Truck Driver Safety Investigation

A Survey of Truck Drivers: Cheyenne, WY

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Editors' Note

This report contains the results of a project conducted during June - August 2017 as part of the national Occupational Health Internship Program (OHIP).[i] The OHIP is sponsored by the Association of Occupational and Environmental Clinics, the National Institute for Occupational Safety and Health, the Council of State and Territorial Epidemiologists and other partners. The OHIP provides college students the opportunity to gain exposure and experience in the field of occupational health and safety, while supporting the efforts of a host organization to investigate the needs of workers in under-served or high-hazard jobs.

For this project, the Department of Workforce Services partnered with the Wyoming Trucking Association and the Wyoming Highway Patrol to host two OHIP students to investigate the safety experiences and needs of truck drivers entering Wyoming through Cheyenne Ports of Entry. The research and findings contained in this report reflect the work of the OHIP students, and do not necessarily represent the official position of the host agencies or OHIP sponsors. However, these agencies stand behind this work as information worthy of sharing with the public, researchers, policy makers and others who have a stake in truck driver safety in Wyoming and across the nation.

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[i] Occupational Health Internship Program: http://aoec.org/ohip/about-ohip/

Executive Summary

Truck driving is an important industry throughout the United States and in Wyoming, where the transportation and warehousing industry makes up around 7% of state GDP, compared to only 3% nationally (BEA, 2017). However, this industry is also a dangerous one. Year after year, transportation incidents are the leading cause of workplace death, transportation and material moving occupations account for the highest numbers of workplace deaths, and the transportation and warehousing industry sector experiences one of the highest occupational death rates in the country. In 2015, 1,301 transportation and material moving workers in the U.S. suffered a fatal work-related injury (BLS CFOI, 2015). In recent years in Wyoming, the transportation and warehousing industry has accounted for 25% of all fatal work-related injuries (WY DWS, 2017).

During summer 2017, the Wyoming Department of Workforce Services and the Wyoming Trucking Association hosted two interns from the Occupational Safety and Health Internship Program (OHIP) to pilot, administer and analyze a survey of long-haul and other truck drivers at the Cheyenne Ports of Entry. The survey asked questions about commercial driver's license obtainment, experiences driving in Wyoming, the best methods of communication while in Wyoming, priority hazards and barriers to safety. The survey also asked several questions about driver and management attitudes toward health and safety practices.

While the results of this study are not representative of all truck drivers traveling through Wyoming, they still provide new and valuable insights not available elsewhere. In all, 270 drivers participated in the survey. About 90% were driving heavy, class 8 vehicles, primarily dry vans and refrigerated vans (Table 1). Most drivers interviewed had driven through Wyoming before and indicated that high-wind/blow-over risk, winter weather, construction zones and other drivers (commercial and non-commercial) are the top hazards they face on the road (Figures 4 & 5). The most preferred method of communication was the Wyoming Department of Transportation (WYDOT) 511 App or other mobile apps (Table 10). Over 70% consistently responded that they strongly agreed that their management had positive attitudes toward safety culture (Table 11). However, upwards of 40% of drivers responded that they sometimes or often drive when fatigued or in bad weather if faced with certain scheduling pressures (Table 13).

Other issues highlighted in this report are the unintended consequences of hours of service restrictions, the electronic logging mandate and the unintended consequences of that mandate, the need for more parking and the need for more training.

Part I: Introduction

Background

Although it only accounts for 3% of United States GDP, the transportation and warehousing industry is vital to the way the United States economy functions (BEA, 2017). Truck transportation is the main way our goods move from ports on the coasts, from Mexico and Canada, and onto the shelves of our local stores. Many of these goods pass through Wyoming on interstate thoroughfares.

Truck drivers account for approximately 3.5 million of the workforce in the United States, with over 65% of these workers driving in the heavy and tractor-trailer industry (ATA, 2017; Chen, 2016). In Wyoming, the heavy and tractor-trailer driving industry (Standard Occupational Classification[ii] 53-3032) employed 6,210 individuals in 2016 (BLS OES, 2016). Out of every thousand workers in Wyoming, around 22.5 work in this field. This gives Wyoming a location quotient of 1.85 (the fifth highest in the nation), meaning that the state workforce is 1.85 times more concentrated with this occupation than the rest of the country. As for light truck and delivery services drivers (Standard Occupational Classification 53-3033), in 2016 Wyoming had a total employment of 1,510, with a location quotient of 0.90 (BLS OES, 2016). In addition to these in-state employment numbers, many out-of-state truck drivers pass through Wyoming every day on major highways such as I-80, I-25 and U.S. 85. According to the Bureau of Economic Analysis, the transportation and warehousing industry makes up about 7% of Wyoming's GDP (BEA, 2017).

Not only are trucks an immense economic presence, but a large physical presence as well. Cars, motorcycles, buses, and even bicycles and pedestrians share the road with truck drivers. Many do not realize the difficulties truck drivers face on the road, or the lengths which some drivers go to in order to keep themselves and other drivers safe. Truck driving is a dangerous profession for both truck drivers and the motoring public. Heavy and tractor-trailer drivers were 12 times more likely to die on the job than the general population of the U.S. in 2012 (Chen et al, 2015). From 2012-2016, Wyoming had a total of 116 fatal crashes involving a truck, which resulted in 29 truck driver deaths and a total of 143 deaths overall (WYDOT, 2017).

Because of these statistics and with a goal to improve driver safety, the Wyoming Department of Workforce Services (DWS) and the Wyoming Trucking Association (WTA) took on two Occupational Health Internship Program (OHIP) interns to administer and analyze a truck driver survey in summer 2017. The survey was designed to examine Wyoming-related weather and traffic hazards, as well as general hazards and safety practices, that most impact driver health and safety on Wyoming roadways. The results of this survey are summarized in this report.

[ii] Standard Occupational Classification (SOC) is used by U.S. federal government agencies collecting occupational data.

Critical Issues and Definitions

This section reviews several critical safety concerns for the trucking industry, as well as key themes and terms that will be referenced throughout this report.

Driver Shortage

The American Trucking Associations (ATA) estimates that by 2026 there will be a potential shortage of 174,000 drivers, compared a shortage of 36,500 drivers in 2016 (Costello, 2017). Research suggests that the three main factors influencing this shortage are competition within the industry, driver qualifications/requirements and workforce demographics (Short, 2014).

Industry deregulation in the 1980s led to increased competition in the industry and the number of motor carriers rocketed from 20,000 to 500,000 within four decades (Short, 2014). Competition reduced the price of trucking services. From 2010-2013 average operating margins decreased from 3.8 to 3.4% (Short, 2014). A report by the American Transportation Research Institute (ATRI) explains that the downward pressure on prices meant that the carriers could not afford higher wages to meet market demands (ATRI, 2016). This led to depressed wages across the labor market, which partially resulted in high turnover rates. High turnover continues to be a hallmark of the industry, although it has been decreasing in recent years, with "historically low" turnover rates for the first quarter of 2017 at 74% for large truckload fleets, 66% for small truckload fleets (ATA, July 2017).

It is suggested that qualifications required to become a commercial vehicle driver are also barriers to entry into the labor market. The cost of training and the ease of license loss due to citations, conviction or medical conditions are examples of the barriers that are discouraging individuals from becoming truck drivers (Short, 2014).

Lastly, young drivers are not entering the industry in the quantities needed to replace the retirees. The ATRI suggests that the biggest obstacle to entry is the minimum age of 21 required to obtain a commercial driver's license (CDL) that is valid for interstate transportation, a rule that was instated with the Commercial Motor Vehicle Safety Act of 1986 (ATRI, 2016). It is argued that, by this age, individuals would have chosen another career path in the 3-year period after high school that they were not allowed to obtain a full CDL.

Crash Rates

During 2003-2008, the average number of occupational highway transportation deaths per year in the U.S. for all industries was 1,362 (CDC, 2011). Workers aged 65 or older accounted for the highest fatality rates, followed by those aged 55-64. Male workers had a significantly higher fatality rate than female workers. The truck transportation industry was the greatest contributor to this occupational highway transportation death count and accounted for the highest rate. Geographically, the Mountain, Northwest, Central, and South regions had the highest all-industry occupational highway transportation fatality rates, with Wyoming ranking among the states with the highest rates (CDC, 2011).

The national overall truck crash rate has been decreasing since 2006 from 16 crashes per 100 million vehicle miles traveled (VMT) to around 13 crashes per 100 million VMT (Park and Pierce, 2013). However, by class, medium duty crash rates have been increasing, affecting the downward trend in the overall crash rate. This increase was highest in urban areas and during periods with economic expansion, notably around 2006, and the crash rate index (CRI) was higher than usual even when accounting for the changes in VMT. One suggested explanation for the increase in the medium duty truck CRI is a decline in the driver quality, as the highest CRI was observed during economic expansion. The high demand for truck drivers during that period could have led to less stringent hiring practices to overcome a shortage of qualified drivers. Additionally, many medium duty truck drivers are not held under the same rules and regulations as their fellow heavy duty truck drivers (Park and Pierce, 2013).

The FMCSA released data in 2005 to determine the causes and contributing factors in crashes that involved drivers of large trucks. The FMCSA emphasizes in this report that the variables measured do not indicate the causes of the crashes, but rather provide an understanding of the variables contributing to crash causation. Their data showed that in 55% of truck crashes overall, the truck was assigned as the "critical reason" for the crash, but in two-vehicle crashes involving a car and a truck, passenger cars were assigned the "critical reason" more often at 56%, compared to trucks at 44% of the time (FMCSA, 2005). Drivers in our study expressed concern that cars are not educated on how to share the road with semi-trucks, and these data, while not indicating fault, but rather critical reason for the critical event that led to the crash, may show there is some validity to that concern.

Hours of Service and Electronic Logging

Hours of Service (HOS) regulation refers to the rules governing the maximum amount of hours drivers are allowed to spend on duty or driving. Regulation of hours of service began in the 1930s as a way to "protect drivers from being forced [by employers] to work long and unsafe hours" (Monaco and Williams, 2000). These rules continue to exist today to prevent drivers from driving too many hours, which could result in unsafe behaviors for the drivers and others on the road, such as driving while fatigued.

One of the most commonly mentioned Hours of Service regulation is referred to as "the 14 hour rule." This rule states that drivers are allowed to drive for 11 hours maximum within a 14 hour shift. Drivers must take a 30-min break after 8 hours of continuous driving. Also, drivers may not drive after 60 or 70 hours on duty in 7 or 8 consecutive days respectively. The clock on these 60 or 70 hours can be "restarted" if a driver takes a 34 hour break between two shifts. Finally, drivers using the sleeper berth provision can "pause" their 14 hour shift by spending 8 hours in their sleeper berth mid-shift and an additional 2 hours in the sleeper berth, off duty, or any combination of the two.

Although these regulations are meant to protect drivers, concerns have surfaced about the drivers' lack of flexibility as a result of these regulations. For example, 30% of respondents to a survey sent out to truck drivers by the ATRI would like more flexibility in the sleeper berth provision to allow them to rest whenever they are tired (ATRI, 2016).

To further complicate the hours of service rules, on-duty time includes not just driving time, but also activities for

which many drivers do not get paid and still count against their 14 hour shift, such as waiting for loading or unloading. These delays result in longer trips and ultimately, cause drivers to lose money. This situation may cause drivers to keep driving even though their 14 hours are up because they drove so little of the shift and still need to get their loads delivered.

This time squeeze causes some drivers to drive fatigued or to drive more hours than legally allowed. According to some studies, up to 73% of drivers have been found to be hours of service violators, and it is common practice to fake HOS log books in order to be able to drive more hours (Monaco and Williams, 2000; Viscelli, 2016). Faking log books has long been practiced as a way to cope with the restrictions drivers feel from the 14 hour rule so that they can make on-time deliveries and get paid.

However, Hours of Service and log books are becoming increasingly more burdensome in the eyes of drivers as technology begins to play a larger role. Larger companies have mostly shifted to using Electronic Logging Devices (ELDs), and in December 2017, all trucks were required to switch to electronic logs following the ELD mandate. With ELDs in place, drivers can no longer fake their logbooks in order to get around HOS restrictions as they had in the past. For some drivers, this completely disrupts their work-sleep balance, and may cause more fatigue as drivers race to "beat the clock" on the ELDs. Some studies predict enforcement of ELDs will result in loss of productivity up to 10% (ATRI, 2016). And, although the ELD mandate includes anti-harassment policies to protect driver privacy, drivers are concerned about privacy invasion once ELDs can track their every move (ATRI, 2016).

Haul Length, Pay Rates, and Employment

In our survey, drivers were asked to identify themselves as long-haul/over-the-road drivers (OTR), regional drivers, or local drivers. Long-haul/OTR drivers are drivers who travel cross-country and average over 100,000 miles per year. Long-haul/OTR drivers often spend between days and weeks on the road, while regional and local drivers are typically home every night. Regional drivers typically travel between cities on a regular route, while local drivers typically drive within cities on a regular route (ATA, Glossary of Terms).

Drivers can be paid for their work a number of ways. A common way drivers are paid is by the mile. Sometimes drivers paid by the mile receive extra pay for activities, such as loading or unloading or drop and hook, and sometimes they receive extra pay on an hourly basis for stops over a certain number of hours. Other payment methods include being paid by a percentage of revenues, or being paid by the load. Drivers may also be paid by the hour for driving, or may be paid by salary. Drivers may be paid any combination of these methods.

In Wyoming, drivers are among the highest paid in the country, with the annual mean wage for heavy and tractor-trailer driving ranking sixth at $49,210 a year and light truck and delivery services driving ranking tenth at $36,940 a year in 2016 (BLS OES, 2016).

Though drivers can be employed in a number of arrangements, our survey was divided into two broad categories: drivers employed for wages by a private motor carrier company, and owner-operators. Typically owner-operators own their truck, or are leasing-to-own their own truck from a company.

Differences in employment, pay rate and haul length are important to distinguish, as research has shown that certain combinations of pay, mileage and employment tend to result in different health and safety outcomes. Studies also suggest that driver safety is not solely determined by individual driver characteristics, but that carrier expectations, delivery schedules and pay structures affect driver safety practices. For example:

- A 2000 study of the characteristics that have the most impact on safety measures of drivers found that drivers paid by percentage of revenue were more likely to report accidents, moving violations and logbook violations than those paid by the mile, and that those paid by the hour were 10.2% less likely to have been involved in an accident than either drivers paid by percentage of revenues or by the mile (Monaco and Williams, 2000). It was also found that more often, those paid by percentage of revenues were owner-operators, and that owner-operators overall reported more moving violations (Monaco and Williams, 2000). Although these statistics are determined from self-reported data, the authors noted that they do not believe these numbers are primarily the result of an underreporting bias due to the volume of responses indicating violations.
- A 2016 book by Steve Viscelli features qualitative interviews with drivers done in the mid-2000s. Among other conclusions, Viscelli finds that owner-operators tend to push themselves to drive less safely or falsify logbooks more often than company drivers due to higher pressure to make deliveries and make more money. He also finds local and dedicated drivers to be less likely to engage in these self-pushing behaviors, or what he refers to as the "mileage game" caused by pay-by-mile schemes (Viscelli, 2016).
- A 2006 study of the safety consequences of increasing driver pay found a connection between low pay and higher probability of crash involvement. The authors suggest that drivers paid by the mile face more uncertainty about take-home pay, causing them to take on riskier behaviors like driving more hours to make up for this uncertainty. This study finds that, although the precise causal chain is not clear, increased pay rates for paid-by-the-mile drivers resulted in safer driving (Rodriguez, Targa, and Belzer, 2005).
- A 2008 study found that HOS rule violations occur more frequently with "unrealistic delivery schedules" and longer waiting times for drop off and pickups, among other characteristics (McCartt, 2008).

It appears from these and other studies that haul-length, employment type and method of payment are often correlated to one another. Not only this, but the stress induced from low pay, stressful employment relationships and inconsistent income can lead to rushing behaviors that impact safety negatively. Sometimes this pressure comes directly from the company, sometimes from drivers themselves, or most likely some combination of both, as employment type, haul type and method of pay compound to impact driver safety on the road - for better or for worse.

Parking

Truck parking has been a well-studied topic within the industry in recent years, after the American Transportation Research Institute named it the most important research topic of the year in 2015. The shortage of truck parking spaces has been a concern for a long time, but the implementation of the ELD mandate at the end of 2017 has made the issue more pressing. Once this mandate takes effect, the competition to find parking will be increased because drivers will have to stop once their shift comes to an end. Research conducted by the Federal Highway Administration (2015) found that 75% of the 8,000 drivers that they surveyed regularly had trouble finding parking spots at night. The majority of states have shortages of public rest areas, and around a third of states have

shortages of private truck stops. If drivers are unable to find parking post-ELD implementation, they will have to make the choice of either parking illegally and risk getting ticketed, parking in unsafe areas, or violating their hours of service.

Not only is finding available space a problem for drivers, but another issue identified by the ATRI is the restrictive time limits on the parking spaces that are available. The required 10 hour break between the drivers' 14 hour shifts is often longer than the period that the trucks are permitted to be parked in these spaces (Boris and Brewster, 2016).

Adequate parking may also potentially lower crash rates. Research has shown that truck crash rates are lower immediately downstream of public rest areas. This increase in safety is attributed to safer driving practices after drivers have taken a resting period. This suggests that distance between parking areas impacts safety on the road: if rest stops are closer and more frequently available, crash rates may be lower (Boris and Brewster, 2016).

Overall, Wyoming ranks the third in the number of truck parking spaces available per 100K daily truck vehicle miles traveled. However, it was still one of the states that responded "yes" to the question "Do you have a problem with commercial vehicle truck parking in your State?" (FHWA, 2015) Despite efforts to accommodate drivers with more parking, even states doing comparatively well still need to improve the availability of safe and comfortable rest spaces.

Governed Trucks

Although not one of the main issues investigated by the ATRI, governed trucks were often brought up by drivers during our survey as a concern they have when driving through Wyoming. Many employers and owner-operators choose to govern their trucks at a certain speed limit to prevent unsafe driving. Wyoming's speed limit goes up to 80 mph, so the trucks governed at around 65 mph may frustrate cars on the road that are unaware of the trucks' speed limitations. This can lead to unsafe driving behaviors on the road. Research conducted by the ATRI on the safety impact of speed-limiting trucks has shown that the overall crash rates of speed limited and non-speed limited trucks are not significantly different. However, the speed-related crash rate was significantly lower for speed limited trucks than for non-speed limited trucks (Hanowski et al., 2012).

Self-Driving Trucks & Connected Vehicles

There are significant industry efforts underway to enable self-driving trucks and enhance connected vehicle technology. In fact, the WYDOT is one of a handful of agencies currently funded by the U.S. Department of Transportation to develop roadway systems integrated with connected vehicle technology.[iii] This survey project did not explore these topics.

[iii] U.S. Department of Transportation, Connected Vehicle Pilot Deployment Program: www.its.dot.gov/pilots/pilots_overview.htm

Part II: Objectives

1. Investigate major factors influencing safety behaviors;
2. Assess driver knowledge of safe driving practices and Wyoming-specific hazards;
3. Identify best methods to communicate with and educate drivers about these hazards.

During July and August of 2017, the Wyoming Department of Workforce Services (DWS) and the Wyoming Trucking Association (WTA), along with two interns from the Occupational Health Internship Program (OHIP), created and administered a survey for drivers in the trucking industry. This survey was conducted at three Ports of Entry in Cheyenne, WY: Interstate 80, Interstate 25 and U.S. 85.

The goal of the survey was to capture information about driver health and safety from the perspective of drivers themselves. The survey was designed to focus on critical issues within health and safety, including: driving despite fatigue and bad weather, pay and employment structures, Wyoming-specific driving and weather hazards, and best methods of communication with drivers while in Wyoming.

Wyoming is a main travel corridor for moving goods from the east to the west coasts of the United States, or from Mexico or Texas to Canada. It is hypothesized many drivers passing through may not have experience driving in the unique hazards that are common in Wyoming. Some examples include severe winter weather and ice, especially in the mountains in the center and north of the state, as well as high wind blow-over hazards and hail. The DWS and WTA sought to examine these issues with drivers to find ways to improve their awareness and preparedness, especially among those less familiar with such hazard conditions.

The survey devoted several questions to capturing information regarding employment structure, pay and company dedication to health and safety, and to measure the pressure and fatigue experienced by drivers as a result of these relationships. The survey also included questions on the topics of compensation and carrier expectations in order to add to the understanding of how employment relationships and pay structures affect health and safety. Emphasis was placed on employment relationships and pay structures because these different relationships may encourage or impede drivers' behavior in regards to their own health and safety.

The OHIP interns also conducted a review of empirical studies, past surveys, and other literature on trucking, crash incidences, and employment and compensation characteristics, as well as a review of relevant transportation policy. Their study of this information helped inform the background and conclusions in this report, as well as their recommendations to improve health and safety among truckers traveling through Wyoming.

Part III: Methods

This study used convenience sampling method to survey 270 drivers across three Wyoming Ports of Entry in Cheyenne (Interstate 80, Interstate 25, and U.S. 85) from July 10 - July 28. Driver participation was anonymous and entirely voluntary.

The surveys were created by convening stakeholders of the Department of Workforce Services and the Wyoming Trucking Association, as well as consulting prior surveys in the trucking industry; most notably the National Institute for Occupational Safety and Health (NIOSH) survey by Sieber, et al. in 2010 (see Chen, et al, 2015). The surveys were then piloted at three large trucking companies in Cheyenne with various company drivers before the official interview collection process began.

Most surveys were conducted verbally between an interviewer and a driver. The average length of the survey was 6-7 minutes. Some surveys were administered on paper by drivers waiting in lines for permits and inspections. Whenever possible, interviews were conducted outside the port building, allowing for physical distance between the port officers and drivers to facilitate the highest level of privacy possible.

Part IV: Results and Discussion

Demographics

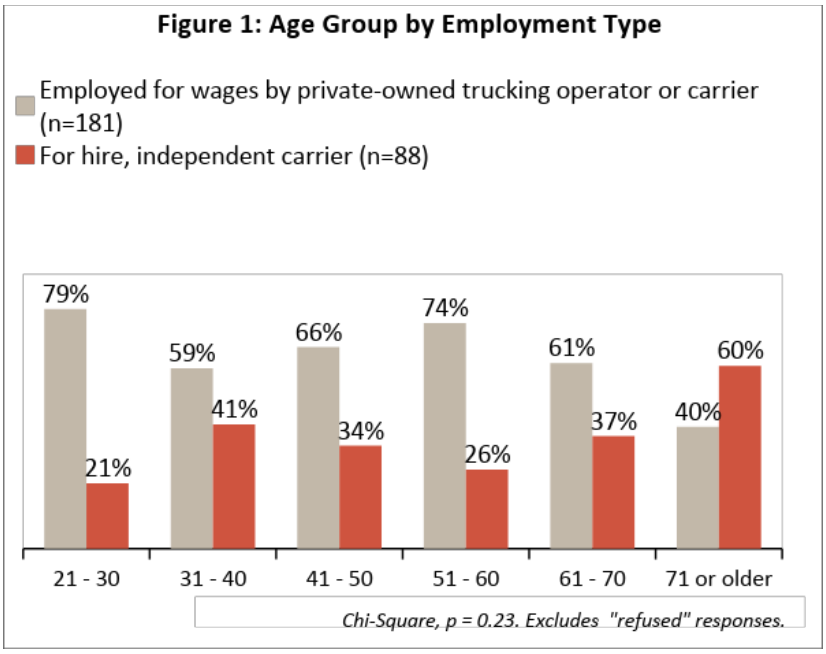
Table 1 provides an overview of participant demographics and employment statuses, including age, years of experience, employment type, and pay method. Most survey respondents (90.4%) were drivers of Class 8, Heavy Truck vehicles, which are tractor-trailers over 33,000 lbs., typically with three or more axles. The most common type of vehicle reported were dry boxes/enclosed vans (26.7%), refrigerated vans (17.4%) and flatbeds (20.4%). Most non-Class 8 vehicle drivers interviewed were driving escort vehicles for oversize loads or pick-up trucks pulling RVs for commercial transportation. The data presented throughout the report include the non-Class 8 vehicle drivers unless otherwise noted.

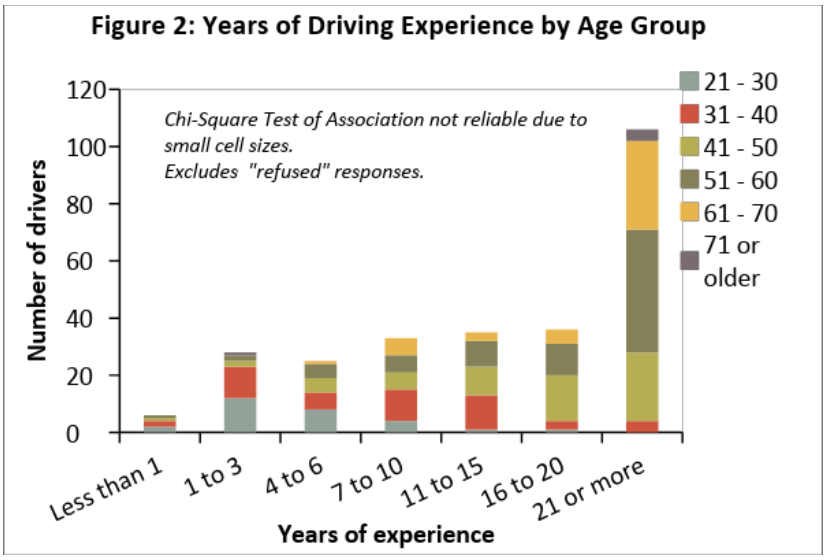
Survey respondents were 94% male and 6% female. These proportions differ slightly from national estimates of gender distribution, which indicate that 11.5% of persons employed in the truck transportation industry are women (BLS CPS, 2016). Overall, 71.5% of respondents were age 41 or older. Most respondents were 51-60 years old (28.5%) and the second largest age group represented was 41-50 years old (24.1%). The national median age of workers in the truck transportation industry is 47.2 years old (BLS CPS, 2016).

Almost 40% of respondents claimed 21+ years of driving experience. Over two-thirds of drivers surveyed worked for a privately owned motor carrier or company; the remaining third were owner-operators. There was no significant association between employment type and age (Figure 1). Figure 2 displays the observation that drivers with more years of experience tended to be older in age. There were no respondents in the 18-20 year old age group (Table 1). These findings align with industry concerns of new drivers not entering the market in enough numbers to replace retiring drivers (ATRI, 2016).

Table 1: Demographic and Employment Characteristics of Survey Respondents

Vehicle Classification		
Class 8, Heavy Truck	244	90.4%
Class 6, Medium Truck	15	5.6%
Class 3, Light Truck	11	4.1%
Vehicle Type		
Van, enclosed (box)	74	27.4%
Flatbed	55	20.4%
Refrigerated van (“refer”)	47	17.4%
Tanker	18	6.7%
Straight Truck (truck that does not pull a trailer)	14	5.2%
RV/Camper/Mobile Home	13	4.8%
Low boy	10	3.7%
Dump	4	1.5%
Livestock carrier	4	1.5%
Tractor without trailer	4	1.5%
Gooseneck trailer	3	1.1%
Auto carrier	2	0.7%
Van, open top	2	0.7%
Pole/logging	0	0.0%
Other	20	7.4%
Age		
18 – 20	0	0.0%
21 - 30	28	10.4%
31 - 40	49	18.1%
41 - 50	65	24.1%
51 - 60	77	28.5%
61 - 70	46	17.0%
71 or older	5	1.9%
Years of Experience		
Less than 1	6	2.2%
1-3	28	10.4%
4-6	25	9.3%
7-10	33	12.2%
11-15	35	13.0%
16-20	36	13.3%
21 or more	106	39.3%
Refused	1	0.4%
Gender		
Male	253	93.7%
Female	16	5.9%
Unknown	1	0.4%
Employment Type		
Employed by private-owned trucking operator or carrier	181	67.0%
For hire, independent carrier (owner-operator)	88	32.6%
Refused	1	0.4%
Route Characteristics		
Over the road (long-haul)	196	72.6%
Regional	41	15.2%
Local driver (day drivers)	31	11.5%
Unknown	2	0.7%





Training

Drivers were asked how they obtained their current CDL (Table 2).[iv] The most common way drivers obtained their CDL was on their own, without any formal training program or course (49.3%). About 30% had attended a vocational technical trade school. The six drivers who did not have a CDL were not driving a vehicle that required a CDL at the time of the survey.

[iv] According to the Federal Motor Carrier Safety Administration, those required to have a commercial driver's license must obtain it through their home state. Only some states require the successful completion of CDL training prior to taking the state licensing skills test. It is illegal to have a license from more than one state. www.fmcsa.dot.gov

Table 2: How Drivers Obtained Current CDL (n=270)		
	Count	**Column %**
Obtained on my own, no formal training program or course	133	49.3%
Vocational technical trade school	82	30.4%
Company-provided training	36	13.3%
Community college training course	9	3.3%
No CDL	6	2.2%
Military	2	0.7%
Other	2	0.7%
Total	**270**	**100%**

Of all drivers who obtained their CDL on their own, 52 (39%) had since participated in a structured CDL training course or program (Table 3). Many of those who obtained their CDL on their own mentioned being "grandfathered in," meaning that they had received their licenses before the implementation of the Commercial Motor Vehicle Safety Act of 1986, which established standards for testing and licensing of commercial motor vehicle drivers. Because the survey captured "21+ years" of driving experience in one single category, it was not possible to ascertain how many respondents received their licenses before the federal CDL standards implementation.

Table 3: Participation in a CDL Training Course since Obtaining CDL "On Your Own"		
Yes	52	39.1%
No	81	60.9%
Total	**133**	**100%**

To gain additional insight into CDL obtainment pathways, the association between CDL obtainment and years of experience was summarized and tested in three collapsed experience categories, cut-offs of: more or less than 7 years of experience, more or less than 16 years of experience, and more or less than 21 years of experience (Table 4).

In all three experience categories, the following trends were observed:

- Drivers who obtained their CDL on their own were more likely to have more years of experience.
- Drivers who obtained their CDL through a vocational trade school or company-provided training program were more likely to have fewer years of experience.
- There appears to be a direct relationship with years of experience and the proportion of drivers obtaining a CDL on their own. Among drivers with 21 or more years of experience, 71.6% obtained their CDL on their own, compared to only 55.9% of drivers with 7 or more years of experience.

While not representative of all drivers, these findings showcase less experienced drivers tending to utilize pathways to CDL obtainment that include more formal training.

Table 4: How Drivers Obtained CDL by Select Years of Driving Experience Categories (n=259*,¥)															
	Less than 7 years of experience		**7 or more years of experience**			**Less than 16 years of experience**		**16 or more years of experience**			**Less than 21 years of experience**		**21 or more years of experience**			**All Years**
	Count	**Column %**	**Count**	**Column %**		**Count**	**Column %**	**Count**	**Column %**		**Count**	**Column %**	**Count**	**Column %**		**Count Total**
Obtained on my own, no formal training program or course¥	19	33.3%	113	55.9%		43	35.2%	89	65.0%		59	37.6%	73	71.6%		**132**
Vocational technical trade school	23	40.4%	59	29.2%		48	39.3%	34	24.8%		62	39.5%	20	19.6%		**82**
Company-provided training	12	21.1%	24	11.9%		25	20.5%	11	8.0%		28	17.8%	8	7.8%		**36**
Community college training course	3	5.3%	6	3.0%		6	4.9%	3	2.2%		8	5.1%	1	1.0%		**9**
Total	**57**	**100%**	**202**	**100%**		**122**	**100%**	**137**	**100%**		**157**	**100%**	**102**	**100%**		**259**
	chi square, p = 0.0227					*chi square, p <.0001*					*chi square, p <.0001*					

**Excludes CDL obtainment categories with infrequent responses to eliminate small cell sizes to improve validity of Chi-Square Test of Association.*

¥*Excludes one driver who did not provide years of experience.*

The three experience categories are not presented as mutually exclusive.

Top Industries

Drivers were asked if they provided trucking services for certain types of industry primarily over others. The top industries that drivers reported servicing were retail (n=69), manufacturing (n=63), and agriculture (n=58). General freight was also a leading response (n=56), with drivers mentioning they would haul "whatever fits" in their van or flatbed. General freight was also applied to a response if five or more industries were selected.

Table 5: Industries Serviced by Drivers

Industry Serviced	Number of Responses
Retail Trade	69
Manufacturing	63
Agriculture	58
Oil & Gas Extraction	43
Construction	39
Mining (excluding oil & gas)	14
General Freight/No Specific Industry	56
Other	27
Refused/Don't Know	4
Total	**373**

Pay Structure, Haul Lengths, and Employment

Drivers were asked how they were being paid for their current trip. All 270 participants provided at least one response, 90 provided two responses, 11 provided three, two provided four, and one provided five responses – for a total of 374 responses (Table 6). Thirty-five percent of all responses (131 of 374) indicated payment by miles driven. Studies have found that drivers paid by the mile and by percentage of revenues have been found to be 10.2% more likely to have been involved in an accident than drivers paid by the hour (Monaco and Williams, 2000). In his 2016 book, *The Big Rig*, Viscelli claims that "pay by mile is *the* critical problem" and barrier to health and safety behaviors.

Table 6: Reported Pay Structures

How Paid	Number of Responses	Percent
By the mile (driving)	131	35%
By the activity (loading, unloading, etc.)	51	14%
By the hour (driving)	47	13%
By the load (oversized, etc.)	46	12%
By the hour (stopping)	43	11%
Percentage of revenues	39	10%
By the hour (salary)	13	3%
Other	3	1%
Don't know	1	0%
Total	**374**	**100%**

Only 85 of 270 participants (32%) indicated receiving some form of hourly pay, either for time spent driving, stopping or as salary (Table7). There was a significant relationship between employment type and receiving hourly pay – those employed for wages by private carriers were more likely to have reported some form of hourly pay for their current trip.

Table 7: Hourly Pay by Employment Type (n=269*)						
Any Hourly Pay (Driving, Stopping or Salary)	**Employed by private-owned trucking operator or carrier**		**For hire, independent carrier**		**Total**	
	Count	**Col %**	**Count**	**Col %**	**Count**	**Col %**
Yes	76	42%	9	10%	85	32%
No	105	58%	79	90%	184	68%
Total	**181**	**100%**	**88**	**100%**	**269**	**100%**
**Excludes one driver who did not provided employment type* *chi square, p <.0001*						

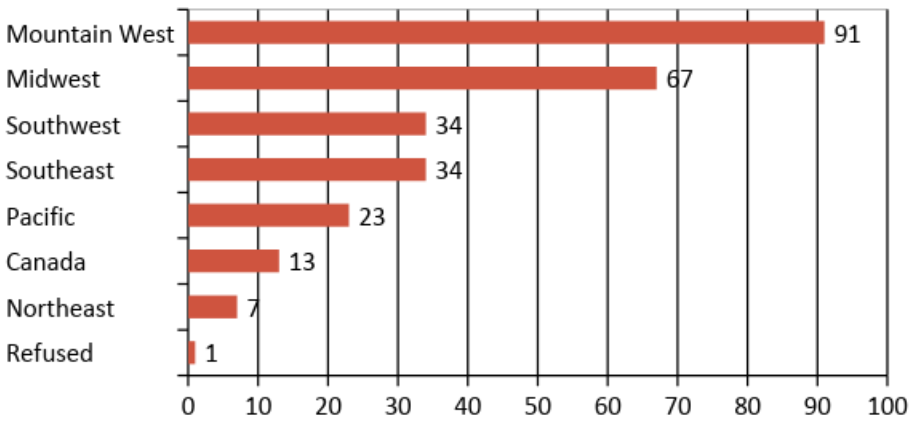
Of all respondents, 72.6% were long-haul drivers (also called over-the-road (OTR) drivers), 15.2% regional, and 11.5% local (Table 8). However, the distribution of driver type varied by port of entry. Participants at the I-80 port, which runs from the East-West from Teaneck, New Jersey to San Francisco, California, were primarily long-haul/OTR drivers (92.5%). However, U.S. 85, running North-South through Cheyenne and eastern Wyoming, saw the lowest proportion of long-haul/OTR drivers compared to local and regional drivers, but also saw fewer drivers overall. The Port at I-25, also running North-South but from Texas to Canada, saw all three types of drivers, with a higher proportion of long-haul/OTR drivers. These distributions make intuitive sense given the different routes accessed by these three highways.

Table 8: Driver Type by Port Location (n=270)								
	Total		**I-25**		**I-80**		**US-85**	
Driver Type	**Count**	**Col %**	**Count**	**Col %**	**Count**	**Col %**	**Count**	**Col %**
Over the road (long-haul)	196	72.6%	71	71.7%	99	92.5%	26	40.6%
Local driver (day drivers)	31	11.5%	13	13.1%	0	0.0%	18	28.1%
Regional	41	15.2%	15	15.2%	8	7.5%	18	28.1%
Don't know	2	0.7%	0	0.0%	0	0.0%	2	3.1%
Total	**270**	**100%**	**99**	**100%**	**107**	**100%**	**64**	**100%**

Driver Origins

Survey participants were asked to provide their home state (state of residency) (Figure 3). The Mountain West states were the most represented, accounting for 91 of 270 (33.7%) of the drivers. The Northeastern states were the least represented, making up only 2.6% of the respondents (n=7). A total of 40 states and the District of Columbia were represented. The top five most represented states were Colorado (n=38), Wyoming (n=29), Texas (n=18), California (n=16) and Utah (n=14).

Figure 3: Number of Drivers by Region of Residency (n=270)



Mountain West (CO, WY, MT, NV, ID, UT)
Midwest (MI, MO, KS, NE, ND, SD, MN, WI, IL, IN, IA, OH)
Southwest (AZ, NM, TX, OK)
Southeast (LAm AR, AL, NC, SC, FL, GA, MS, WV, KY, TN, MD, DE, VA, D.C.)
Pacific (CA, WA, OR,)
Northeast (NY, PA, ME, CT, MA, NH, RI, VT, NJ)
No participants cited non-contiguous states or territories.
One participant refused to provide home state.

There was variation in the distribution of home region by port of entry location (Table 9). At the US-85 port, 64.1% of drivers were from the Mountain West states, with 37 of 64 drivers (58%) citing CO or WY as their home state. The I-80 port was the only port where the Midwest was more represented than the Mountains West.

Table 9: Home State Regions Reported by Port (n=270)

	I-25		I-80		US-85	
Home Region	**Count**	**Col %**	**Count**	**Col%**	**Count**	**Col %**
Mountain West	32	32.3	18	16.8	41	64.1
Midwest	21	21.2	37	34.6	9	14.1
Southwest	18	18.2	8	7.5	8	12.5
Pacific	11	11.1	11	10.3	1	1.6
Southeast	8	8.1	24	22.4	2	3.1
Canada	6	6.1	4	3.7	3	4.7
Northeast	3	3.0	4	3.7	0	0.0
Refused	0	0.0	1	0.9	0	0.0
Total	**99**	**100%**	**107**	**100%**	**64**	**100%**

Wyoming-Specific Hazards and Methods of Communication

Drivers were asked to name the top three hazards that concern them during winter driving, and also the top three hazards that concern them during summer driving. Note only 11 of 270 drivers cited that their current trip was

their first time driving through Wyoming. Thus, these results represent a sample of drivers that may have more experience with Wyoming weather and road conditions.

Figure 4 describes the winter hazard responses for 245 drivers who, in total, provided 511 responses. Twenty-five drivers who reported more than three winter hazards were excluded from this analysis. "Winter weather" and "high winds/blow-over risk" were the most frequently cited winter hazards (29% and 24% of responses, respectively). Notably, "other drivers" was not a pre-defined selection on the survey, but was cited frequently enough to warrant its own category. It includes responses referring to both commercial and non-commercial motorists.

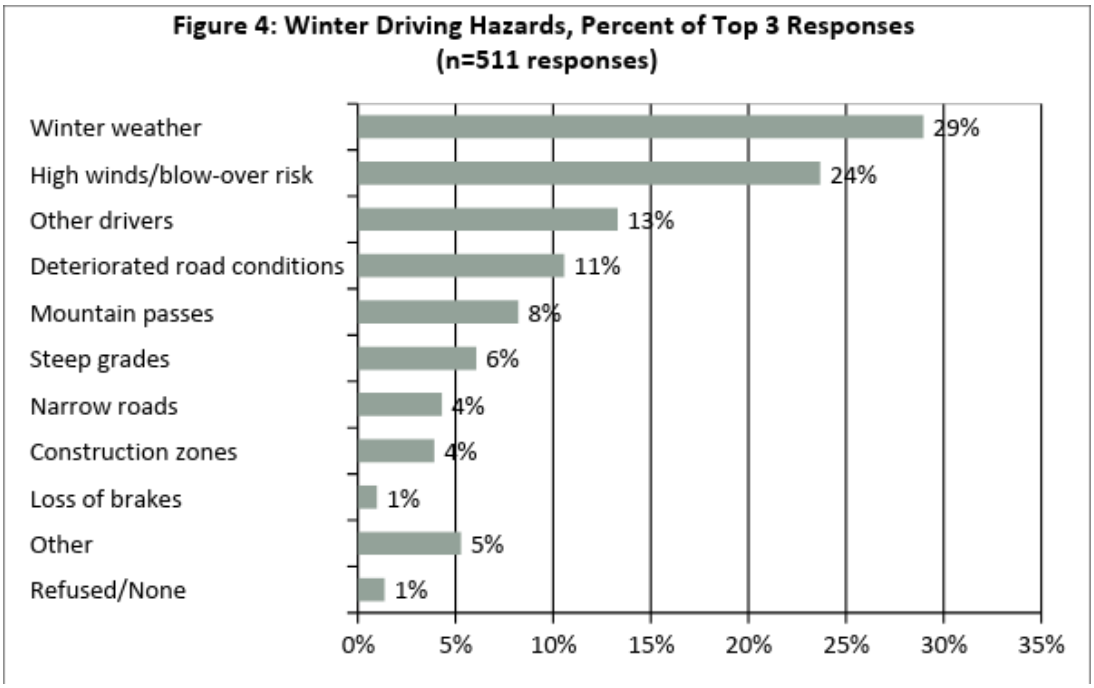
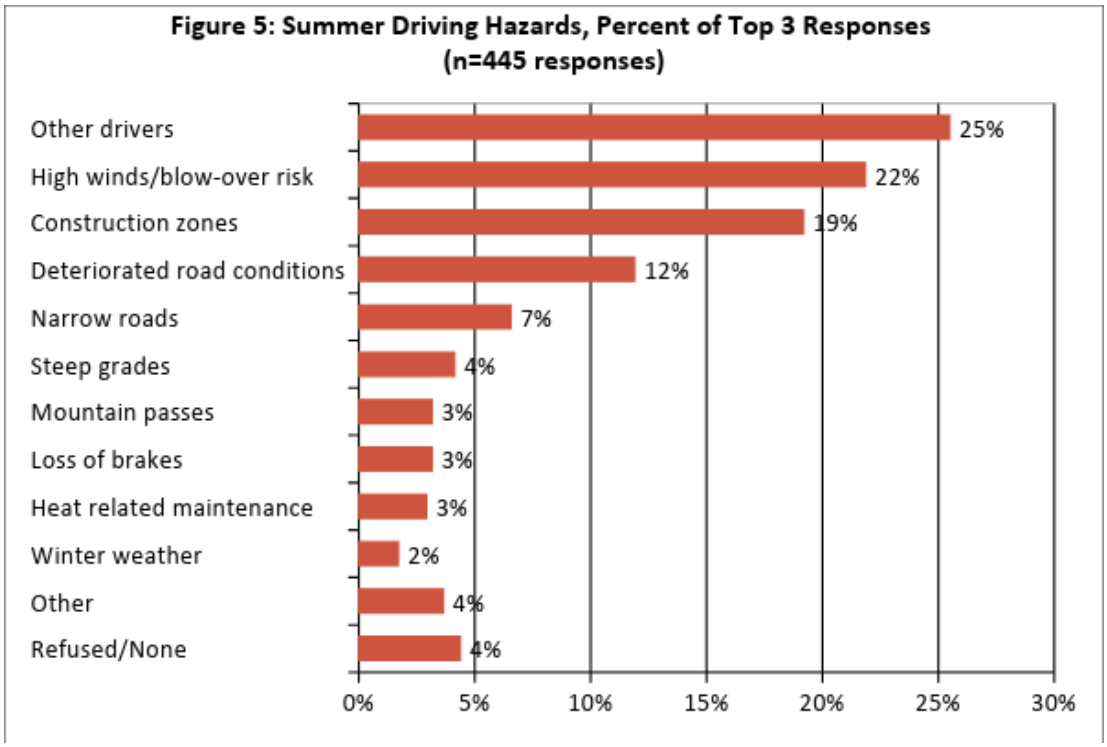
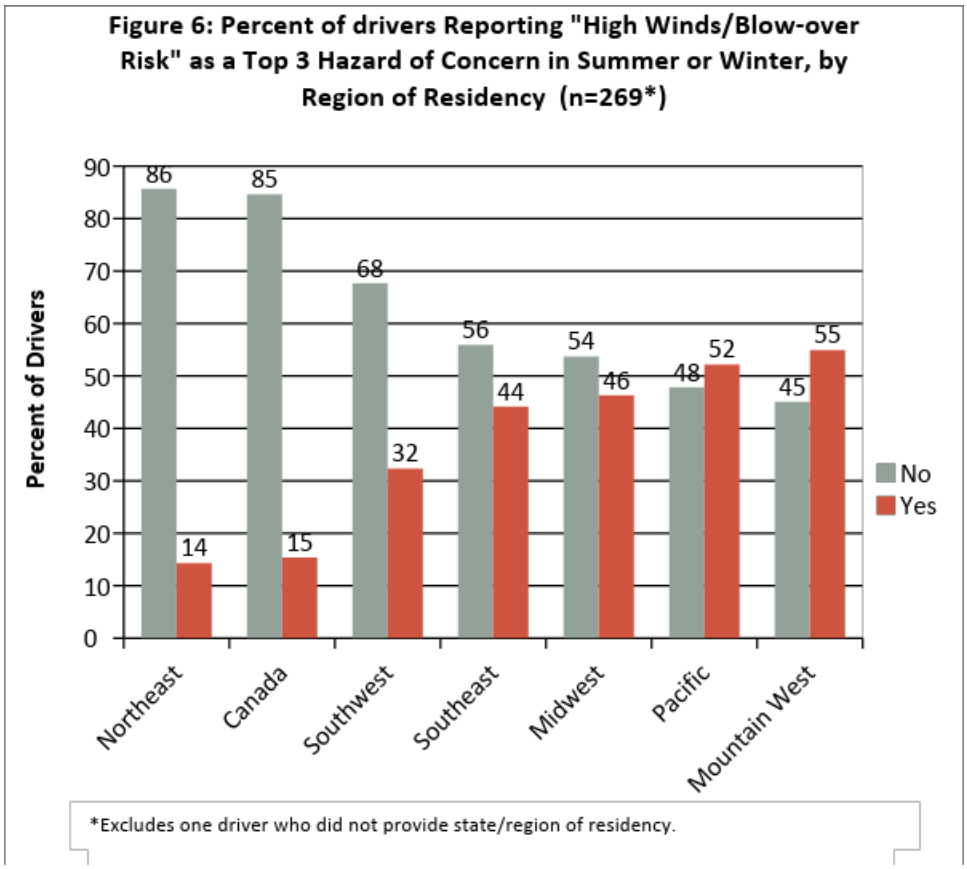


Figure 5 describes the perceived leading summer hazards for 265 drivers who, in total, provide 445 responses. Five drivers who reported more than three summer hazards were excluded from this analysis. Again, "other drivers" was not a pre-defined choice on the survey, but was cited frequently enough warrant its own category, accounting for the most of all responses (25%). This category was inflated compared to winter driving hazards as it encompassed more responses about recreational vehicle (RV) motorists and summer tourism traffic. "High winds/blow-over risk" and "construction zones" accounted for the second and third most frequently cited summer hazards of concern.



The perception of high winds and blow-over risk was of specific interest for this project. Blow-over risk is a weather hazard of high concern in Wyoming. From 2009-2014, there were 200 reported cases of truck blow-overs along I-80 in Wyoming (UW, 2016). When conditions warrant, WYDOT issues "extreme blow-over risk" warnings when gusts are 65mph or higher, and may close roadways in certain locations to light-weight, high-profile vehicles and trailers.

In total, 122 of 270 drivers mentioned "high wind/blow-over risk" as a top three hazard in winter or summer. However, mentions of "high winds/blow-over risk" as one of the top three concerns varied by drivers' region of residency (Figure 6). Drivers from the Mountain West and Pacific regions were the most likely to report it as a top three concern.



Drivers were also asked about the best methods to contact them with information about weather and driver safety while in Wyoming (Table 10). Overall, 270 participants provided 444 responses to this question. The most frequently cited communication methods were mobile apps, either the Wyoming 511 app (25%) or other mobile apps, which included weather apps (18%). The highway overhead signs (12%) and the Wyoming DOT website (11%) were also cited as useful communication tools. CB radio was a polarizing response - some drivers indicated it was their main method for communication and others indicated it was obsolete. Very few responses cited on-board company messages (3%) or dispatch calls (1%), which are methods of communication that would update the driver proactively, rather than the driver having to seek out updates themselves. Similarly, few of the responses (4%) referred to Ports of Entry as sources of information, although the ports are required stops for many drivers passing through Wyoming.

Table 10: Best Methods for Hazard Communication (n=444 responses)		
Communication Method	**Number**	**Percent**
511 app/phone call	111	25%
Other mobile apps	80	18%
Overhead signs	54	12%
Local radio	52	12%
State DOT website	47	11%
CB radio	36	8%
Info obtained at POE	18	4%
On-board computer (OBC)/company messages	12	3%
Personal observation/judgment	8	2%
Company dispatch	6	1%
Other	13	3%
Refused/No Answer	7	2%
Total Responses	**444**	**101%**

Safety Attitudes and Practices

Management Attitudes

More than 90% of drivers surveyed agreed or strongly agreed that the safety of workers is a high priority with management where they work; that there are no shortcuts or compromises when worker safety is at stake; and that management and employees work together to ensure the safest possible working conditions (Table 11). Results were similar between owner operators and those employed for wages. A study by Short et al (2007) found that the safety culture of a carrier reflects in the safety practices and behaviors of the drivers, and it is well known that management attitudes toward safety directly influence safety culture at work.

Table 11: Management Safety Attitudes and Practices (n=270)		
Where I work, employees and management work together to ensure the safest possible working conditions.		
Strongly Disagree	5	1.9%
Disagree	12	4.4%
Agree	57	21.1%
Strongly Agree	190	70.4%
Refused/ Don't know	6	2.2%
There are no significant compromises or shortcuts taken when worker safety is at stake.		
Strongly Disagree	3	1.1%
Disagree	11	4.1%
Agree	50	18.5%
Strongly Agree	201	74.4%
Refused/ Don't know	5	1.9%
The safety of workers is a high priority with management where I work.		
Strongly Disagree	2	0.7%
Disagree	10	3.7%
Agree	51	18.9%
Strongly Agree	199	73.7%
Refused/ Don't know	8	2.9%

Driver Practices & Attitudes

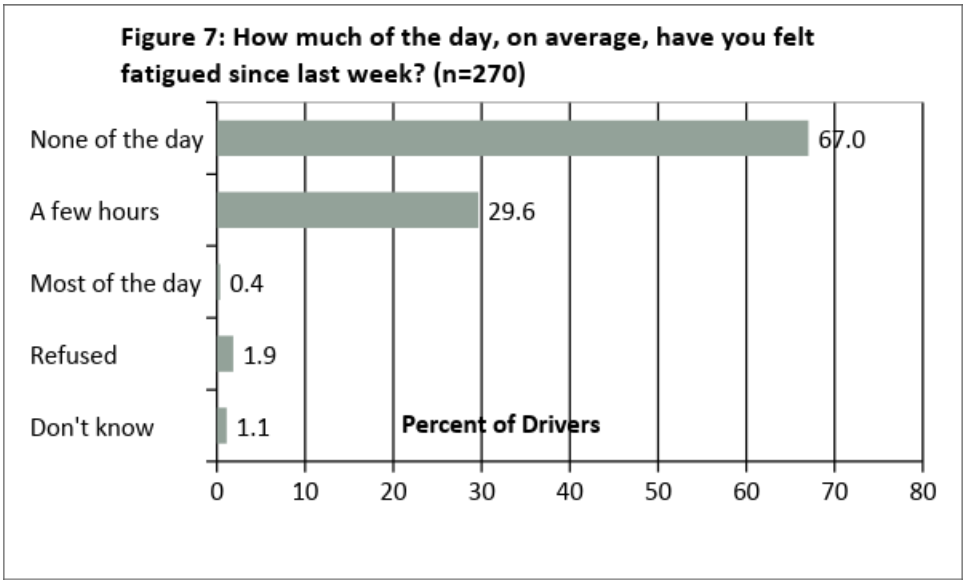
Drivers were also asked about their own safety behaviors and attitudes. Most reported they often wear a seatbelt (87.4%) and drive less than 10 mph over the speed limit (78.9%) (Table 12). However, over 85% reported often or sometimes getting frustrated by other drivers on the road. High frustration on the road can lead to dangerous driving behaviors.

Table 12: Driver Safety Practices and Attitudes (n=270) How often do you…		
Get frustrated by operations at the loading dock?		
Often	58	21.5%
Sometimes	90	33.3%
Never	115	42.6%
Refused/Don't know	7	2.6%
Wear a seatbelt?		
Often	236	87.4%
Sometimes	11	4.1%
Never	16	5.9%
Refused/Don't know	7	2.6%
Get frustrated by other drivers on the road?		
Often	124	45.9%
Sometimes	108	40.0%
Never	31	11.5%
Refused/Don't know	7	2.6%
Drive 10 miles, or more, faster than the speed limit?		
Often	10	3.7%
Sometimes	41	15.2%
Never	213	78.9%
Refused/Don't know	6	2.2%

When asked about scenarios in which drivers commonly drive despite fatigue and bad weather over 55% of the drivers responded that they "never" drive if facing fatigue or bad weather for each of the scenarios presented to them (Table 13). Among those who anecdotally expanded on their answer, some felt that their employers really did value their safety and would encourage them not to drive. Others told us they felt empowered to make that decision for themselves, valuing their lives above the load - regardless of their company's demands or potential repercussions. Notably, however, nearly 30% of drivers interviewed indicated they had felt fatigued for "a few hours" of the day, on average, in the past week (Figure 7).

We also asked the drivers if there was any other reason that we did not mention that would push them to drive despite fatigue or bad weather. Of respondents who answered yes, a common reason was to get to a safe space to park, a rest stop, and/or cell phone reception. This is especially important to note in light of the ELD rules that will take effect soon and force drivers to more or less park where they are at, or spend hours they could be using to move their loads looking for adequate parking instead.

Table 13: How often do you continue to drive despite fatigue or bad weather because: (n=270)		
You must deliver or pick up a load at a given time?		
Often	27	10.0%
Sometimes	89	32.9%
Never	150	55.6%
Refused/ Don't know	4	1.5%
You have hours left in the 14-hour continuous shift?		
Often	36	13.3%
Sometimes	72	26.7%
Never	153	56.7%
Refused/ Don't know	9	3.3%
You need to make more money?		
Often	26	9.6%
Sometimes	44	16.3%
Never	194	71.9%
Refused/ Don't know	6	2.2%
Delays associated with dispatching?		
Often	25	9.3%
Sometimes	53	19.6%
Never	184	68.2%
Refused/ Don't know	8	2.9%
Delays associated with loading/unloading?		
Often	38	14.1%
Sometimes	67	24.8%
Never	157	58.2%
Refused/ Don't know	8	2.9%
You want to get home?		
Often	37	13.7%
Sometimes	72	26.7%
Never	155	57.4%
Refused/ Don't know	6	2.2%



As with the previous section on management attitudes, the observed emphasis on never driving in fatigue or bad weather may be biased by the fact that we spoke with a group of more experienced drivers, who shared stories of leaving companies that demanded they drive through bad weather or did not respect their safety, or of learning that no load was "worth it" if it meant choosing between their safety or their employer, dispatcher or customer demands. These paired findings may also reflect the studied connection between company safety culture and management attitudes, and driver safety attitudes and behaviors (Short et al., 2007).

Crashes

When asked whether they had ever been in a DOT-Recordable truck crash, either as a driver or as a non-driving team member, 65 (24.1%) of the respondents said yes (Figure 8). A DOT recordable truck crash occurs when the crash results in one of the following: a fatality; an injury to a person requiring immediate treatment away from the scene of the accident; or disabling damage to a vehicle, requiring it to be towed.

If the driver responded "yes," we followed up by asking how many crashes the driver had experienced, and whether the experience had changed either their or their employer's safety practices. Of those that had been in a DOT recordable crash, about 72% had only been in one recordable crash, 22% said two or three, and very few said they have been in four or more crashes (Table 14).

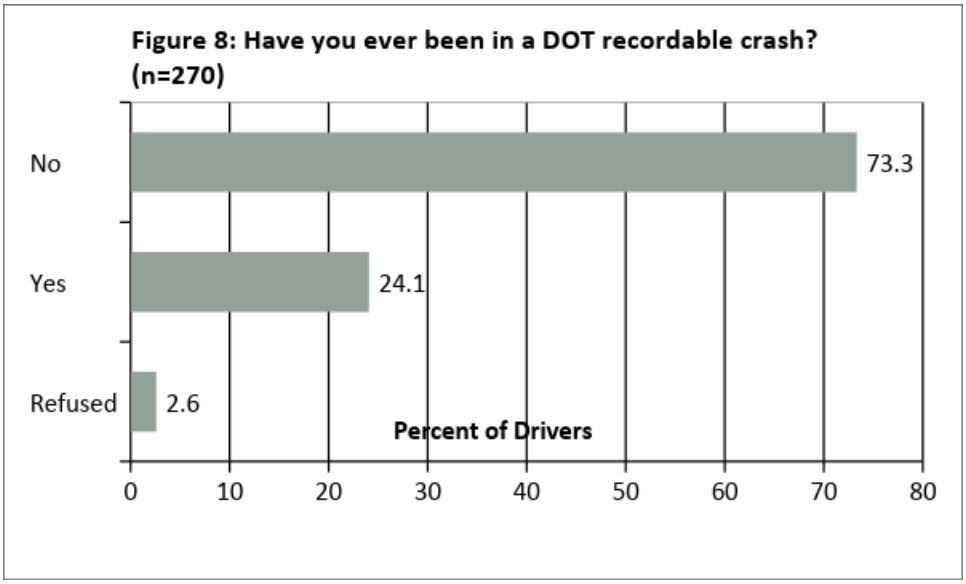


Table 14: If yes to being in a DOT crash, how many crashes? (n=65)		
Number of crashes	**Number Drivers**	**Percent**
1	47	72%
2 to 3	14	22%
4 to 6	2	3%
No Answer	2	3%
Total	**65**	**100%**

When asked whether safety practices changed after the crash, 33of the 65 (51%) indicated that neither their own nor their employer's practices changed as a result of the crash (Table 15). Drivers commonly responded to this question by adding that the accident was not their fault, that they could not have prevented it from happening, and therefore there was nothing to change about their safety practices.

Of the 30 drivers that did report changes to safety practices post-crash, 23 indicated that only their own safety practices had changed, and not their employer's. Those who indicated there were changes by the employer mentioned increased safety trainings and increased employer attentiveness to drivers' opinions on their own limitations.

Table 15: If yes to being in a DOT crash, were there any changes to you or your employer's safety practices? (n=65)		
Reported safety behavior changes?	**Number**	**Percent**
No	33	51%
Yes, self-behavior	23	35%
Yes, employer	4	6%
Yes, both employer and self-behavior	2	3%
Yes, unspecified	1	2%
Fired	1	2%
Not specified	1	2%
Total	**65**	**101%**

Common reasons for reporting no behavior changes:	*It wasn't my fault.* *Crash couldn't have been avoided.*
Common self-behavior changes reported:	*Slowed down.* *More cautious about other trucks and cars.* *More wary about team member driving.* *Quit or changed employers.*
Common employer behavior changes reported:	*Required safety videos.* *Required safety training.* *Made equipment upgrades.* *One driver indicated his employer listened more to his concerns about bad conditions.*

Other Topics of Note

Some drivers shared comments on the topics of health and fitness and the changing culture around truck driving and fellow drivers. These topics are noteworthy because they were brought up by drivers despite not being explicitly asked in the survey, and because the few who spoke on these topics were passionate about their importance.

During the survey, two different drivers at different ports brought up health and fitness as concerns facing drivers. One mentioned that gym time is impossible due to parking issues, but that physical fitness is important for drivers, as their profession is an overall sedentary one. Another driver, in a longer conversation than we were afforded with most drivers, lamented the lack of healthy food options on the road and at truck stops especially.

Another topic that one driver spoke about at length was the changing culture around driving. A driver with many years of experience noted that when she first started driving, drivers had a sense of community or camaraderie. If a driver was broken down on the side of the road, more often than not another driver would pull over to offer help or make sure the driver was okay. She told us disappointedly that this sense of community is now being replaced by a more competitive, "every-driver-for-themselves" spirit. Supporting this concept, in his book Viscelli mentions the difference in self-pushing behavior and attitude of autonomy that newer drivers tend to take on

compared to more experienced drivers. The feeling of loss of camaraderie that the driver mentioned could be an outcome of the intense time pressures that so many drivers, especially newer drivers, face on the job.

Part V: Challenges & Limitations

Convenience sample surveys are excellent tools when time and/or funding is limited because the survey can reach a wide number quickly. However, a limitation of such surveys is that the sample represents a biased group, and the results are only applicable to the group in question, rather than applicable to the entire population. Nonetheless, this survey is important because it was able to capture a snapshot of the population passing through Wyoming Ports of Entry, and featured Wyoming-specific questions that had not been asked in a survey of commercial truck drivers before.

An added challenge to this survey was that we were working with a population that faces extreme time pressures. Drivers try to make it in and out of the Wyoming ports as quickly as possible to continue with their schedule. Many drivers considered taking our survey, but declined after learning the amount of time it would take to complete (7-8 minutes). Even drivers who did take the survey were sometimes visibly anxious to get going, and some drivers had to stop mid-survey because they simply did not have the time. This accounts for the majority of the "refused to answer" responses we received in this survey.

Part VI: Conclusions & Recommendations

Increase General Motorist Education

Many drivers interviewed expressed concern and frustration with general motorists' lack of knowledge about truck limitations and the unique difficulties that truck drivers face on the road. Drivers often said that motorists regularly jeopardize their own lives and the lives of others by driving recklessly and distractedly on the road, especially around trucks. One of the most mentioned examples was the tendency of car drivers to cut off a truck, only to slow down to exit the highway at the next ramp, unaware that the truck requires almost twice the distance and twice the time that a car takes to slow down or stop. Many truck drivers expressed that the general public needs to be better educated about sharing the road with semi-trucks.

A suggested recommendation for this issue is to develop and implement a public awareness campaign. One strategy already implemented as a result of this study utilized the WYDOT Dynamic Messaging System (DMS) signs on the highways in Wyoming to display messages about driving safely around semi-trucks. The following messages were developed in partnership with the WYDOT DMS committee and displayed during National Truck Driver Appreciation Week (NTDAW)[v] in September 2017. It is recommended that these and other appropriate safety messages be routinely displayed, especially during NTDAW each year.

[v] Promoted by the American Trucking Associations: www.trucking.org/Appreciation_Week.aspx

Safety Messages Displayed on Select Over-head No hyphen needed on "overhead' Highway Signs During National Truck Driver Appreciation Week, Wyoming, September 2017
SEMIS TAKE 2X LONGER TO STOP. PASS WITH CARE WINTER IS APPROACHING. USE 511 APP FOR TRAVEL INFO. SEMIS HAVE BIGGER BLIND SPOTS. STAY IN SIGHT. CAR VS. SEMI? NO CONTEST. GIVE THEM SPACE! TRUCKERS: OUR MOUNTAINS ARE NO JOKE. CHECK YOUR BRAKES. SEMIS NEED 2 FOOTBALL FIELDS TO STOP. PASS WITH CARE.

A second recommended strategy to increase public education is to include more information about driving safely around trucks in Wyoming's general driver licensing training materials and education. The current Wyoming Class C Driver License Manual includes only limited information about the safest practices for sharing the road with semi-trucks.[vi] Expanding on this information may increase public knowledge and awareness of the risks and common causes of crashes. The Federal Motor Carrier Safety Administration (FMCSA) has a suite of educational materials and recommendations for the motoring public about the dangers of the "No-Zone," which are areas where cars may be in a truck's blind spot, and explains why cars should not be driving in them.[vii] These graphics and resources could be incorporated into Wyoming's drivers' license training materials, or more strategically shared with the motoring public at key points of driver engagement.

Review and Improve Regulations and Policies

It is recommended that the ELD and 14-hour rule regulations be continually reviewed and revised as necessary. These regulations are meant to ensure driver protection and safety from job pressures and stressors, and should not be dismantled. However, in order for them to work in drivers' best interests, changes should be considered that would monitor the companies and their dispatchers for pay structures and scheduling protocols that may push drivers to operate in conflict with the regulations. Emphasis should be placed on combining the 14-hour rule with realistic delivery deadlines. A 1995 study found that 26% of drivers' schedules were violation-inducing, or "unreasonable" (Beilock 1995). Drivers have limited control over their schedules once on the road due to traffic, weather, loading, and other circumstances, while company dispatch designs the overall time frames. Regulations should hold distribution companies accountable for unrealistic scheduling expectations that provoke driver behaviors and practices that breach regulation.

Increasing wages and implementing strategies to reduce high turnover rates are other mechanisms that could improve driver safety on the road; more experience and higher wages are associated with safer driving practices (Monaco and Williams, 2000). Viscelli's book and other articles bring up the dangers inherent in a pay-by-mile wage structure because drivers will rush to get more miles done per shift than if they were paid hourly.

[vi] Wyoming Department of Transportation: www.dot.state.wy.us/home/driver_license_records/driver-manuals.html

[vii] Federal Motor Carrier Safety Administration: www.fmcsa.dot.gov/ourroads/tips-driving-safely-around-large-trucks-or-buses

Increase Seat Belt Use

Seat belt use has been consistently proven to prevent fatalities and lessen injury severity in vehicle crashes. One study found that semi-truck drivers and passengers in the sleeper berth who did not use occupant safety restraints had a 2.25 times increased odds of injury in a moving semi-truck collision than those who used occupant safety constraints at the time of the collision (Bunn et al., 2013). Data from the Wyoming State Occupational Epidemiologist show that over 30% of trucking industry workers killed in motor vehicle crashes were not using a seat belt at the time of the crash (WY DWS, 2017). Proper use of seat belts and other forms of safety restraints are essential for improving the safety of drivers and passengers on the road. Converting to primary enforcement of seatbelt laws in Wyoming would help ensure that more severe injuries and fatalities are avoided.

Increase Driver Training

Lastly, more rigorous and prolonged training for the trucking industry is recommended. Experienced drivers in our survey complained about newer truck drivers being trained in a short period of time. Additionally, many drivers voiced their concern about truck driver trainers not having enough experience before they begin training new drivers. They questioned the quality of drivers that graduate from training programs where "students are training other students". Toward this overarching goal, the FMCSA is implementing an Entry-Level Driver Training (ELDT) Final Rule, which requires all states, the District of Columbia, and all U.S. territories comply with new, minimum, entry-level driver training requirements by February 2020.[viii] Prior to this requirement to comply, individual driving schools should evaluate their training requirements to help ensure better training for new drivers.

[viii] Federal Motor Carrier Safety Administration: www.fmcsa.dot.gov/registration/commercial-drivers-license/eldt

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Association of Occupational and Environmental Clinics, Occupational Health Internship Program (OHIP):
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Council of State and Territorial Epidemiologists (CSTE)

National Institute for Occupational Safety and Health (NIOSH):
Dr. W. Karl Sieber

Federal Motor Carrier Safety Administration (FMCSA):
John Mulcare, Division Administrator

Pilot Survey Testing:
Airgas: Greg Bates and all their drivers
Crete Carrier: Christopher Grosc and their drivers
Cheyenne Walmart Distribution Center: Dock managers and their drivers

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Appendix: Survey

Truck Driver Survey

Administered to a Volunteer, Convenience Sample of Drivers
Summer 2017 at Cheyenne Ports of Entry (I-25, I-80, US-85)

Verbal Consent:

We are interns with a national program, The Occupational Health and Safety Program (OHIP), which has placed us with the Wyoming Department of Workforce Services and the Wyoming Trucking Association this summer. We're hoping to learn a little bit more about the issues that affect the safety of truck drivers here in Wyoming by talking to the drivers themselves.

Before we start the survey, please read this statement informing you about participating in our survey:

Purpose: The purpose of this study is to learn more about the hazards faced by truck drivers. This survey is being conducted by the Wyoming Trucking Association and the Department of Workforce Services. You will not receive any direct benefit from being in this survey. However, your honest answers may increase our knowledge of the health and safety issues facing truck drivers.

Process: We will ask about your work and your safety education. The survey will last about 7-8 minutes.

Benefits and Risks: There is very little risk to you if you take part in this survey. We will not collect your name or any other data that can identify you. All data we collect will be private and protected to the extent permitted by law. We are not part of any federal or regulatory agency.

You may take part in this survey or not. The choice is yours. If you say 'no', you will not lose any benefits that you normally have the right to receive. If you choose to take part, you do not have to answer every question or you may quit at any time.

Agreement: All of the information just given to you is on this this sheet. Please take a minute to look this over. Do you have any questions? Do you agree to take part in this survey?

Questions:

1. Which of the following most closely classifies your vehicle?
   - Class 3 / light truck
   - Class 6 / medium truck
   - Class 8 / heavy truck
   - Other _____
   - Refused
   - Don't know

2. What type of tractor-trailer are you driving today?
   - Straight truck (truck that does not pull a trailer)
   - Tractor without trailer
   - Auto carrier
   - Dump
   - Flatbed
   - Livestock carrier
   - Low boy
   - Pole/logging
   - Refrigerated van ("refer")
   - Tanker
   - Van, enclosed (box)
   - Van, open top
   - Gooseneck trailer
   - Other – please specify_____
   - Refused
   - Don't know

3. Is this the same type of tractor-trailer you typically drive?

- Yes
- No
- Refused
- Don't know

4. In which one of the following age groups do you belong?
   - 18 – 20
   - 21 – 30
   - 31 – 40
   - 41 – 50
   - 51 – 60
   - 61 – 70
   - 71 or older?
   - Refused
   - Don't know

5. What is your home state/state of residency? _____

6. For how many years has driving a truck been your main occupation?
   - Less than 1
   - 1-3
   - 4-6
   - 7-10
   - 11-15
   - 16-20
   - 21 or more?
   - Don't know
   - It's not my main occupation. I work more hours at another job.

7. Do you have a current Commercial Driver's License CDL?
   - Yes
   - No
   - Refused
   - Don't know

8. How did you obtain your Commercial Driver's License (CDL)?
   - Vocational technical trade school
   - Community college training course
   - Company-provided training
   - Obtained on my own, no formal training program or course
   - Military
   - Trucking school/CDL school (not through your company)
   - Other - please describe:_____

9. If you obtained your CDL on your own, have you ever participated in a structured CDL training course or program? Either company-run or through trade school?

   - Yes

- No
- Refused
- Don’t know

10. Which best describes your current employment as a driver?
    - Employed for wages by private trucking operator or motor carrier
    - Employed for wages by government-owned motor carrier
    - For hire, independent carrier
    - Other – please specify _____
    - Refused
    - Don’t know

11. Would you consider yourself:
    - Over the road (long-haul)
    - Regional
    - Local driver (day drivers)
    - Refused
    - Don’t know

12. How are you being paid for your time on your current trip? [Choose as many as apply]
    - By the hour (driving)
    - By the mile (driving)
    - By the load (special, oversized, etc.)
    - By the activity (loading, unloading, drop and hook, etc.)
    - By the hour (stopping)
    - A percentage of revenues
    - Refused
    - Don’t know
    - Other – please specify _____

13. Do you provide trucking services for certain types of industry primarily over others? If so, which industry or industries?
    - Agriculture
    - Construction
    - Oil & gas extraction
    - Mining (excluding oil & gas)
    - Manufacturing
    - Retail Trade
    - Other – please specify _____
    - Refused
    - Don’t know

About Driving In Wyoming

14. Have you driven through Wyoming before?
- Yes
- No
- Not sure

15. If no, how did/will you select your route?
- Built-in, in-vehicle navigation system
- Smartphone navigation system (Android, IPhone)
- CMV navigation system
- Company dispatch
- Another driver
- Other, please specify _____

16. If yes, what parts of Wyoming have you driven before?
- Northwest
- Northeast
- Central
- Southwest
- Southeast

17. Name the top three hazards that concern you for winter driving.
- Deteriorated road conditions
- Narrow roads
- High winds/blow-over risk
- Construction zones
- Mountain passes
- Winter weather
- Loss of brakes
- Steep grades
- Other, please specify _____

18. Name the top three hazards that concern you for summer driving.
- Deteriorated road conditions
- Narrow roads
- High winds/blow-over risk
- Construction zones
- Mountain passes
- Winter weather
- Loss of brakes
- Steep grades
- Other, please specify _____

19. What is the best way to reach you with information about weather or driver safety while in Wyoming?
    - 511 app
    - Other mobile apps
    - Local radio
    - Overhead signs
    - CB Radio
    - State DOT website
    - On-board computer (OBC)/company messages
    - Info obtained at POE
    - Other, please specify _____

About Improving Safety

20. The most important thing all trucking contractors or employers should do to prevent crashes is _____ (more training, log verification, team drivers, etc.)

21. In my opinion, the biggest barrier to safety on the road is _____ (using other devices in the cab (distracted driving, other truck drivers, other drivers (car/motorcycle), driving new/unknown routes, unexpected weather, delivery deadline pressures, etc.)

22. Please circle whether you strongly disagree, disagree, agree, or strongly agree with each of these statements.

	Strongly Disagree			Strongly Agree	RE	DK
A. The safety of workers is a high priority with management where I work	0	1	2	3	X	X
B. There are no significant compromises or shortcuts taken when worker safety is at stake	0	1	2	3	X	X
C. Where I work, employees and management work together to ensure the safest possible working conditions	0	1	2	3	X	X

23. Drivers often continue driving despite fatigue, bad weather, or heavy traffic for a number of reasons. **Fatigue is defined as being so tired that you need to sleep.** How often do you continue to drive despite these conditions because:

	Often	Some-Times	Never	RE	DK
A. You must deliver or pick up a load at a given time?	1	2	3	X	X
B. You have hours left in the 14-hour continuous shift?	1	2	3	X	X
C. You need to make more money?	1	2	3	X	X
D. Delays associated with dispatching?	1	2	3	X	X
E. Delays associated with loading/ unloading?	1	2	3	X	X
F. You want to get home	1	2	3	X	X
G. Some other reason? (specify)_____					

24. How often do you do the following while driving a truck at work? Would you say often, sometimes, or never?

	Often	Some-Times	Never	RE	DK
A. Get frustrated by operations at the loading dock?	1	2	3	X	X
B. Wear a seatbelt?	1	2	3	X	X
C. Get frustrated by other drivers on the road?	1	2	3	X	X
D. Drive 10 miles or more faster than the speed limit	1	2	3	X	X

25. How much of the day, on average, you felt fatigued since last week.
FATIGUE IS DEFINED AS BEING SO TIRED THAT YOU NEED TO SLEEP.
- None of the day
- A few hours
- Most of the day
- All day
- Refused
- Don't know

26. In your career as a truck driver, have you ever been in a DOT recordable truck crash, either as a driver or as a non-driving team member?

A DOT recordable crash occurs when the crash results in one of the following: a fatality; an injury to a person requiring immediate treatment away from the scene of the accident; or disabling damage to a vehicle, requiring it to be towed.

- Yes
- No
- Refused
- Don't know

27. If yes, how many of these crashes have you had?

- Number of crashes |___|___|
- Refused
- Don't know

28. Did the experience of crashing result in any changes to you or your employer's safety practices?

29. Is there any else you like us to know about how we can help improve your safety experience on the road?

30. M □ F □

The Safety Truck consists of a wireless camera attached to the front of the truck, which is connected to a video wall made out of four exterior monitors located on the back of the truck. The monitors give drivers behind the truck a view of what is going on ahead, even in the dark of night. This allows drivers to have a better view when deciding whether it is safe to overtake. Another advantage of the Safety Truck is that it may reduce the risk of accidents caused by sudden braking or animals crossing the road. Samsung led the prototype development by providing large format display samples, and Truck and Bus Driver Safety. Truck Stops & Road Safety. Minibus Taxi. Bus Industry in South Africa. Number One Taxi Drivers & Road Safety. Checklist for Trucks & Buses. Passenger Safety. Child Safety.Â But what does this mean, and how does an Accident Investigator/ Collision Reconstructionist go about establishing whether brake failure has been one of the contributing factors to the crash?