



## Original Article

# Surveying the Impact of Work Hours and Schedules on Commercial Motor Vehicle Driver Sleep



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## ABSTRACT

**Background:** Given the long hours on the road involving multiple and interacting work stressors (i.e., delivery pressures, irregular shifts, ergonomic hazards), commercial drivers face a plethora of health and safety risks. Researchers goal was to determine whether and to what extent long-haul trucker work schedules influence sleep duration and quality.

**Methods:** Survey and biometric data collected from male long-haul truck drivers at a major truckstop in central North Carolina over a six month period.

**Results:** Daily hours worked (mean = 11 hours, 55 minutes) and frequency of working over government-mandated daily HOS regulations (23.8% “frequently or always”) were statistically significant predictors of sleep duration. Miles driven per week (mean = 2,812.61), irregular daily hours worked (63.8%), and frequency of working over the daily hour limit (23.8% “frequently or always”) were statistically significant predictors of sleep quality.

**Conclusion:** Implications of findings suggest a comprehensive review of the regulations and operational conditions for commercial motor vehicle drivers be undertaken.

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## 1. Introduction

The United States (US) transportation sector contributes 8.6% to the country’s Gross Domestic Product [1] and employs millions of workers across several occupational categories. Freight haulage is a central component of the transportation sector and commercial drivers who move a variety of goods across the 48 contiguous states are subject to more adverse work conditions than workers in other blue-collar occupations [2,3]. Given the long hours on the road involving multiple and interacting work stressors (i.e., delivery pressures, irregular shifts, ergonomic hazards), commercial drivers face a plethora of health and safety risks. In fact, the work environment of commercial drivers has been linked with a wide range of health afflictions including, among others, musculoskeletal and pulmonary disorders [4–7], cardiometabolic comorbidities [8–11], overweight and obesity disorders [12,13], and fatigue and sleep

disorders [14–16]. These comorbidities are particularly pronounced among long-haul truck drivers, who are associated with shorter life expectancies than the general population [6].

Empirical evidence reveals the wide array of challenges for long-haul truck drivers that include long work hours, irregular work schedules, unequal pay structures, and a lack of regular access to quality and affordable health care services [6,17–20]. Truck drivers’ work conditions often involve erratic demands and result in inconsistent hours of sleep, short sleep duration, and disrupted sleep patterns, placing long-haul truckers at risk for chronic fatigue [14–16]. A survey by the National Sleep Foundation that investigated the sleep habits of key categories of transport operators reported that 17% of truckers average < 6 hours of sleep on their workdays, compared to 16% of train operators, 10% for bus/taxi/limo drivers, and 9% for airline pilots [21]. The same survey revealed that 44% of truckers get a good night’s sleep only on rare occasions or never during their workdays,

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surpassed only by train operators who reported getting a good night's sleep more frequently. Inconsistent sleep patterns of long-haul truckers (i.e., disrupted sleep, irregular sleep, sleep deprivation) may result in overall poor sleep quality that not only influences driver health but also jeopardizes highway safety [14–16,22–24].

With the notion that commercial driving places a tremendous burden on overall morbidity and mortality of transport workers, the purpose of this paper is to determine whether and to what extent work schedules and long and inconsistent work hours of long-haul truckers influence their sleep duration and quality. Study findings are expected to make valuable contributions to research into and preventive interventions for occupational health disparities, and to inform regulatory policy.

## 2. Materials and methods

### 2.1. Data collection

Survey and biometric data were collected from male long-haul truck drivers at a major truckstop located in central North Carolina, US over a period of 6 months. This study site was selected due to the consistent high-level trucking activity at the truckstop. Permission to conduct the study was granted by the corporate office of the company and the cooperation of onsite management facilitated data collection; a table was set up in a central location of the truckstop with visible signage around the facility describing the research procedures.

Beginning in October and ending in March, two teams of field researchers spent 3–4 weekdays at the truckstop from 6:00 PM to 10:00 PM. Using intercept techniques, researchers approached drivers and asked targeted screening questions to establish first the status of long-haul trucker (as opposed to short-haul drivers), second that they were laid over that night at the truckstop, and third their willingness to provide fasting blood specimens prior to departing early the following morning. Field researchers explained the voluntary nature of study participation, nature of survey questions, anthropometric and serological data collection, and cash incentives to be paid at the end of the survey data collection and blood draws. Enrolled drivers were then asked to sign an informed consent form, and those who preferred to use aliases to assure a greater degree of confidentiality were allowed to do so. Those drivers who wished to receive the results of their serological tests (e.g., cholesterol) provided either a street or e-mail address, and were later sent their results. In this manner, 260 truck drivers completed the interviewer-administered survey, which took approximately 40 minutes. This paper reports findings based only on survey data.

### 2.2. Survey instrument

We used the Trucker Sleep Disorders Survey (TSLDS) that was developed from insights gleaned from other key instruments (i.e., Basic Nordic Sleep Questionnaire, Berlin Questionnaire), relevant sleep literature, and our previous work with truckers [25–28]. Initial cognitive testing involved a review of the instrument by public health professionals to assure: (1) appropriateness of language used; (2) that questions conveyed intended meanings and made sense; and (3) optimal question placement and flow. Following necessary revisions, a paper-and-pencil draft of the instrument was pilot tested with a sample of six long-haul truckers in the Piedmont Triad area in central North Carolina. Truckers were monitored and timed as they completed the survey to detect pauses and problems before appropriate revisions were made. This phase was intended to help determine construct validity, identify missing items, clarify

scale distributions, help conduct item correlations, and determine reliability.

The TSLDS instrument was organized into five sections and included questions on: (1) trucking work environment such as work hours, workplace factors, job strain, workload, and irregular schedules; (2) truckers' work- and health-related individual factors such as sociodemographics, dietary and physical activity patterns, substance use, prescription medication use, health history, sleep patterns, and psychosocial factors; (3) truckers' self-reported sleep disturbances and disorders such as daytime sleepiness, insomnia, restless leg syndrome, periodic limb movement disorder, sleep fragmentation, sleep deprivation, and diagnosed sleep apnea; (4) truckers' health consequences attributable to sleep-disorders such as concentration lapses, judgment errors, work injuries, highway near misses, accident and crash history, and disability and medical claims; and (5) truckers' self-reported comorbidities associated with chronic sleep disorders such as stroke, hypertension, metabolic syndrome, diabetes, ischemic heart disease, and psychiatric disorders.

### 2.3. Measures

#### 2.3.1. Sleep patterns and quality

Sleep patterns were assessed with the following five questions: "How many hours of sleep do you feel you need for your highest function?"; "How many hours of sleep do you get on work nights and nonwork nights?" (this can be "days for drivers" depending on the time of day they work), "How long does it take you to fall asleep on workdays and nonworkdays?", "How many naps on average do you take on workdays and nonworkdays?", and "How long are your naps on workdays and nonworkdays?". For each of these questions, participants were given the opportunity to express their sleep length in hours and minutes and to report the number of daily naps and their length in hours and minutes.

Sleep quality was assessed with the following four questions: "How often do you feel you get a good night's sleep on workdays and nonworkdays?" (this can be "days for drivers" depending on the time of day they work); "Over the past 2 weeks, how often have you experienced difficulty falling asleep?"; "Over the past 2 weeks, how often have you experienced waking up during sleep?"; and "Over the past 2 weeks, how often have you experienced waking up too early and being unable to fall back asleep?" Response options included "never", "rarely", "almost every night", and "every night".

#### 2.3.2. Predictors of sleep patterns and quality

Work patterns were measured with the following six questions: "How many miles on average do you drive per week?"; "How many days on average are you on the road per month?" (meaning because of work—we just mean "total" days away from home per month); "How many hours on average do you work each day?"; "Is your schedule the same or different every day?"; "Does the number of hours you work per day remain the same or change each day?"; and "Are the days of the week that you work the same or different each week?". Responses for miles driven per week were the actual weekly average number that drivers reported. For analysis this variable was categorized as "high" (> 3,000 miles), "medium" (2,500–3,000 miles), and "low" (< 2,500 miles). Days on the road were first categorized as < 5 days, 6–10 days, 11–15 days, 16–20 days, 21–25 days, 26–30 days, > 1 month, and > 2 months, then grouped as "high" (≥ 26 days), "medium" (21–25 days), and "low" (≥ 20 days). Hours worked in a day were noted as < 6 hours, 6–7 hours, 7–8 hours, 8–9 hours, 9–10 hours, 10–11 hours, 11–12 hours, 12–13 hours, 13–14 hours, and > 14 hours. For both consistency of schedule and hours worked daily, responses were "different every day" or "same every day". For consistency of the

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