handling of HazMat. The new HazMat Compliance BASIC addresses the release of HazMat from packages, the absence of shipping papers and the absence of appropriate placards or markings when necessary.\(^{39}\) The cargo securement issues addressed in the original Cargo-Related BASIC are now part of the Vehicle Maintenance BASIC.\(^{40}\) Finally, the Hours-of-Service (HOS) Compliance BASIC replaced the Fatigued Driving


\(^{38}\)Ibid.


\(^{40}\)Ibid.
Previously, the Fatigued Driving BASIC only addressed HOS violations and whether a driver was ill or fatigued. The new HOS BASIC addresses the previous points, but now also incorporates violations pertaining to records-of-duty status (RODS). Other changes to CSA that affect the SMS and BASICs include:

- Removal of speeding violations that are between 1 mile-per-hour (mph) and 5 mph;
- Adjusting severity weights for HazMat violations, paper logbook violations, electronic logbook violations and speeding violations;
- Addition of intermodal equipment violations;
- Clarification of fatality versus injury;
- Clarification of a passenger carrier; and
- Clarification of violations for “driver-only” versus “vehicle-only” inspections.

These frequent changes to CSA further enhance its complexity and make it difficult to analyze historic data. Therefore, a critical objective of this research is to understand how industry perceptions and knowledge levels change over time in light of the ongoing program modifications. Taking into consideration the recent focus on enforcement disparities, it is of particular importance to evaluate the CSA knowledge-level of enforcement personnel. Though enforcement personnel are responsible for enforcing the FMCSRs, it is still important that they be familiar with CSA and the components that specifically relate to their daily work activities, such as reporting clean roadside inspections (RI).

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41 Ibid.
42 Ibid.
2.0 METHODOLOGY

ATRI utilized a longitudinal research approach to compare meaningful differences in driver perceptions, attitudes and knowledge of CSA. ATRI surveyed participants utilizing an online survey, as well as in-person surveys conducted at several truck driver-focused events including the Mid-America Trucking Shows (MATS; 2011, 2012 and 2013) and the 2012 Georgia Truck Driving Championships.

In 2011, ATRI administered a baseline CSA survey that examined driver and carrier perceptions of employment trends, safety behaviors and other impacts associated with the program’s nationwide deployment in December 2010. ATRI also developed and administered a 14-item CSA knowledge test which assessed driver and carrier ability to separate CSA facts from CSA myths that were circulating in the industry, as well as understand key program components.

In 2012, ATRI administered the CSA survey to drivers, carriers, shippers and law enforcement members of the Commercial Vehicle Safety Alliance (CVSA). In addition to the survey, drivers and carriers completed the 14-item knowledge test. The combined findings of the 2011 and 2012 data collection activities are described in the report, Compliance, Safety, Accountability: Evaluating a New Measurement System and Its Implications.44

For the 2013 data collection, ATRI updated the CSA knowledge test to reflect the re-naming of two of the BASICs.45 No other components of the knowledge test were altered. ATRI once again administered the CSA survey and knowledge test to drivers. In addition, ATRI partnered with CVSA to administer the CSA knowledge test to law enforcement personnel (utilizing an online survey).

3.0 DRIVER RESULTS

3.1 Driver Demographics

In total, approximately 7,800 drivers participated in ATRI’s 2011, 2012 and 2013 CSA survey and knowledge tests (Table 2). Of these drivers, 6,870 completed the survey online, while 896 of the participants were surveyed on site at trucking industry events. For the remainder of this section, unless explicitly stated, “drivers, respondents, or participants” will refer to the driver participants from the 2013 data collection only.

Table 2. Driver Participants 2011-2013

<table>
<thead>
<tr>
<th>Year</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>4,555</td>
</tr>
<tr>
<td>2012</td>
<td>1,344</td>
</tr>
<tr>
<td>2013</td>
<td>1,867</td>
</tr>
</tbody>
</table>

Of the 1,867 drivers, 90.7 percent were male and 9.3 percent were female, a slightly higher than expected female representation when compared to the industry-wide average of 4.8 percent.46 The largest age group represented was 45 years to 64 years (68.0%), followed by 26.6 percent between the ages of 25 to 44. As shown in Figure 1, the age distributions in ATRI’s sample deviate slightly from the Bureau of Labor Statistics’ (BLS) trucking industry distributions.47

Figure 1. Truck Driver Representativeness by Age

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Drivers were asked to identify their operating status as either an employee driver (63.4%), an owner-operator (O-O)/independent contractor (I-C) leased to a motor carrier (23.6%), or an O-O with their own authority (13.0%). As shown in Table 3, the Truckload sector (49.7%) had the highest representation, whereas HazMat carriers had the lowest (3.5%). Approximately 48.9 percent of drivers indicated they work for a small fleet (Table 4).

Table 3. Industry Sectors

<table>
<thead>
<tr>
<th>Sector</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Truckload</td>
<td>49.7%</td>
</tr>
<tr>
<td>Less-than-Truckload</td>
<td>6.0%</td>
</tr>
<tr>
<td>Flatbed/Open Deck</td>
<td>12.3%</td>
</tr>
<tr>
<td>Bulk/Tanker</td>
<td>6.8%</td>
</tr>
<tr>
<td>Hazardous Materials</td>
<td>3.5%</td>
</tr>
<tr>
<td>Private Fleet</td>
<td>5.7%</td>
</tr>
<tr>
<td>Specialized</td>
<td>8.1%</td>
</tr>
<tr>
<td>Other</td>
<td>9.2%</td>
</tr>
</tbody>
</table>

Table 4. Participant Fleet Size

<table>
<thead>
<tr>
<th>Number of Power Units</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 5</td>
<td>28.9%</td>
</tr>
<tr>
<td>6 to 15</td>
<td>8.2%</td>
</tr>
<tr>
<td>16 to 50</td>
<td>11.8%</td>
</tr>
<tr>
<td>51 to 250</td>
<td>14.1%</td>
</tr>
<tr>
<td>251 to 500</td>
<td>5.4%</td>
</tr>
<tr>
<td>501 to 1,000</td>
<td>4.7%</td>
</tr>
<tr>
<td>More than 1,000</td>
<td>19.7%</td>
</tr>
<tr>
<td>Don’t Know</td>
<td>7.3%</td>
</tr>
</tbody>
</table>

Drivers with 16 to 20 years of driving experience represented 14.9 percent of the sample, followed closely by those with one to five years’ experience at 14.1 percent (Figure 2).

Figure 2. Truck Driver Representativeness by Professional Tenure

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48 As defined by Lueck & Brewster (2012), a small fleet has 50 or fewer power units.
3.2 CSA Impacts

Hiring Concerns. Twenty-five percent of drivers were extremely concerned that CSA would affect their employment status (Figure 3). However, the intensity of extreme concern has decreased 9.7 percent since 2011.

![Figure 3. Employment Concerns Due to CSA](image)

Additionally, 22.4 percent of respondents believe that the number of truck drivers has been substantially reduced due to CSA, 51.3 percent believe that truck driver employment has been somewhat reduced, while 26.3 percent do not believe a shift in the workforce specifically due to CSA has occurred.

Accessing CSA Data. Only 37.8 percent of employee drivers and 53.2 percent of O-O/I-C leased to a motor carrier had accessed their employer’s CSA data, while 60.8 percent of O-O not leased to a motor carrier had accessed their own data.

Averaged across all three years of driver data, 44.3 percent of truck drivers had accessed their respective employers’ CSA data while 55.7 percent have yet to do so (Figure 4).  

![Figure 4. Percent of Truck Drivers Accessing CSA Data](image)

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As shown in Figure 5, only 28.6 percent of drivers have accessed their personal safety data available through the Pre-employment Screening Program (PSP). Another 40.3 percent indicated that they intended to access their data shortly, while 21.1 percent had not accessed their data. Furthermore, only a fraction (7.5%) of drivers had used DataQs to challenge violation or crash data in their records.

Figure 5. Percent of Drivers Accessing PSP Data

<table>
<thead>
<tr>
<th></th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unaware of PSP</td>
<td>7.4%</td>
<td>10.1%</td>
<td>10.0%</td>
</tr>
<tr>
<td>Won't Access PSP</td>
<td>24.8%</td>
<td>14.3%</td>
<td>21.1%</td>
</tr>
<tr>
<td>Intend to Access PSP</td>
<td>42.1%</td>
<td>43.9%</td>
<td>40.3%</td>
</tr>
<tr>
<td>Have Accessed PSP</td>
<td>25.7%</td>
<td>31.7%</td>
<td>28.6%</td>
</tr>
</tbody>
</table>

CSA Impacts on Operations. Among drivers, 28.3 percent rejected loads and equipment they would have otherwise accepted under SafeStat, which is a 1.6 percent increase from 2011 driver responses (Figure 6).

Two significant changes between SafeStat’s methodology and CSA may be influencing these findings. First, under SafeStat only carriers received safety scores while both drivers and carriers receive safety scores under CSA. Second, SafeStat only evaluated select violations or incidents that resulted in OOS status whereas CSA evaluates all violations. Therefore it is likely that drivers previously engaged in more unsafe behaviors (under SafeStat) than they currently do (under CSA), as the consequences of unsafe behavior may have more negative and immediate impacts on drivers.

Figure 6. Have You Rejected Loads or Equipment?

- Yes 28.3%
- No 71.7%

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51 Ibid.
CSA’s Impact on Safety. More than half of all driver respondents in 2012 (53.2%) and 2013 (52.7%) indicated that CSA had influenced them to conduct more pre-trip and post-trip inspections. These findings suggest that, to an extent, CSA may be positively influencing driver safety behaviors.

As illustrated in Figure 7, only 2.7 percent of drivers believe that CSA has substantially improved the quality of truck drivers, with two-thirds of respondents (66.2%) indicating that CSA has not improved driver quality at all.

**Figure 7. Do You Believe CSA Has Improved the Overall Quality of Truck Drivers?**

Furthermore, only 1.5 percent of drivers feel that CSA has been very effective in improving highway safety, while 20.5 percent feel that CSA has been very ineffective (Figure 8).

**Figure 8. In General, How Effective Do You Believe CSA Has Been in Making Our Roads Safer?**

Drivers who believed that industry safety had improved as a result of CSA were asked which factors they believed were responsible for the improvements. Thirty percent of drivers indicated that shippers utilizing safe carriers are responsible for improving industry safety. Drivers also indicated FMCSA’s quick response to problem identification (24.6%) and driver behavior changes (23.5%) as factors positively influencing industry safety (Figure 9).
Drivers do believe that CSA has had some positive safety impacts, with 28.0 percent indicating that HOS violations have become less common as a result of CSA (Figure 10). Of these 28.0 percent, a reluctance to violate HOS (24.2%), less pressure from carriers (14.2%) and less pressure from shippers (6.8%) are among reasons suggested for decreased HOS violations.

Across the three years, there was an upward trend in the number of drivers receiving CSA training (Figure 11). In 2011, 58.7 percent of employee drivers indicated they had received CSA training, in 2012, 67.8 percent of employee drivers received training, and in 2013, 71.6 percent of employee drivers received training. Furthermore, the percentage of employee drivers receiving multiple training sessions has increased by 16.8 percent between 2011 and 2013.

Even though CSA training has increased from 2011 to 2013, one-third of employee driver respondents (33.9% across all three years) did not receive any training. An additional concern is that the definition of training may vary from carrier to carrier and driver to driver, suggesting that CSA training could differ substantially in quality, depth and breadth. This lack of
consistency becomes an issue for the industry at large, as it is difficult to gauge the impact of CSA training on driver and carrier safety performance.

Figure 11. Employee-Driver Reported Levels of CSA Training and Education

Another finding which could improve future driver retention rates is the emerging practice of incentivizing safe behaviors. According to the driver respondents (27.6%), motor carriers have increased their use of monetary incentives for drivers that demonstrate safety-forward behaviors such as pre-trip inspections (Figure 12). These findings suggest that carriers are recognizing the value of compensating their drivers for positive behaviors, as the 2013 figure increased from 2011 (25.0%) and 2012 (23.2%).

Figure 12. Does Your Employer Offer Monetary Incentives for Positive Behaviors That Improve CSA Scores?

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3.3 CSA Test Scores and Number of Training Sessions

To determine whether meaningful differences exist between driver knowledge and frequency of CSA training, an Analysis of Variance (ANOVA) was used. In 2011, no significant differences were observed between drivers receiving no training, one training session or multiple training sessions relative to their performance on the CSA knowledge test.

However, significant differences were observed between the training levels in 2012 ($F(2, 1072) = 15.01, p < .05$) and 2013 ($F(2, 1695) = 9.46, p < .05$). In 2012 and 2013, drivers that participated in multiple CSA training sessions performed better on the knowledge test than drivers who received one training session and better than drivers who did not complete any training.

On average, drivers who completed multiple training sessions correctly answered 6.2 items, while drivers who completed one training session correctly answered 5.7 items and drivers that did not participate in any training correctly answered 5.8 items (Figure 13).

![Figure 13. CSA Training Session Frequency and Test Scores](image)

These findings suggest that a relationship exists between training session frequency and driver CSA knowledge; however, further investigation into the operational definition of training is necessary to determine whether current CSA training offerings are truly effective.

3.4 CSA Test Scores and Self-Reported Knowledge

A significant, positive relationship existed between self-reported CSA knowledge and CSA test scores ($r = .32, p < .01$). As seen in Figure 14, the average number of test items answered correctly increased as reported knowledge level increased.
3.5 CSA Knowledge Test Results

Findings on the CSA knowledge test suggest that drivers still do not have an adequate understanding of all CSA components, regardless of the length of time that has passed since the program commenced. On average, drivers (2011-2013) are responding to the CSA knowledge test with 43.3 percent accuracy.

As demonstrated in Figure 15, on average, drivers correctly answered:

- 5.71 items ($SD = 1.87$) in 2011;
- 6.55 items ($SD = 2.48$) in 2012, and;
- 5.94 items ($SD = 2.38$) in 2013.

Further analyses reveal that of the 14 items, drivers (across all three years) consistently respond incorrectly to items 3 and 10 (Figure 16). Drivers consistently respond correctly to items 2, 8 and 9 (see Appendix A for the complete knowledge test).
As noted previously, the CSA knowledge test is comprised of two seven-item scales. *Scale 1* measures drivers’ level of awareness regarding myths about CSA components, using a true-false response format. *Scale 2* of the knowledge test measures drivers’ comprehension level of the technical aspects of CSA.

*Scale 1.* A noteworthy finding from Scale 1 is that the only item the 2013 drivers outperformed the 2011 and 2012 drivers on addressed the impact of driver termination on a carrier’s SMS score (Table 5). Furthermore, the 2013 drivers performed worse than the participants in previous years on the items addressing driver physical fitness and FMCSRs. Overall the results indicate that drivers in 2012 performed with greater accuracy on Scale 1 than drivers in 2011 or 2013.

Table 5. Percentage of Correct Responses on Scale 1 Items

<table>
<thead>
<tr>
<th>Drivers understood that:</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>A trucking company <em>cannot</em> remove a bad driver's inspection and crash data from its SMS scores by terminating the driver.</td>
<td>82.6%</td>
<td>84.5%</td>
<td>85.8%</td>
</tr>
<tr>
<td>FMCSA <em>does not</em> evaluate driver physical fitness nor does it penalize drivers with high body mass indexes (BMI).</td>
<td>62.2%</td>
<td>58.4%</td>
<td>54.6%</td>
</tr>
<tr>
<td>CSA <em>does not</em> give FMCSA the authority to revoke a commercial driver’s license (CDL).</td>
<td>27.8%</td>
<td>56.9%</td>
<td>47.6%</td>
</tr>
<tr>
<td>CSA <em>does not</em> take into consideration tickets and warnings drivers receive when operating their personal vehicles.</td>
<td>31.4%</td>
<td>50.5%</td>
<td>41.4%</td>
</tr>
<tr>
<td>FMCSRs <em>have not</em> changed as a result of CSA.</td>
<td>41.5%</td>
<td>47.8%</td>
<td>39.7%</td>
</tr>
<tr>
<td>A trucking company <em>does not</em> inherit past violations from new hires.</td>
<td>22.5%</td>
<td>37.1%</td>
<td>33.1%</td>
</tr>
<tr>
<td>State issued convictions <em>are not</em> part of the SMS formula for calculating BASIC scores.</td>
<td>12.7%</td>
<td>21.9%</td>
<td>13.6%</td>
</tr>
</tbody>
</table>

*Scale 2.* Several items on Scale 2 were multiple response for which drivers were required to select all possible correct answers to receive a point. If a driver chose both correct and incorrect options, the driver would not receive a point.
Overall, drivers are responding with greater accuracy to the Scale 2 items that focus on actions and consequences specific to the driver. This may suggest that drivers are becoming more familiar with the CSA aspects that are directly relevant to their operating status.

Among the 2013 Scale 2 findings:

- **96.7%** of drivers did not know that only FMCSA can access official driver CSA scores.

  **Figure 17. Who Can Access Official Driver CSA Scores?**

- **95.6%** of drivers could not correctly identify the 5 publicly available BASIC scores.

  **Figure 18. Which BASICs Are Publicly Accessible?**

- **67.1%** of drivers did not know that the number of power units (PU), vehicle miles traveled (VMT) and RIs influence safety event groups.
- 59.3% of drivers failed to understand that high CSA scores help prioritize carriers for intervention.

**Figure 20. What Purpose Do High CSA Scores Serve?**

- 55.5% of drivers did not know that CSA scores are weighted by both time and severity.

**Figure 21. What Are CSA Scores Weighted By?**
• 17.3% of drivers failed to realize that clean RIs can improve driver and carrier CSA scores.
• 21.9% of drivers failed to realize that all violations, (including OOS) count against driver and carrier CSA scores.

3.6 CSA Attitudes

Beyond the knowledge test, ATRI’s survey assessed a variety of driver attitudes surrounding CSA. Among the respondents, 71.6 percent of drivers agreed that motor carriers should be able to access driver CSA scores.

Drivers were asked to rank order the seven BASICS in terms of importance to highway safety performance. Figure 22 displays the percentage of respondents who ranked each BASIC as “most important” and “least important.” Of the seven BASICS, Controlled Substances/Alcohol (51.0%), Unsafe Driving (46.3%), and Vehicle Maintenance (35.4%) were ranked most important while the Crash Indicator (32.0%), Driver Fitness (17.0%), and Hazardous Materials Compliance (12.0%) BASICS received the lowest ratings.

Figure 22. What Are the Most Important and Least Important BASICS?

The majority of drivers (53.1%) were opposed to FMCSA and enforcement personnel using CSA to measure driver safety performance, while less than one in five drivers were supportive. As illustrated in Figure 23, driver support was greater in 2011 and slowly declined in 2012 and 2013.
Thirty-seven percent of drivers were opposed to FMCSA and enforcement personnel using CSA to measure motor carrier safety performance, while 35.2 percent of drivers were supportive (Figure 24).

Finally, only 8.9 percent of drivers believe that CSA is better than they had expected, while 48.0 percent believe that CSA is worse than they had expected. Drivers further indicated great dissatisfaction (63.0%) with FMCSA's responsiveness to industry concerns in the development and modification of CSA. Only 9.0 percent of drivers were satisfied with FMCSA's attention to industry concerns.
3.7 Discussion of Findings

As noted, a key objective of this research was to monitor and assess truck driver perspectives on CSA since its deployment in 2010. Based on the findings of ATRI’s surveys, drivers do not feel that CSA has positively influenced safety within the trucking industry. Other findings from the driver surveys illustrate that negative opinions of CSA have steadily increased from 2011 to 2013. Drivers are not satisfied with FMCSA’s approach toward alleviating industry concerns surrounding CSA. Moreover, results indicate that drivers are not significantly improving on their technical knowledge of CSA.

One positive finding is that carrier-provided CSA training has steadily increased from 2011 to 2013. Additionally, the frequency of CSA training is trending toward more carriers providing multiple sessions. The results from the current analyses suggest that drivers’ self-awareness of their CSA knowledge closely relates to their performance on the knowledge test.

Despite these optimistic results, drivers are still responding with less than 50 percent accuracy on the 14-item knowledge test. This may leave industry stakeholders questioning why driver performance is not improving even though the amount of training has increased. Several factors may be responsible. For instance, FMCSA does not require carriers to provide CSA training to their drivers, nor does FMCSA specify to carriers what constitutes adequate training. Therefore, despite the number of training sessions held, the content may not be targeted or rigorous enough to impart sufficient knowledge of CSA components. Likewise, if the training is not delivered on a consistent basis, it is unlikely that retention of materials will occur, given particularly high driver turnover rates.

Future research should focus on CSA training content, delivery methods (particularly for over-the-road drivers), ideal frequency and appropriate evaluation tools for monitoring training efficacy.

4.0 ENFORCEMENT PERSONNEL RESULTS

4.1 Enforcement Personnel Demographics

The Commercial Vehicle Safety Alliance (CVSA) is comprised of motor carrier safety officials at local, state and federal levels across the United States, Canada and Mexico. Ninety-nine United States law enforcement personnel completed ATRI's CSA knowledge test. Of the respondents, 90 represented state-level enforcement, eight were local enforcement, while one represented federal-level enforcement.

The majority of the enforcement personnel described their positions as roadside inspectors (57.6%), followed by patrol officers (45.5%), safety auditors or investigators (24.2%), directors or administrators (15.1%), management (1.0%), and other (13.1%). Among those who selected “other” were compliance reviewers, training coordinators and Motor Carrier Safety Assistance Program (MCSAP) personnel.

4.2 CSA Knowledge Test Results

On average, enforcement personnel correctly answered 9.32 (SD = 2.13) items on the CSA knowledge test (Figure 25). These findings suggest that, relative to the other testing groups, enforcement personnel have a moderate understanding of CSA.

Figure 25. Number of Items Correctly Answered

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58 The CSA knowledge test was distributed by CVSA to enforcement personnel across all 50 states.
59 Percentage total does not equal 100% as participants were instructed to choose all positions that would be applicable to their work duties.
Figure 26 displays the percentage of enforcement respondents that correctly answered each of the 14 items. Enforcement personnel had the most difficulty with items 3 and 10, which address the public availability of BASIC scores, and the individuals who have access to driver CSA scores. However an exceptional number of enforcement personnel (99.0%) correctly answered item 2, which addresses the alteration of a carrier’s SMS score if a driver is terminated (see Appendix A for a complete listing of questions).

Figure 26. Percent of Enforcement Personnel Correctly Answering Each Item

Among the findings for Scale 1 of the knowledge test (CSA myths):

- **99.0%** of enforcement personnel understood that the termination of bad driver *does not* remove this driver’s inspection and crash data from a trucking company’s SMS scores.
- **89.9%** of enforcement personnel were aware the FMCSA *does not* take into account driver physical fitness, or drivers with high BMI.
- **89.9%** of enforcement personnel were aware that FMCSA *does not* have the authority to revoke a driver’s CDL under CSA.
- **86.7%** of enforcement personnel were aware the tickets and warnings drivers receive while operating their personal vehicles *are not* taken into account under CSA.
- **79.8%** of enforcement personnel understood that CSA *did not* modify the FMCSR.
- **61.6%** of enforcement personnel were aware that a new hire’s past driving violations *are not* inherited by the carrier.
- **44.4%** of enforcement personnel were aware that SMS formula for calculating BASIC scores *does not* include state-issued convictions.
Among the Scale 2 technical knowledge findings:

- **92.9%** of enforcement personnel were unaware that official driver CSA scores are *only* accessible by the FMCSA.

  **Figure 27. Who Can Access Official Driver CSA Scores?**

- **86.9%** of enforcement personnel failed to identify the 5 publicly available BASIC scores.

  **Figure 28. Which BASICs Are Publicly Accessible?**

- **48.5%** of enforcement personnel failed to recognize that the number of PUs, VMTs and RIs influence safety event grouping.
• **30.3%** of enforcement personnel did not understand that high CSA scores help prioritize carriers for intervention.

**Figure 30. What Purpose Do High CSA Scores Serve?**

- **46.5%** of enforcement personnel were unaware that CSA scores are weighted by both time and severity.

**Figure 31. What Are CSA Scores Weighted By?**

- **7.1%** of enforcement personnel did not realize that all violations affect driver and carrier CSA scores.
- **6.1%** of enforcement personnel did not realize that clean RIs can improve driver and carrier CSA scores.
4.3 Discussion of Findings

Enforcement personnel knowledge of CSA is important for executing FMCSA's goals of accuracy and uniformity in the program, especially RI procedures.60 Yet, with CSA in its third year of operation, enforcement personnel completed the CSA knowledge test with only an average of 66.5 percent accuracy. Enforcement personnel performed poorly on the items addressing BASICs; however, they performed exceptionally on items that focused on convictions and violations.

Of particular interest however is the finding that 20.2 percent of enforcement personnel incorrectly thought that under CSA the FMCSRs had changed.61 As enforcement personnel are responsible for enforcing the FMCSRs, the uncertainty as to whether or not the FMCSRs have changed under CSA could have an impact on how enforcement personnel address violations during RIs.

Previous research of enforcement personnel and CSA by ATRI found that 11.8 percent had not participated in any CSA-related training.62 In addition, 73.5 percent of participants expressed a desire for more CSA training.63 Finally, enforcement personnel indicated a lack of training on DataQs (20.0%), RI standards (23.3%) and the reporting of RI violations (26.7%).64 Though ATRI's knowledge test did not address RI standards, the different RI inspection levels, or DataQs processes these may be the most pertinent concepts related to CSA for enforcement personnel.

The findings from previous research as well as this current analysis provide a basis for future examination and monitoring of enforcement personnel CSA knowledge and applications. Future research on enforcement should identify the critical CSA knowledge components needed by enforcement personnel to best complete their daily work activities.

63 Ibid.
64 Ibid.
5.0 CONCLUSION

Nearly three years after its implementation, truck driver attitudes toward CSA have not improved substantially. The findings suggest that drivers are dissatisfied (to an extent) with FMCSA’s management of the program and responsiveness to industry concerns. Furthermore, with the program in its third year, drivers are still performing poorly on the knowledge test (42.4% accuracy), indicating the need for greater understanding of CSA. Yet the increase in driver CSA training sessions and monetary incentives for safe driving behaviors may suggest carriers are adopting proactive practices to maintain or improve upon their current safety performance scores. These carrier practices may influence drivers to adapt their behavior and increase their understanding of CSA which may in turn alleviate (to a degree) driver concerns surrounding the program.

In terms of enforcement personnel knowledge test performance, one may expect that these individuals would perform with a high degree of accuracy on the items relevant to RI activities given their vital role in CSA. Yet, one in five enforcement personnel respondents did not realize that the FMCSRs had not changed due to CSA.

A comparison of response patterns between drivers and enforcement personnel reveals that enforcement personnel and drivers responded similarly to the following items:

- **99.0 percent of enforcement personnel** and **85.8 percent of drivers** correctly answered item 2, which addressed the effect that terminating a driver would have on a carrier’s SMS score;
- **86.9 percent of enforcement personnel** and **95.6 percent of drivers** incorrectly answered item 3, which addressed the publicly available BASICs;
- **92.9 percent of enforcement personnel** and **96.7 percent of drivers** incorrectly answered item 10, which addressed access to driver CSA scores.

Furthermore, a comparison of the number of correctly answered knowledge test items reveals that enforcement personnel performed slightly better than drivers (Figure 32).

**Figure 32. Comparison of the Number of Correct Responses Between Samples**
While acknowledging current and past findings on CSA attitudes, perceptions and knowledge, it is important to recognize that CSA is a work in progress, with FMCSA continuing to modify program components. However, to ensure that the program remains effective across all stakeholders, a continual process of data collection and analysis on attitudes, perceptions and knowledge is recommended to ensure that improvements are identified and instituted by FMCSA, law enforcement, motor carriers and drivers.
1. When a trucking company hires a new driver, the company inherits that driver’s past violations.

☐ True  ☒ False

Rationale:
- Carriers do not inherit any of a newly hired driver’s past violations; only those inspections that a driver receives while driving under a carrier’s authority can be applied to a carrier’s SMS record.\(^{65}\)

2. A trucking company can remove a bad driver’s inspection and crash data from its Safety Measurement System (SMS) scores by terminating the driver.

☐ True  ☒ False

Rationale:
- All inspections and crashes that a CMV driver receives while under the authority of a carrier will remain part of the carrier’s SMS data for two years unless overturned through the DataQs system (https://dataqs.fmcsa.dot.gov), even if the carrier terminates the driver.\(^{66}\)

3. Which BASIC scores are publicly accessible? (check all that apply)

☒ Hours-of-Service (HOS) Compliance scores
☒ Crash Indicator scores
☒ Driver Fitness scores
☒ Controlled Substances/Alcohol scores
☒ Hazardous Materials scores
☒ Vehicle Maintenance scores
☒ Unsafe Driving scores

Rationale:
- The public can view any carrier’s BASIC percentile ranks for five of the seven BASICs: Unsafe Driving, Fatigued Driving (HOS), Controlled Substances/Alcohol, Driver Fitness and Vehicle Maintenance.\(^{67}\)

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\(^{66}\) Ibid.

4. State issued convictions are part of the SMS formula for calculating BASIC scores.

- [ ] True
- ✗ False

**Rationale:**
- The data kept by a State (i.e. tickets, citations, written warnings, convictions) and the data that are kept in the SMS (i.e. violations from RI and crash reports) are separate.  

5. CSA gives FMCSA the authority to revoke a driver’s CDL.

- [ ] True
- ✗ False

**Rationale:**
- CSA does not give FMCSA the authority to remove drivers from their jobs and cannot be used to rate drivers or to revoke a CDL; only State agencies responsible for issuing licenses, CDL or otherwise, have the authority to suspend them.

6. As part of CSA, FMCSA evaluates the physical fitness of drivers and penalizes drivers with high body mass indexes (BMIs).

- [ ] True
- ✗ False

**Rationale:**
- While research data indicate that a driver’s BMI is a risk factor for identifying drivers that may have sleep apnea, neither FMCSA nor the CSA program currently has any rules that restrict who can be a CMV driver based on BMI, weight or neck size.

7. The content of Federal Motor Carrier Safety Regulations (FMCSRs) has changed as a result of CSA.

- [ ] True
- ✗ False

**Rationale:**
- CSA has not changed any of FMCSA’s regulations, although FMCSA is advocating for a future rule change to alter the carrier safety rating process for determining whether or not a carrier is unfit.

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69 Ibid.
70 Ibid.
8. Under CSA, only out-of-service (OOS) violations are counted in the measurement system.

☐ True
☒ False

Rationale:
- All safety-based RI violations count, not just OOS violations.\(^{72}\)

9. Clean roadside inspections can actually improve a driver or carrier’s CSA scores.

☒ True
☐ False

Rationale:
- When the BASIC scores are being calculated, a clean inspection (i.e. an inspection with no violations for a particular BASIC) will lower scores on the corresponding measure.\(^{73}\)

10. Who has access to official driver CSA scores? (check all that apply)

☐ All trucking companies
☐ The company that currently employs the driver
☐ The driver him/herself
☐ FMCSA enforcement staff during motor carrier investigations
☐ Insurance companies
☐ Third party logistics companies
☐ Third party vendors who market driver scorecards

Rationale:
- Currently, the Driver SMS results are being used strictly as an investigative tool for law enforcement and are not available to carriers, drivers or the public.\(^{74}\) While some third-party vendors are developing and marketing CSA driver scorecards, FMCSA does not provide these companies with access to driver violation histories and will not validate any vendors’ scorecards or data.\(^{75}\)

\(^{71}\) Ibid.
\(^{74}\) Ibid.
11. CSA scores are weighted by: (check all that apply)

- [x] Time (older events are weighted less than recent ones)
- [x] Severity (events closely linked with crash risk or crash severity are weighed more)
- [ ] Nothing

**Rationale:**
- Violations are classified into a BASIC and are then time weighted, severity weighted and normalized to form a quantifiable measure for each BASIC.\(^{76}\)

12. Which of the following does the FMCSA take into account in order to compare among carriers with different levels of exposure in various BASICS? (check all that apply)

- [x] Number of power units
- [x] Vehicle miles traveled (VMTs)
- [x] Number of inspections

**Rationale:**
- The number of driver inspections normalizes driver-related BASICS (Fatigued Driving, Driver Fitness and Controlled Substances/Alcohol); the number of vehicle inspections normalizes vehicle-related BASICS (Vehicle Maintenance and Cargo-Related); and carrier size (i.e. a hybrid PU and VMT measure) normalizes BASICS whose violation behaviors typically prompt an inspection (Unsafe Driving and Crash Indicator).\(^{77}\)

13. CSA takes into consideration tickets and warnings drivers receive when operating their personal vehicles.

- [ ] True
- [x] False

**Rationale:**
- Tickets or warnings that CMV drivers receive while operating their personal vehicles do not count in the SMS.\(^{78}\)

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\(^{77}\) Ibid.

14. Under CSA, BASIC scores higher than the specified threshold: (check all that apply)

- identify potentially at-risk carriers and help prioritize them for intervention
- indicate that a carrier is unsafe and should not be used
- accompany fines if the scores do not drop lower than the threshold in a pre-specified amount of time

Rationale:

- FMCSA’s website for accessing SMS Results issues the following statement, labeled Use of SMS Data/Information:\(^79\)

The data in the Safety Measurement System (SMS) is performance data used by the Agency and Enforcement Community. A ▲ symbol, based on that data, indicates that FMCSA may prioritize a motor carrier for further monitoring. The ▲ symbol is not intended to imply any federal safety rating of the carrier pursuant to 49 USC 31144. Readers should not draw conclusions about a carrier’s overall safety condition simply based on the data displayed in this system. Unless a motor carrier in the SMS has received an UNSATISFACTORY safety rating pursuant to 49 CFR Part 385, or has otherwise been ordered to discontinue operations by the FMCSA, it is authorized to operate on the nation's roadways.

\(^79\) Available Online: http://ai.fmcsa.dot.gov/sms/