



Commercial Driver Safety Risk Factors

OVERVIEW

The study examined an array of driver and situational factors to determine their prevalence and relationship to crash or moving violation risk among more than 21,000 commercial motor vehicle (CMV) drivers. These risk factors consisted of personal factors, such as demographic characteristics, medical conditions (e.g., diabetes/elevated blood sugar, high blood pressure, obstructive sleep apnea [OSA]), personal attitudes, and behavioral history.

The study linked risk factors with characteristics of individual drivers and their driving records—especially the occurrence of crashes. The prospective study design observed these drivers for up to 3 years using data from carrier and Federal sources. The study collected driver exposure data and treatment (yes/no) information for the medical conditions. Key findings from the study are presented in Table 1.

STUDY APPROACH

Interested drivers completed initial study materials during a driver orientation session with the participating carrier at one of eight recruitment sites across the United States. Safety outcomes included crash data from the participating carrier and crashes and moving violation convictions from national datasets. Depending on the analysis, exposure included the driver’s tenure at the participating carrier during the study or the amount of time under observation during the study.

Data from over 21,000 drivers were collected; 20,753 drivers were included in the analyses. More specifically, a total of 13,724 Medical Examination Reports,¹ 11,414 Initial Driver Surveys, and 5,790 Brief Medical Screens were collected. The median tenure for drivers at the participating carrier was 114 days. The median number of days under observation for each driver was 636 days. Drivers in the study were involved in a total of 2,775 on-road crashes as recorded by the participating carrier (1,438 were deemed preventable by the carrier), 741

Table 1. Key findings.

Research Question	Study Finding
Crash Risk for Medical Conditions: Which medical conditions and treatments had an impact on future crash and/or moving violation risk?	Overall, drivers being <i>treated</i> for certain medical conditions, such as diabetes/elevated blood sugar, high blood pressure, and OSA, were no riskier than drivers without that same medical condition. In some age groups, treated drivers were less risky than those who did not have the medical condition.
Crash Risk by Prior Moving Violation: Did prior moving violations have an impact on future crash and/or moving violation risk?	Prior moving violation convictions in the last 3 years were associated with increased crash and moving violation risk.
Crash Risk by Age and Driving Experience: Did driver age and driving experience have an impact on future crash and/or moving violation risk?	In general, more experienced drivers in the study sample age 52 and older were less likely to be involved in crashes or moving violation convictions compared to less experienced drivers in the study sample age 20-33. Note there was 1 driver that was age 20 out of over 21,000 drivers in the study.
Obstructive Sleep Apnea Predictors: Which predictors were associated with a diagnosis of OSA?	For drivers in the study sample, body mass index (BMI > 35.03) was the best predictor, followed by being male, diagnosed high blood pressure, and age (>33.5 years), and to a lesser extent the Berlin Questionnaire (multiple choice self-assessment for OSA based on snoring, apneas, daytime sleepiness, and blood pressure).

¹ At the time this study was conducted, FMCSA had not yet implemented its Medical Examination Report (MER Form), MCSA-5875. Thus, data collected during this study may differ from data currently collected via FMCSA’s MER Form.

Department of Transportation recordable crashes, 815 crashes in the Commercial Driver's License Information System (CDLIS), and 1,614 moving violation convictions. Preliminary analyses found that drivers' age strongly correlated with crash rate, but also with most of the medical conditions. To adjust for this potential confounding and interacting effect, the analyses were stratified by age ranges (i.e., 20–33, 34–42, 43–51, and 52 and older). Note there was 1 driver that was age 20 out of over 21,000 drivers in the study.

FINDINGS

Prevalence of Medical Conditions

The prevalence of obesity was significantly higher in the study population than in the general working population (58.4 percent versus 30.5 percent, respectively).² Study findings indicate that obesity itself does not increase crash or violation risk; the risk is increased by the comorbid health conditions associated with obesity (such as OSA).³ For example, drivers aged 34–42 with untreated OSA were 78.6 percent more likely to be convicted of a moving violation compared to drivers in that same age group who did not have OSA.

Similarly, the prevalence of tobacco use was significantly higher in the study population than in the general working population (60 percent versus 18.9 percent, respectively). Again, study findings indicate that tobacco use itself has no impact on safety outcomes, but untreated comorbid conditions (such as lung/chest disease)⁴ can increase crash risk. In the current study, for example, drivers over 52 with an untreated lung and chest condition were 3.72 times more likely to be involved in a total carrier crash compared to drivers over 52 who did not have such a condition.

The 3 most commonly diagnosed medical groupings (out of 38) in the study population were high blood pressure (24.39 percent), diabetes/elevated blood sugar (9.38 percent), and OSA (7.15 percent).

Safety Outcomes

Table 2 (page 3) summarizes the key safety outcomes for study population drivers with treated diabetes/elevated blood sugar, high blood pressure, or OSA compared to (1) drivers who did not have the condition and (2) drivers who had the condition but were not receiving

treatment. Statistically significant findings related to these conditions were found among certain age groups, most often ages 34–42 or 43–51. As shown in Table 2, for diabetes/elevated blood sugar, high blood pressure, and OSA, in certain age groups, treated drivers were less risky than drivers without the condition. For high blood pressure and OSA, in certain age groups, treated drivers were less risky than untreated, diagnosed drivers.

An increase in risk (compared to baseline drivers in the study) in one or more of the safety outcomes was usually associated with a driver not receiving treatment or the driver not being officially diagnosed with the medical condition (thus, not receiving treatment). Those drivers who did receive treatment for a diagnosed medical condition were generally no riskier than drivers who were not diagnosed with the medical condition.

One of the more important findings was the effect of age on safety events and the relationship of age to BMI and medical conditions. Older drivers who had more CMV driving experience exhibited lower rates of safety events. Despite having a lower rate of crashes or moving violations as a group, older drivers on average also had a higher BMI and more medical conditions than younger drivers.

LIMITATIONS

- Due to the limited sample size, the study did not find statistically significant differences for many of the medical conditions considered.
- Exposure was measured in calendar days, not vehicle miles traveled or hours driving.
- Drivers who completed the Initial Driver Survey reflect a convenience sample, not a random sample.
- “Treatment” for medical conditions did not consider the specific type of treatment or the efficacy of the specific treatment. Different types of treatment are likely associated with different efficacies and impacts on the safety outcomes.
- Once drivers left the participating carrier, the research team had no way of knowing whether that driver continued as a CMV driver. Thus, the analyses using national crashes and violations may be impacted (e.g., drivers with poor safety records and unable to find employment would have zero crash risk).

² Weighted estimates in working adults from the 2010 National Health Interview Survey.

³ Must, A., Spadano, J., Coakley, E.H., Field, A.E., Colditz, G., & Dietz, W.H. (1999). The disease burden associated with overweight and obesity. *Journal of American Medical Association*, 282(16): 1,523-1,529.

⁴ Centers for Disease Control and Prevention (US); National Center for Chronic Disease Prevention and Health Promotion (US); Office on Smoking and Health (US). *How Tobacco Smoke Causes Disease: The Biology and Behavioral Basis for Smoking-Attributable Disease: A Report of the Surgeon General*. Atlanta (GA): Centers for Disease Control and Prevention (US); 2010. 7, Pulmonary Diseases.



Table 2. Safety outcomes (adjusted for age and BMI) for drivers with treated diabetes/elevated blood sugar, treated OSA, and treated high blood pressure, compared to (1) study drivers without those conditions and (2) study drivers who had the condition but were not receiving treatment.

Crash/Moving Violation Category	Findings
Safety Outcomes for Treated Drivers Compared to Drivers without the Conditions (Baseline)	
Carrier-Defined Preventable Crashes	<p>Treated OSA:</p> <ul style="list-style-type: none"> • Drivers aged 34-42 with treated OSA were 95.9% less likely to be involved in a carrier preventable crash compared to study drivers without OSA. <p>In all other age groups, there were no statistically significant differences in this safety outcome between drivers with treated OSA and drivers without the condition.</p>
National Crashes as Reported to MCMIS	<p>Treated Diabetes/Elevated Blood Sugar:</p> <ul style="list-style-type: none"> • Drivers aged 43-51 with treated diabetes/elevated blood sugar were 50% less likely to be involved in a national crash compared to study drivers without diabetes/elevated blood sugar. <p>In all other age groups, there were no statistically significant differences in this safety outcome between drivers with treated diabetes/elevated blood sugar and drivers without the condition.</p>
Moving Violation Convictions found in CDLIS	<p>Treated High Blood Pressure:</p> <ul style="list-style-type: none"> • Drivers aged 34-42 with treated high blood pressure were 40% less likely to be involved in a moving violation compared to study drivers without high blood pressure. <p>In all other age groups, there were no statistically significant differences in this safety outcome between drivers with treated high blood pressure and drivers without the condition.</p>
Safety Outcomes for Treated Drivers Compared to Drivers with the Conditions Who Were Not Receiving Treatment	
Carrier-Defined Preventable Crashes	<p>Treated OSA:</p> <ul style="list-style-type: none"> • Drivers aged 34-42 with treated OSA were 92.2% less likely to be involved in a carrier preventable crash than untreated drivers with OSA. • Drivers aged 43-51 with treated OSA were 68.9% less likely to be involved in a carrier preventable crash than untreated drivers with OSA. <p>In all other age groups, there were no statistically significant differences in this safety outcome between drivers with treated OSA and drivers with untreated OSA.</p>
National Crashes as Reported to MCMIS	<p>Treated OSA:</p> <ul style="list-style-type: none"> • Drivers aged 43-51 with treated OSA were 59.7% less likely to be involved in a MCMIS-reportable* crash compared to untreated drivers with OSA. <p>In all other age groups, there were no statistically significant differences in this safety outcome between drivers with treated OSA and drivers with untreated OSA.</p>
Moving Violation Convictions found in CDLIS	<p>Treated High Blood Pressure:</p> <ul style="list-style-type: none"> • Drivers aged 20-33 with treated high blood pressure were 69.3% less likely to be convicted of a moving violation compared to untreated drivers with high blood pressure. Note there was 1 driver that was age 20 out of over 21,000 drivers in the study. • Drivers aged 34-42 with treated high blood pressure were 72.6% less likely to be convicted of a moving violation compared to untreated drivers with high blood pressure. • Drivers aged 52 or older with treated high blood pressure were 51.5% less likely to be convicted of a moving violation compared to untreated drivers with high blood pressure. <p>In the 43-51 age group, there were no statistically significant differences in this safety outcome between drivers with treated high blood pressure and drivers with untreated high blood pressure.</p> <p>Treated OSA:</p> <ul style="list-style-type: none"> • Drivers aged 52 or older with treated OSA were 71.9% less likely to be convicted of a moving violation compared to untreated drivers with OSA. <p>In all other age groups, there were no statistically significant differences in this safety outcome between drivers with treated OSA and drivers with untreated OSA.</p>

* A crash is MCMIS-reportable if it involves a vehicle meeting certain thresholds (i.e., a CMV) and results in a minimum grade of damage or injury, or in a fatality.

To read the complete report, please visit: <https://rosap.ntl.bts.gov/view/dot/49620>

