ASSESSING DAILY DRIVING AND WORKING HOURS WITHIN THE CONTEXT OF HOURS-OF-SERVICE REGULATIONS

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ABSTRACT

Today's truck drivers typically operate under a unique pay structure that interacts with their hour limits and lifestyles in a manner that some view as detrimental to driver safety, health, and well-being. Drivers' current pay structures have developed along with the trucking industry's unique history. Yet, while industry regulations have evolved and job tasks changed throughout the years, pay structure remains relatively the same, with up to 88% of drivers' compensation received as pay-per-mile (Dupre, Leitner, & Rader, 2014; Braver et al., 1992; Apostolopolous, Sonmez, Shattell, Gonzales, & Fehrenbacher, 2013; Griffin & Rodriguez, 1992, as cited in Lafontaine & Masten, 2002). Detention time compensation, if available, generally does not begin until after two-hours of wait-time. Additionally, under the Fair Labor Standards Act, truck drivers have historically been excluded from the groups of workers who may receive overtime pay (U.S. Department of Labor, 2009).

The current study presents a description of commercial drivers' working and driving hours, including the average and median driving and working hours per shift, using data collected in the Naturalistic Truck Driving Study and enriched in the Blanco et al. (2011) study. A total of 97 drivers and 1,938 shifts were included in the calculations. When excluding shifts with zero driving hours from the calculations, drivers had an average of 7.58 driving hours (SD = 2.69) and 11.25 working hours (SD = 3.50). A breakdown of the average workdays for line-haul and long-haul drivers showed a majority of the workday consisted of driving (68% and 60% of the workday for long-haul and line-haul drivers, respectively); however, both driver types spent a significant portion of their workday doing non-driving work. For long-haul drivers, 19% of their workday consisted of non-driving work (2% was heavy work) and line-haul drivers spent about 37% of their workday performing non-driving work (12% was heavy work). While long-haul drivers spent a larger percentage of their day driving than line-haul drivers, they also spent proportionally more time resting (13% and 3% of workday, respectively).

The naturalistic data analysis highlighted several potential implications for the pay-per-mile pay structure. The Hours-of-Service regulations specify that a driver can drive a maximum of 11 hours per shift, over a 14-hour window. The study findings indicate drivers are, on average, not driving the legal maximum available time, a finding with obvious pay implications for drivers paid per-mile driven. Furthermore, drivers are spending 32–40% of their workday performing non-driving work, for which they are unlikely to be compensated under a pay-per-mile structure. Pay structure can create pressure for drivers to complete work, even when facing legal or safety-related consequences, such as getting caught violating regulations or speeding, in order to maximize their pay within the confines of their allocated driving (and paid) time. Beyond contributing to unsafe driving behaviors, the pressure to complete work within the constraints of the compensation method may also affect drivers' health and personal well-being. Therefore, a better understanding is needed of the implications, including unintended consequences that driver compensation approaches may have on safety, health, and well-being.

1. INTRODUCTION

Proclaimed the "backbone of America," the trucking industry is a pivotal component of economic sustainability, prosperity, and progression (Gies, 2009; Hamilton, 2008). With such a strong role in the productivity of the nation, one would presume truckers to be well respected and well paid. Unfortunately, this is not typically the case. Today's truck drivers operate under a unique pay structure, which interacts with hour limits and their way of life in a manner that may be detrimental to driver health and well-being.

Throughout the years, the majority of carriers have consistently paid over-the-road drivers by the mile, with up to 88% of drivers citing pay by mileage (Dupre, Leitner, & Rader, 2014; Braver et al., 1992; Apostolopolous, Sonmez, Shattell, Gonzales, & Fehrenbacher, 2013; Griffin & Rodriguez, 1992, as cited in Lafontaine & Masten, 2002). In contrast, less-than-truckload pickup and delivery drivers are mostly paid by the hour (Trego & Murray, 2010). While most long-haul drivers are paid by the mile, a recent study from Canada differentiated data according to pay-of-book miles, or the company's estimated distance, and actual miles. The vast majority of drivers were paid according to book miles instead of the actual miles they had driven, at a difference of 35% (Sun et al., 2013). This practice does not take into account the routing alternatives that may occur due to construction, personal needs, or locating appropriate parking or fuel locations. Additionally, it should be noted that owner-operators appeared to rarely receive payment for actual miles, with the added burden of being responsible for paying their own tolls and fuel costs (Sun et al., 2013).

Although the pay by mileage compensation format is widespread in the industry, this type of compensation does not appear to work well in conjunction with current regulations. For example, compensation for detention time generally does not begin until after two-hours of wait-time. However, average time spent loading/unloading at a delivery location is 3.4 hours (Dunn, Hickman, Soccolich, & Hanowski, 2014). As drivers are often working to complete their driving within the Federal Motor Carrier Safety Administration (FMCSA)–mandated 14-hour time-limited window for the entire day, pressures to make up the time lost waiting may ensue. The 14-hour time-limited window is one aspect of the Hours of Service (HOS) regulations, which were implemented in 2004. Instead of the typical 40-hour workweek, HOS regulations limit drivers to a 60-hour maximum per 7-day workweek or up to 70 hours in an 8-day workweek (U.S. Department of Transportation, 2011). HOS regulations have also established daily driving limits, working windows for these driving limits, and rest requirements, with the intention of reducing driver fatigue.

Although trucking industry regulations, like HOS regulations, have evolved throughout the years, the Fair Labor Standards Act (FSLA) has remained the same. Under this act, drivers have historically been excluded from the groups of workers who receive overtime pay (U.S. Department of Labor, 2009). This exemption was determined in the Supreme Court's ruling in the *Levinson vs. Spector Motor Service* case ("Safety and Overtime Pay: The Motor Carrier Exemption from the FLSA," 1948). Siding with the judgment of the Interstate Commerce Commission, the Supreme Court determined that truck drivers were among workers who devoted a significant amount of time to, and had a significant effect on, the safety of motor vehicle operations ("Safety and Overtime Pay: The Motor Carrier Exemption from the FLSA," 1948). In light of this, it was determined that drivers should not be tempted into working overtime by being eligible for overtime pay.

Although truck drivers were excluded in the FLSA in the hopes of increasing safety, this exemption may have had a negative impact on safety instead. The combination of fluctuating income despite working long hours and lack of overtime pay may result in consequences such as increases in speeding and HOS violations in order to obtain a certain number of miles (and corresponding pay). Drivers may strive to meet a minimum amount of income per month, as their bills are not likely to fluctuate in the way that their revenue does (Rodriguez, Tarpa, & Belzer, 2006; Belzer, 2012). Several studies of drivers conducted during previous iterations of HOS regulations have found HOS violations not to be uncommon. In a study of roughly 1,400 drivers from across the nation, three fourths violated HOS regulations (Braver et al., 1992). Thirty-three percent claimed driving more than 10 hours a day due to

a tight schedule, while 31% stated they did so due to economic necessity (Braver et al., 1992). A survey of 500 drivers in Florida found similar results. Drivers with regular routes, long distance routes, or with refrigerated goods were more likely to have violation-suspect or violation-inducing schedules (Beilock, 1995). To ensure more accurate documentation of hours worked and discourage HOS violations, implementation of electronic logging devices (ELDs) was recently deemed mandatory for commercial vehicle drivers (Electronic Logging Devices and Hours of Service Supporting Documents, 2015). However, this solution doesn't address the underlying issues that may be involved in HOS violations. Given that violations may be related to economic pressure, a more in depth discussion of driver pay is necessary. This paper provides a closer look into the history of driver pay, examines driver schedules observed in a current naturalistic study, and evaluates the implications of these findings on trucking climate and safety.

2. HISTORY OF DRIVER PAY IN THE TRUCKING INDUSTRY

Around the industrial revolution of the late 1880s to the early 1900s, the invention of diesel and electric engines allowed for the establishment of trucks as a mode of transport (Oshima, 1984). The transition from animal-led transportation to vehicles provided greater efficiency, and helped mold trucks into a growing component of company transportation of goods (Mom & Kirsch, 2001). Trucks also found an advantage over railway transport through their flexibility in the transportation of goods, including their ability to maneuver among alternative routes deemed unmanageable by railways (George, 1935). As the First World War ignited an increased need for goods, the production of trucks increased accordingly (Mom & Kirsch, 2001).

This increase in the number of trucks sparked an increase in the competition between trucking companies. Freshly wary of the potential for monopolies through unregulated competition, Congress successfully passed the Motor Carrier Act of 1935 (Taylor, 1994). This act gave birth to the Interstate Commerce Commission with hopes of preventing increases in competition and costs through regulation of permits, trucking routes, and tariff rates (IRS, 2015). This act substantially reduced competition within the industry (IRS, 2015).

Although advancements in transportation along with interstate highway development from the 1900s to 1950s provided opportunities for growth, long distance travel was still difficult. Trucking industry regulations were not sufficient to adequately handle the novel results of these systematic changes. Trucking permits were scarce and truck drivers with permits were limited to set routes at set prices (Crain, 2007). As regulatory inadequacies were realized and exemptions were provided for companies of certain sizes, a discrepancy between regulated and unregulated carriers arose (Crain, 2007). Unregulated carriers, such as independent truckers or companies that shipped their own products, were suddenly carrying more freight than those under the regulations, establishing imparities in the industry (Crain, 2007). Regulation prevented expansion and connectivity by keeping the price of long distance services exorbitantly high (Crain, 2007). By the 1970s, a communal cry for deregulation was acknowledged and interstate rules were loosened through the Motor Carrier Act of 1980 (Belzer, 2002). Deregulation allowed a decrease in rates, but with the rise of competition came the rise of company frugality (Mayhew & Quinlan, 2006). As a result of company efforts to implement cost-saving procedures, employee practices such as piece rate pay have become the customary employee compensation rate for today's truckers. Another result of the implementation of deregulation practices and increased route opportunities was the formation of a large number of transportation broker businesses, who connect shippers with carriers (Engel, 1998). While there appears to be little mention of the effect transportation brokers have on the relationship between trucking pressure and compensatory practices, their close connection between customer and carrier within the overall system may indicate a need for further analysis. As this growth in the transportation broker industry may have affected shipper interactions with truckers, it may be an overlooked cause of today's intercompany perception of timeframes and tensions.

Market deregulation affected the railway and trucking industries in different ways. The railway industry benefited from greater profitability through freedom to compete with other modes of transportation, and kept wages steady while eliminating jobs (Moore, 1983). In comparison, truck driver profits have

dwindled due to this same freedom to compete with other truckers, and the number of jobs has remained stable while wages have decreased (Moore, 1983).

As the trucking industry has evolved, commercial truck drivers have formed a collective voice strong enough for Congress to heed. However, that collective voice appears to falter when regulation ceases, enabling companies to take advantage of workers. This may be due to the evolution of unions. As unions gained strength in numbers, their voice became more powerful. However, once deregulation occurred, nonunion carriers received more business than union carriers due to lower labor costs (Engel, 1998). This competition caused a steep decline in union participation, weakening the voice of the drivers (Monaco & Habermalz, 2011). This legislative change also resulted in lower employee compensation rates, with pay by mile decreasing by around 44% between 1977 and 1987 (Corsi & Stowers, 1991). Meanwhile, labor intensified (Belzer, 2002). Fifteen years after the most recent Motor Carrier Act, the Trucking Industry Regulatory Reform Act was initiated, preventing governmental entities from controlling carrier rates, routes, or services (Engel, 1998). This final act removed any form of governmental involvement in compensatory regulations, leaving negotiations between the worker and the company. While wage inequality throughout the economy increased between 1979 and 2009, truck driver wages did not exhibit the same pattern (Monaco & Habermalz, 2011). Although skill-based advancements in certain fields may account for wage-related discrepancies, technological advancements in the trucking industry are not as significant, and do not allow for wage differences between skill-based and non-skill-based groups (Monaco & Habermalz, 2011). This reasoning may justify a company's lack of heightened pay, but the current structure may even fall short of *adequate* pay.

3. DRIVER SCHEDULES OBSERVED IN NATURALISTIC DRIVING STUDY

In order to understand the impacts of today's pay structure and to gain a further understanding of modern drivers' schedules, naturalistic driving data was used to assess the activities drivers take on during their workday as well as their average driving and working hours. Learning more about current driver schedules and workday activities, collected in situ, may provide context for understanding potential impacts of driver compensation.

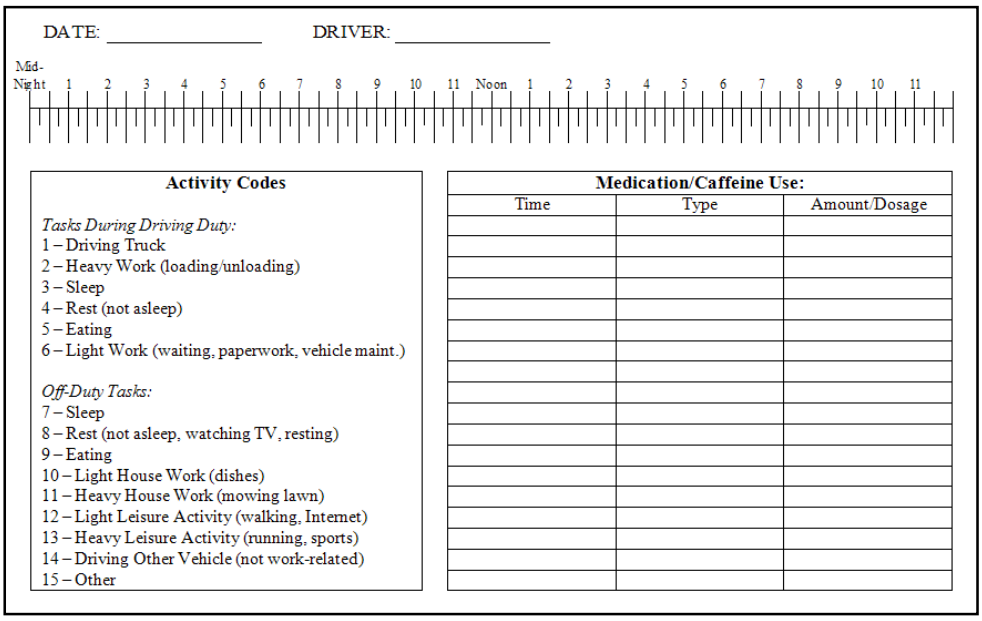
3.1. Study participants and procedure

The current study used data originally collected in the Naturalistic Truck Driving Study (NTDS) (Blanco et al., in press) and further studied in Blanco et al. (2011). This naturalistic data, which included self-reporting by drivers, was verified through driving logs. To the researchers' knowledge, this data set is the only available naturalistic truck driving data collected by the Virginia Tech Transportation Institute that provides verified information on specific details of truck drivers' hours. A total of 100 drivers working for commercial fleets participated in the NTDS from November 2005 to March 2007. The drivers were recruited from four companies, two with terminal locations in Virginia and two with locations in North Carolina. Three drivers were excluded from the analyses due to missing data (e.g., missing activity logs). Of the 97 drivers included in the analyses, 96 provided demographic information. The 96 drivers included 91 male drivers and 5 female drivers, with an average age of 44.3 years (SD = 12.1). The drivers reported an average 9.1 years of commercial motor vehicle (CMV) driving experience (SD = 10.6). Drivers included line-haul operators (drivers drive a fixed route, n = 21) and long-haul operators (drivers drive a variable route and may be on the road for over a week, n = 75). The delivery locations for all drivers were identified, and over all drivers, the average driving distance from loading location to delivery was 277 miles (SD = 203.3).

A naturalistic-data-collection approach was used in the NTDS, with unobtrusive cameras and sensors collecting data from participants as they operated instrumented company trucks during normal, revenue-producing runs. A total of nine trucks were instrumented with data collecting equipment. Each driver was assigned to an individual instrumented truck, which they drove for approximately four weeks before a new participant was assigned to the truck. This method continued until all participants completed data collection. Approximately 735,000 miles of driving data (including video data and dynamic sensor data)

were collected in the NTDS. The data were collected via a data acquisition system mounted in each of the nine trucks. Video cameras recorded the driver's face, an over-the-shoulder view of the steering wheel, and three views outside of the truck (forward roadway, driver side, and passenger side).

Driver participants in the NTDS also reported their daily activities, as well as caffeine and drug use, in a paper activity register (Camden, Hickman, Soccolich, & Hanowski, 2014). The activity registers included a 24-hour timeline and drivers used this timeline to mark the start and end of activities during their day. Activities could include driving the truck; light or heavy on-duty work; eating, resting or sleeping while on duty; and off-duty tasks like house work, leisure activities, eating, resting, sleeping, etc. Drivers were encouraged to accurately mark the timeline for the entire day, for all days they participated in the study. An example of the activity register is shown in **Error! Reference source not found.**.


DATE: _____ DRIVER: _____

Mid-Night 1 2 3 4 5 6 7 8 9 10 11 Noon 1 2 3 4 5 6 7 8 9 10 11

Activity Codes

Tasks During Driving Duty:
1 – Driving Truck
2 – Heavy Work (loading/unloading)
3 – Sleep
4 – Rest (not asleep)
5 – Eating
6 – Light Work (waiting, paperwork, vehicle maint.)

Off-Duty Tasks:
7 – Sleep
8 – Rest (not asleep, watching TV, resting)
9 – Eating
10 – Light House Work (dishes)
11 – Heavy House Work (mowing lawn)
12 – Light Leisure Activity (walking, Internet)
13 – Heavy Leisure Activity (running, sports)
14 – Driving Other Vehicle (not work-related)
15 – Other

Medication/Caffeine Use:

Time	Type	Amount/Dosage

Figure 1: Daily activity register used to record activities.

In Blanco et al. (2011), the activity registers were used to create a continuous timeline of each driver's time in the study. Driving periods marked in the register were verified using vehicle time-stamped video data. The activity register data and the vehicle time-stamped data were combined to form a single data set that included both driving and non-driving work-related and non-work related activities. Working shifts were identified in the timeline using the 2005 HOS guideline specifications to determine when shifts started and ended.

3.2. Driver schedule results

Average and median driving and working hours per shift were calculated using data from 97 drivers and 1,938 shifts. When shifts with zero driving hours were included, drivers had an average of 7.35 driving hours (SD = 2.94) and 11.05 working hours (SD = 3.75). These shifts had a median driving hour time of 7.75 hours and a median working hour time of 11.50 hours. When shifts with zero driving hours were excluded from the calculations, drivers had an average of 7.58 driving hours (SD = 2.69) and 11.25 working hours (SD = 3.50). These shifts had a median driving hour time of 7.88 hours and a median working hour time of 11.50 hours.

Average and median driving hours and working hours were calculated for both line-haul and long-haul drivers. A total of 22 line-haul drivers and 75 long-haul drivers were included in the calculations. When shifts with zero driving hours were excluded from the calculations, line-haul drivers had an average of 6.26 driving hours (SD = 2.00) and 10.47 working hours (SD = 2.02) per shift. Line-haul drivers had

median driving and working times per shift of 6.45 hours and 10.50 hours, respectively. Long-haul drivers had longer driving and working times than line-haul drivers, with an average of 7.96 driving hours (SD = 2.74) and 11.48 working hours (SD = 3.80) per shift. Long-haul drivers had median driving and working times per shift of 8.75 hours and 12.00 hours, respectively.

The activity register data used in the current study provided a detailed account of the tasks that CMV drivers performed during their workday. The proportion of activities during an average workday is shown in Figure 2 for all drivers in the study. The majority of their day, 65.7%, was spent driving, while 4.1% was spent doing heavy work, 18.7% was spent doing light work, and 11.5% was spent doing non-work related tasks (i.e., 4.7% spent resting, 4.4% spent sleeping, and 2.4% spent eating). In shifts with driving, drivers had, on average, 3.1 separate periods of light or heavy non-driving work per day (SD = 2.4).

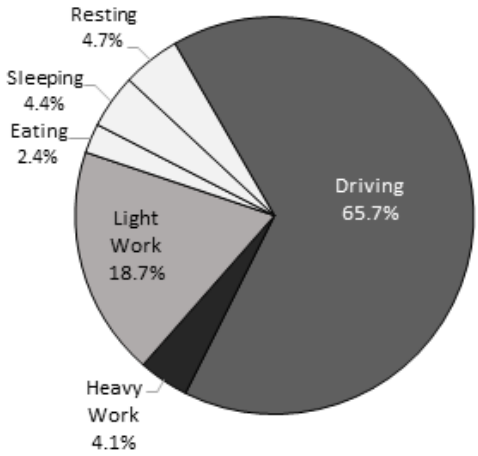


Figure 2: Proportion of tasks performed during an average workday, for all drivers in the current study.

A breakdown of the average workdays for line-haul and long-haul drivers is shown in Figure 3.The comparison shows long-haul drivers spent relatively more time driving (67.7%) compared to line-haul drivers (59.9%). Long-haul drivers spent much less of their workday doing non-driving work (about 19.4%, of which 2.0% was heavy work) than line-haul drivers (about 37.4%, of which 12.0% was heavy work). Long-haul drivers did spend proportionally more time resting (12.8% broken down into 2.3% spent eating, 5.1% spent sleeping, and 5.4% spent resting) than line-haul drivers (2.6% spent doing non-work related tasks, broken down into 1.1% spent eating, 0.5% spent sleeping, and 1.0% spent resting).

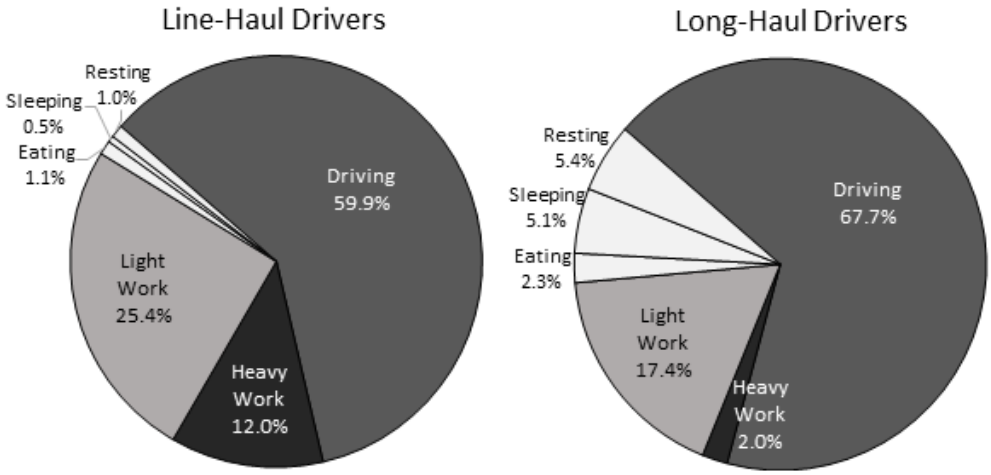


Figure 3: Proportion of tasks performed during an average workday, for line-haul drivers (left) and long-haul drivers (right).

For all shifts, the first work-related task of the shift was identified (see Table 1, which compares line-haul and long-haul operations). The HOS working clock, during which a driver has limited hours to drive, begins when drivers start their first work-related task of the day. The most commonly observed first work-related task of the shift for both line-haul and long-haul drivers was light work (66.2% and 57.1%, respectively); however, the duration of the light work was nearly twice as long for line-haul drivers than long-haul drivers (79.7 minutes and 41.9 minutes, respectively). Line-haul drivers reported doing heavy work as the first activity in 23.2% of shifts, while long-haul drivers reported this same task in 3.5% of shifts. Line-haul drivers reported driving as the first activity less frequently than long-haul drivers (10.3% and 39.5% of shifts, respectively).

Table 1: Frequency and duration of first work-related task of all shifts by task type and carrier operation.

First Work-Related Task of Shift	Line-haul Proportion of Shifts (Frequency)	Line-haul Average Duration in Minutes (SD)	Long-haul Proportion of Shifts (Frequency)	Long-haul Average Duration in Minutes (SD)
Driving	10.3% (45)	151.4 (116.3)	39.5% (593)	176.1 (164.1)
Heavy Work (Loading/Unloading)	23.2% (101)	69.8 (66.9)	3.5% (52)	63.6 (72.7)
Light Work	66.2% (288)	79.7 (67.6)	57.1% (857)	41.9 (27.9)
Potential Work During Duty Period (left blank)	0.2% (1)	90.0 (-)	0.0% (0)	- (-)

4. DISCUSSION

This study sought to illustrate the systemic impacts between driver schedules and pay. Although no pay rates data were available, the apparent disconnect between today's pay-per-mile format and current driver schedules highlights the incompatibility of these two highly overlapping elements of the compensation system. The evolution of this specific pay structure shows how small decisions in honest efforts to improve the situation, without fully accounting for the way that a driver's schedule is executed, inhibit the development of a cohesive system. The data also indicates drivers do not, on average, work or drive maximum hours available in the HOS regulations, suggesting a pay-by-hour format may also be incompatible with current driver schedules.

As drivers with zero driving hours under HOS regulations may not have needed to drive that day or were taking a well-timed break, the more accurate picture of a driver workday excludes that data. Thus, when shifts with zero driving hours were excluded from calculations, driving hours averaged 7.58, while overall working hours were 11.25. Interestingly, this sample of drivers did not, on average, use the full allotment of driving or working hours available under the HOS regulations in place during the study (11 hours of driving in a 14 hour working window). Drivers spent the majority of their workday (60-68%) driving. However, the second highest percentage of drivers' days was consumed with light work, which was also the category of work the majority of drivers spent their first work hour performing. Drivers paid by mile would not be compensated for time spent performing light or heavy non-driving work or taking mandated breaks (the remaining 38-40% of their workday). It may be that a desire to start driving and begin making an income is why long haul drivers take less time conducting light work than other drivers at the beginning of their shift, despite having longer routes.

In the NTDS, driver payment type was not recorded, so the compensation of this group of drivers is unknown. However, if this sample is representative of the larger driver population, the prevalent pay-per-mile structure does not fully compensate drivers for all of the work required of them to do their jobs.

This discrepancy between pay and schedule appears to be outside of the driver's control. For example, drivers may reach their destination within adequate time, but receivers may wait multiple hours to unload the truck. These hours may still count towards the governmental ruling of total hours allowed in a daily working window. While detention time may be due to insufficient staff, equipment, or overscheduling (Government Accountability Office, 2011), carrier companies may not seek to resolve the issue with shippers for fear of diminished customer relationships ("Mandated pay for excess detention time for truckers," 2011). This misalignment between systematic influences creates pressure for the driver, leading to an imbalance within the overall system. Compounding elements of apathy towards a driver's schedule and pay may entice a driver with only a few hours left to drive to then speed towards the destination, increasing crash risk (Rodriguez, Rocha, Khattak, & Belzer, 2003; Mayhew & Quinlan, 2006), and, in turn, effectively negating the safety goals of the Motor Carrier exemption to the FLSA.

Although the pay-per-mile structure was historically framed by companies as an efficiency-inducing practice, the consequences of not making enough miles in a day can be devastating to employees' financial stability. As drivers strive to meet a minimum income per month in order to pay their bills, the consequences to safety can be dire (Rodriguez, Targa, & Belzer, 2006; Belzer, 2012). Pressures to meet a minimum income through miles traveled have also been suggested as a suspected link between increased speeding and violation-related behaviors (Rodriguez et al., 2003; Belzer, 2012). As ELDs will now be mandated across the nation, an earnest discussion of how this will affect drivers experiencing income-related stress, including how it may increase pressures to violate laws in other ways, is indeed necessary. The use of ELDs will allow drivers to be tracked and provides a strong justification for updating of the FLSA to treat drivers like any other non-exempt worker in the U.S. with respect to pay.

Another source of pressure is the influence a dispatcher has on a driver's schedule. Dispatchers have the potential to alleviate time-related pressures due to their frequent communication between drivers and companies, as well as via assignment of routes. Unfortunately, dispatchers have been found to pressure drivers to break the law in an effort to complete trips on time (Braver, Preusser, & Ulmer, 1999; Chatterjee et al., 1994). In fact, 75% of dispatchers cited revenue of a load as the largest factor in accepting or rejecting a load, while only 9% factored in HOS regulations (Braver, et al, 1999). It appears that these regulations do not affect the dispatchers enough to influence their decisions, which in turn affects the driver. Additionally, the majority of dispatchers cited time allotted for non-driving tasks as a portion of the day that was up to the driver, suggesting dispatchers do not factor this into trip planning times (Braver et al, 1999). Another study differentiated pre-trip route planning and en route adjustments, and found that an assigned route may be mandatory or recommended, but the majority of drivers claimed responsibility for route decisions (Sun et al., 2013). Drivers mainly mention certainty of travel time and parking or fuel stations as important components of route planning, showing a difference in cognitive

processes from the dispatchers. Different priorities for drivers and dispatchers as well as differences in pay structure by employee type may be factors in this complex relationship.

Even though dispatchers, shippers, and schedule structure may entice a driver to violate HOS rules, the consequences of drivers cutting corners to make money are quite different from the consequences of any other type of employee doing the same. The transportation industry has a potent safety element that cannot be ignored. Risk-taking behavior is increased with performance based pay, and the potential for injury or illness increases when performance pay is established (Artz & Heywood, 2015; Bender, Green, & Heywood, 2012; Bender & Theodossiou, 2014). Due to the external and internal importance placed on higher performance and greater income, safety practices may be ignored. Indeed, drivers under the piece rate system of pay are more likely to continue driving while fatigued (Thompson & Stevenson, 2014). A study comparing payment types of long distance truck drivers and compensatory behaviors found further evidence for this connection. Those who received incentive based pay had longer trips and higher accounts of fatigue, while unpaid detention time was also linked to longer trips above the legal limits and fatigue (Williamson & Friswell, 2013). This finding suggests that drivers who suffer loss of hours through detention time may not stop driving at their regulated daily limit. In comparison, one study found a 1.33% decrease in crash risk for every one cent increase in pay (Rodriguez et al., 2006). The increase in safe driving behaviors may be due to increased cost of work termination or motivational and incentive factors (Rodriguez et al., 2006). However, the potential for positive outcomes due to employee-centered pay modification seems promising.

This issue is not isolated to one geographic or cultural group. Links have been found throughout the European Union, Australia, and North America between rising competition through deregulation practices and driver fatigue from long work hours, increased use of drugs, and increases in crashes (Mayhew & Quinlan, 2006). The constancy of these connections speaks to the pervasiveness of the problem. It may be time to reassess this component of the current industry, and create an alternative pay format that is congruent with all elements of the system.

In North America, one company has begun to heed the cry of driver discontent. In J.B. Hunt's recent white paper, a BB&T study found only 390 minutes of the total 660 minutes (from FMCSA's 11 allowable driving hours per day) were spent driving (J.B. Hunt Transport Inc., 2015). This is similar to our finding in the current study that line haul drivers spent 59% of their day driving. In the BB&T study, a specific breakdown of the more than 5,000 participants' 14-hour days were detailed, noting that the time at a shipper/receiver was an average of 108 minutes. This one activity alone consumed the majority of the only 150 minutes allotted by HOS rules for non-driving activities, including pickup, delivery, and safety inspections, This leaves little room for anything else to be realistically completed within the HOS timeframe. J.B. Hunt recommended shippers implement remedying actions, such as allowing flexible appointment times or expediting loading/unloading time. These actions were estimated to provide drivers with time to travel 44,375 more miles per year (J.B. Hunt Transport Inc., 2015). This set of data highlights the extensiveness of the scheduling problem. As employees in this group are not driving the maximum time available, it may be valuable to take a closer look at scheduling routines of multiple fleets and driver types to evaluate trends and variances.

In an effort to reduce truck driver fatigue and improve road safety, Australian authorities mandated new regulations in 2008. These regulations, known as the "Australian Heavy Vehicle Driver Fatigue Law," focus on implementation of driver safety throughout the entire supply chain. All persons and entities involved in the process must ensure drivers are able to comply with current work and rest hour laws (Goel, Archetti, & Savelsbergh, 2012). If failures to fulfill this demand occur, those responsible may face legal repercussions (Goel, et al, 2012). This contemporary law succeeds in acknowledging the impact of all operatives within a system, and the power each may have on altering one another within a structure. In addition, Australia's Safe Rates model of fair driver pay has received international attention as a good model to replicate (Tripartite Sectoral Meeting on Safety and Health in the Road Transport Sector, 2015). The development of such implementations may provide further support for drivers' success by providing realistic expectations.

Overall, drivers carry out a number of non-compensated work tasks during their work day, all of which count against their HOS clock. The previously discussed issues contribute to drivers not spending as

much time driving as HOS regulations allow. Drivers compensated by mile may not be paid in a way that represents the activities required to do their job. Drivers compensated by load may also be at risk of having pay affected by high detention times or unexpected delays. Pay structure can create pressure for drivers to complete work, even when facing legal or safety-related consequences, such as violating HOS regulations or speeding. Beyond unsafe driving behaviors, the pressure to complete work for pay reasons could also affect drivers' personal well-being, as they select faster, unhealthier meals, eat while driving, or fail to rest when they become fatigued. All of these bring the risk of immediate and lasting consequences for the well-being of drivers and others on the road.

Before solutions to these issues of driver schedules, pay, and safety can be developed, it is imperative to understand that addressing any one issue may affect multiple components of the structure. Altering anything within the structure in order to address a concern without attending to its position in a system may produce unintended consequences (Hanowski, 2013). These consequences may impede the process of problem mitigation or make the structure of the system worse. Future studies should seek to explore the relationship among these issues in depth. Enhanced communication between multiple system components, including drivers, dispatchers, and shippers may alleviate some detention issues. However, an honest view of how pervasive payment is to driver health, well-being, and safety-related regulation compliance throughout the history of truck driving shows the need to formulate a global approach when addressing the problem. Driver pay type as a motivating factor in safety risks and overall diminished quality of life should be attended to, as an issue cannot be fixed if the root of the problem is ignored.

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