

# ATTACHMENT A: BACKGROUND INFORMATION

This document contains **Background Information** for the developed web content for the Impact of Truck Driver Sleep and Fatigue Information Public Health Practice Project.

Principal Investigator:

Edward Hitchcock, PhD.

CDC, National Institute for Occupational Safety and Health (NIOSH), Division of Applied Research and Technology (DART), Organizational and Human Factors Research Branch (OSHFB).

Co-Investigators:

Claire C. Caruso, PhD, CDC NIOSH, DART

Guang-Xiang Chen, PhD, CDC NIOSH, Division of Safety Research

Heidi Hudson, CDC NIOSH, DART



**Table of Contents**

Title page .....	1
Table on Contents .....	2
Brief Public Health Practice Project Description.....	3
Project Plan	
A) Goal and Specific Aims.....	4
B) Background and Significance.....	4
C) Description of the Method.....	9
D) Participant Recruitment, Compensation, and Data management .....	10
E) Transcript of PSA's .....	11
F) Airtime on XM/Sirius satellite radio.....	12
Literature Cited .....	15

## BRIEF DESCRIPTION OF THE PUBLIC HEALTH PRACTICE PROJECT

Truck drivers account for approximately 31 % of the 8.6 million transportation and material-moving workers in the U.S. workforce (Bureau of Labor Statistics 2011). Heavy and tractor-trailer truck drivers, the largest subgroup of drivers with 2 million drivers (57% of the total), represent an underserved population with high rates of injury and illness. The National Health Interview Survey found that 33% of workers in the transportation and warehousing sector had 6 or fewer hours of sleep per 24 hour period (Luckhaupt 2012). The 2012 Sleep in America Poll found that 17% of 203 truck drivers indicated having less than 6 hours of sleep on average per 24 hour period (National Sleep Foundation 2012). Fatigue has been shown to be a risk factor for increased roadway crashes (Dinges 1995). Long-haul truck drivers have been found to be almost 5 times more likely, on a per mile basis, to be involved in a fatigue related crash relative to other forms of trucking. (Massie et al. 1987). As a result, the issue of fatigue is a primary safety concern of numerous government transportation agencies, motor carrier representatives, safety advocates, and the public at large. Although data limitations make it difficult to determine the exact extent to which fatigue is involved, the transportation industry has recognized that the well-documented operational characteristics of the trucking industry (e.g., long work hours and irregular schedules) predispose truck drivers to fatigue, which is implicated in many driving mishaps. The Federal Motor Carrier Safety Administration recently estimated that 15% of all fatal large-truck-related crashes involved fatigue as either a primary or secondary factor; 4.5% were estimated to have had fatigue directly involved, and the remaining 10.5% were attributed to the mental lapses and inattention associated with fatigue [65 Fed. Reg. 25540 (2000)].

NIOSH will test website health messages to assess the degree of acceptability of sleep information and changes in attitude toward sleep quality among commercial drivers of large trucks. Such attitude change and attendant change in sleep behaviors have been shown to positively impact health and safety. Specifically, the purpose of this Public Health Practice (PHP) Project is to critically evaluate training products currently being developed as part of a FY07-9 NIOSH Public Health Practice Project (PHPP) titled "Training to Reduce Possible Broad Impacts of Work-related Sleep Loss". U.S. workers and their managers show widespread lack of appreciation and knowledge about risks associated with long work hours and shift work. The scientific community has generated knowledge about the risks and strategies to reduce the risks but this information has not been sufficiently disseminated to the public. The PHPP educational products consisted of low-cost, web-based messages derived from accumulated information from NIOSH and the broader scientific community and specifically tailored for dissemination to four types of workers: nurses, retail workers, miners/blue collar workers, and truck drivers. The truck driver materials were designed to educate drivers via "public service" audio recordings, a web-page, and an educational pamphlet that convey the need for sleep; the dangers of sleepiness and fatigue; health risks; functional deficits associated with difficult work scheduling patterns; countermeasures; and shared responsibility of the workplace and the worker to reduce risks. Previous PHPP efforts incorporated a small evaluation of the educational messages with the nursing group; however, the efficacy of the messages has not been assessed in the high-risk commercial truck driving population. This proposed project will address that need and specifically test the efficacy these educational messages have toward positively impacting knowledge, attitude, perceived behavioral control, and intended behaviors regarding fatigue in truck drivers. This project is extremely timely given the U.S. DOT, Federal Motor Carrier Safety Administration's (FMCSA) newly established mandatory training requirement for entry-level operators of commercial motor vehicles who are required to possess a commercial driver's license [49 U.S.C. 3502(b)].

## A. GOALS AND SPECIFIC AIMS OF THE PROJECT

1. The two main outcome goals for the project are: Goal 1 - Assess the impact of the NIOSH fatigue web messages on short and long-term changes in knowledge, attitude, perceived behavioral control, and intended behaviors, within the truck driver population. This will help researchers identify message elements that did not transfer to the trucking population, and will serve to inform NIOSH researchers of deficiencies. Goal 2 - Provide a high-quality fatigue training curriculum for use by truck drivers and stakeholders in anticipation of the U.S. Department of Transportation, FMCSA's training requirement

The long term goal of this project is to minimize the health and safety risks associated with demanding work schedules in the truck driving industry by improving knowledge, attitudes, and intended behaviors, through the transfer of current scientific information about risks associated with demanding work schedules and strategies to reduce risks via training tailored specifically for truck drivers and managers. The results of this proposed web message testing will be used to inform the development of the training products and associated messages.

## B. BACKGROUND AND SIGNIFICANCE

This research addresses the considerable safety and health risks of the estimated 1.5 million truck drivers in the U.S. workforce (Bureau of Labor Statistics, 2005). From 1992-2002, the Census of Fatal Occupational Injuries recorded an annual average of 806 truck driver fatalities, more than any other occupation. The 2004 fatality rate for U.S. heavy and tractor-trailer drivers was 48.2 per 100,000 workers, compared with 4.4 per 100,000 for all workers. In 2004, the Survey of Occupational Injuries and Illnesses estimated 63,570 non-fatal injuries among heavy and tractor-trailer drivers – the second highest number among all occupations.

The project relates to the overall NIOSH Surveillance Strategic Goal of strengthening surveillance of high-risk industries and occupations. The project is also responsive to Healthy People 2010 Objectives 20-1 and 20-2, which address reduction of work-related injury deaths and work-related injuries across all industries. More specifically, it addresses sub-objective 20-1d, which calls for a reduction in work-related deaths in the transportation industry to 8.3 per 100,000 workers by 2010; and to sub-objective 20-2e, which calls for a reduction in work-related injuries in the transportation industry to 5.5 per 100 workers by 2010. The project also directly relates to the new Healthy People 2020 proposed Sleep Health goal to increase public knowledge of how adequate sleep and treatment of sleep disorders improve health, productivity, wellness, quality of life, and safety on roads and in the workplace.

The research is also related to the safety mission and goals of the Federal Motor Carrier Safety Administration (FMCSA), NIOSH's partner safety agency in the U.S. Department of Transportation. FMCSA's mission is to save lives and reduce injuries by preventing truck and motorcoach crashes, and its 2003-2008 Strategic Plan sets a goal of reducing commercial motor vehicle (CMV)-related fatalities to 1.65 fatalities per 100 million commercial motor vehicle miles traveled (VMT) by 2008.

**Risks to Health and Safety:** Commercial truck driving operations share many similarities to other types of work in terms of irregular work hours and long work hours. Both shift work and long work hours have been associated with risk for injuries and illnesses in workers, as well as higher rates of human error due to sleepiness and fatigue. No findings have been conclusive but several researchers theorize that these problems may be due to disruption of the sleep/wake cycle and circadian rhythms, sleep deprivation, and disturbed family and social life (Barton et al., 1995). Also, long work hours lengthen exposures to occupational hazards and reduce recovery time which likely increases risks.

A large number of studies associate shift work with sleep disturbances and human errors. Drake et al. (2005) indicate that 32% of night workers and 26% of rotating shift workers experience long-term insomnia and excessive

sleepiness. Sleep loss makes people sleepier while awake, which may affect the shift worker's ability to perform activities safely and efficiently, both on and off the job. Sleepiness is most apparent during the night shift, and poor daytime sleep appears to be a contributing factor (Akerstedt, 1988). A meta-analysis combining injury data from several studies indicated that injury risk increased by 18% during the afternoon/evening shift and 34% during the night shift as compared to morning/day shift (Folkard and Tucker, 2003). Relative risk also increased across consecutive shifts, with a more substantial increase in risk observed across night shift compared to morning/day shift.

Although the specific contribution of shift work to other illnesses is not clear, several diseases have been associated with shift work schedules. Gastrointestinal (GI) complaints are common in shift workers (Caruso et al., 2004a; Knutsson, 2003). Psychological complaints are frequently reported including depression and other mood disturbances, personality changes, and difficulties with personal relationships (Rohr et al., 2003). A review of 17 studies suggests that shift work increases a worker's risk for cardiovascular disease by 40% compared with day workers (Bøggild and Knutsson, 1999). A systematic review of epidemiological studies of reproductive outcomes by Frazier and Grainger (2003) concluded that shift work was associated with a modest increase in spontaneous abortion, preterm birth, and reduced fertility in women. A meta-analysis of 13 studies examining associations between night work and breast cancer reported that night work was associated with a moderately elevated risk among women (combined estimate for 13 studies 1.48, CI 1.36-1.61) (Megdal et al., 2005). Studies examining associations with other types of cancer have been limited to date. Schernhammer et al. (2003) reported nurses working three or more nights per month for  $\geq 15$  years showed an increased risk of colon cancer and Kubo et al. (2006) reported an increase risk for prostate cancer in men working rotating shifts.

Shift work may exacerbate pre-existing chronic diseases, making it difficult to control symptoms and disease progression. In addition, shift work may interfere with treatment regimens that involve maintaining regular sleep times, avoiding sleep deprivation, controlling amounts and times of meals and exercise, or careful timing of medications that have circadian variations in effectiveness. Sood (2003) suggests several conditions that are particularly vulnerable: unstable angina or history of myocardial infarction; hypertension requiring regular medications; insulin-dependent diabetes mellitus; asthma requiring regular medication; psychiatric illnesses requiring regular medication; alcohol or drug abuse; gastrointestinal diseases; sleep disorders; taking medications that have circadian variations in effectiveness; epilepsy requiring medication within the past year. Aging is also associated with less tolerance of shift work, which may be due to age-related changes in sleep that may make it more difficult for older people to initiate and maintain sleep at different times of the day (Duffy, 2003). These sleep changes may begin as early as age 30, so some workers who initially adapted well to shift work during their younger years may show more symptoms as they grow older.

The number of studies examining long work hours is less extensive, but a growing number of findings suggest possible adverse effects. A meta-analysis by Sparks et al. (1997) reports that overtime was associated with small but significant increases in adverse physical and psychological outcomes. A review by Spurgeon et al. (1997) concluded that the adverse overtime effects were associated with greater than 50 hours of work per week, but little data are available about schedules with less than 50 hours. An integrative review by Caruso et al. (2004b) reported that overtime was associated with poorer perceived general health, increased injury rates, more illnesses, or increased mortality in 16 of 22 more recently published studies. A study by Dembe (2005) examining data from the National Longitudinal Survey of Youth is one of the first reports of a possible dose-response relationship: as number of work hours increased, injury rates increased correspondingly.

Worker fatigue and sleepiness from demanding work schedules also can have broad reaching negative effects to families, employers, and the community (Caruso, 2006). Risks to families include work/family conflict, delayed

marriages and child bearing, and obesity in children (Greenhaus et al., 1987; Jacobs, 2004; Phillips et al., 2006). Risks to employers include reduced productivity and increases in worker errors (Thomas & Raynar, 1997). Mistakes by fatigued workers can have negative effects to the community when workers make a medical error that harms a patient, when a fatigued worker crashes into another driver on the road, or when a fatigued worker makes a mistake that causes an industrial disaster such as a jet liner crash, an incident at a nuclear reactor, or oil spill (Barger et al., 2005; Landrigan et al., 2004; Mitler et al., 1988).

**Strategies to Reduce Risks:** Current scientific literature provides many strategies to promote adaptation to or ease the difficulties of coping with shift work and long work hours. A sampling of strategies discussed in reviews by Rosa et al. (1990), Monk (2000), Knauth and Hornberger (2003), and Revell and Eastman (2005) include designing better work schedules and rest breaks during work, devising sleep strategies, altering circadian rhythms with bright light or blue light, optimally timing physical activity or other work demands, improving physical conditioning, use of pharmacologic aids and caffeine, planning dietary regimens, applying stress reduction techniques, organizing social support groups, and providing family counseling. Empirical evaluations and applications of some techniques have begun and will be useful for workers and managers.

**Mechanisms Lacking to Transfer this Knowledge to the Public:** There is widespread lack of appreciation and knowledge about risks associated with long work hours and shift work among workers and their managers. For the nursing community, preliminary discussions with faculty from several schools of nursing verified a lack of curriculum content to address demanding work schedules. Lee et al. (2004) also report a lack of curriculum content about sleep and chronobiology, a broader related area. Data about level of dissemination of this information to the mining/blue collar, retail, or truck driving communities is lacking but the scientific organizations discussed below believe there has been little dissemination of this knowledge.

**Theoretical Basis for Development of the Truck Driver Training Products:** Training materials used in occupational settings are both useful and necessary if they are effective. Many industries have legal requirements for training employees (such as the mining industry and nursing), but the requirement is generally concerned with assuring that trainees have the expected number of contact hours, not with how effective those hours were.

Effective training is an elusive goal, primarily because different types of workers do not always learn the same way, so what is effective in one setting may fail in another. Workers in different industries require different types of training, which may be skills-based, knowledge-based, or simple safety/health awareness. The key is to identify the cultural norms that drive these individual occupations, and to work inside the cultures to change or impact the common behaviors. To do this, the researcher or training developer must spend some time doing a culture study (an occupational ethnography) of the workers in question. Once the dominant cultural norms are known, it is much easier to develop materials that work within them.

One thing workers do share is that they are almost always (in this country at least) adults, and therefore, the training must be tailored for an adult learner. Adult Learning Theory was first proposed by Malcolm Knowles, and has since been expanded to include Social Learning Theory, Cognitive Learning Theory, Observational Learning, Transformational Learning, and a host of others (Cranton, 1994; Darwin, 2000; Knowles, et al., 1998; Kowalski & Vaught, 2002; Stone, 1999). What these theories share is the understanding that adults do not learn the same way children do, primarily because they make conscious choices about what or whether to learn. Training developed for occupational safety and health must first be interesting and relevant to these adult learners, or they will ignore it.

The impact that unique occupational cultures have on learning must not be understated. Work cultures have well-defined norms and expectations, and any training that runs counter to these will fail. In addition, work cultures

tend to be closed to “outsiders” such as government safety and health professionals, who are sometimes perceived as meddlesome. One of the most obvious barriers to learning or awareness training in these cultures is that teachers who do not look and talk and walk like the workers will not be effective. Workers who have a shared occupational language, or common exposures to dangers that only they understand will not tolerate having an outsider telling them how to do a job they do every day. The training developer would therefore be wise to use insiders who do understand the language, and who will be viewed as credible by the learners. If the culture has a strong tradition of using master-apprentice relationships, as many of the skilled blue-collar occupations do, these masters are the obvious choice to use as spokesmen or teachers, because they are already perceived as experts in the work.

**Existing Educational Resources:** The following existing educational resources were identified that meet the following criteria: easily available; low or no cost; produced in plain language for workers and managers concerning occupational health and safety issues associated with work schedules or related sleep/fatigue topics. No resource was identified that contains all of the content proposed for the truck driver training project. None of these educational materials include certain content that would be helpful for drivers: overview of all possible health and safety risks; full range of difficult work scheduling patterns; full range of strategies to reduce risks; and shared responsibility of workplace and worker to reduce risks. In addition, no tailored educational programs are available for truck drivers.

Source: National Institute for Occupational Safety and Health (NIOSH)

Booklet: Plain Language About Shiftwork. DHHS (NIOSH) Publication No. 1997-145. Date 1997.  
<http://www.cdc.gov/niosh/pdfs/97-145.pdf>

Provides basic facts about shift work and talks about ways to make shift work life easier. The document is an educational document for the general public.

Companion fact sheets: Work-related Roadway Crashes - Prevention Strategies for Employers. DHHS (NIOSH) Publication No. 2004-136. Date 2004. [www.cdc.gov/niosh/docs/2004-136/pdfs/2004-136.pdf](http://www.cdc.gov/niosh/docs/2004-136/pdfs/2004-136.pdf)

Companion fact sheet: Work-related Roadway Crashes - Who's at Risk? DHHS (NIOSH) Publication No. 2004-137. Date 2004. [www.cdc.gov/niosh/docs/2004-137/pdfs/2004-137.pdf](http://www.cdc.gov/niosh/docs/2004-137/pdfs/2004-137.pdf)

Companion fact sheets: Older Drivers in the Workplace Crash Prevention for Employers and Workers. DHHS (NIOSH) Publication No. 2005-159. Date 2005. [www.cdc.gov/niosh/docs/2005-159/pdfs/2005-159.pdf](http://www.cdc.gov/niosh/docs/2005-159/pdfs/2005-159.pdf)

Source: National Sleep Foundation [www.sleepfoundation.org](http://www.sleepfoundation.org)

Video: Day/night strategies for shift workers. Date 1997. 11 minutes. Cost \$19.95

Pamphlet: Sleep strategies for shift workers. Date 1999. Cost \$14.95

Web page: Helping yourself to a good night's sleep.

[www.sleepfoundation.org/sleeplibrary/index.php?secid=&id=55](http://www.sleepfoundation.org/sleeplibrary/index.php?secid=&id=55)

Web page: Strategies for shift workers.

[www.sleepfoundation.org/sleeplibrary/index.php?secid=&id=56](http://www.sleepfoundation.org/sleeplibrary/index.php?secid=&id=56)

Web page: Learn How to Create the Perfect Sleep Environment

<http://www.sleepfoundation.org/sleeplibrary/index.php?secid=&id=358>

Web page: good sleep hygiene

<http://www.sleepfoundation.org/hottopics/index.php?secid=9&id=31>

Source: National Institute of Health, National Heart, Blood, and Lung Institute

Booklet: Your Guide to Healthy Sleep. NIH Publication Number 06-5271. Date 2006. 60 pages.  
[www.nhlbi.nih.gov/health/public/sleep/healthy\\_sleep.htm](http://www.nhlbi.nih.gov/health/public/sleep/healthy_sleep.htm)

This patient and public booklet provides the latest science-based information about sleep including:

Common sleep myths and practical tips for getting adequate sleep

Coping with jet lag and nighttime shift work

Avoiding dangerous drowsy driving

Source: U.S. Department of Transportation, Nation Highway Transportation Safety Administration

In collaboration with National Center on Sleep Disorders Research (NCSDR), NHTSA developed an education program to increase shift workers' awareness of the dangers of drowsy driving, help them to improve the quality of their sleep and reduce sleepiness, and ultimately, reduce the incidence of drowsy driving. Date 2000.

Preventing Drowsy Driving among Shift Workers. Employer Administrator's Guide, which included the Training and Education Session on PowerPoint

Wake Up and Get Some Sleep Video

Sick and Tired of Waking Up Sick and Tired? Brochure for Shift Workers

Getting better sleep: A guide for shift work families. Brochure for Shift Work Families

10 Tips for Shift Workers to Combat sleepiness and drowsy driving Tip Card

How to help your shift workers wake up and get some sleep. Brochure

Source: Royal College of Physicians

Booklet: Working the night shift: preparation, survival and recovery. Horrocks, N & Pounder, R. 2006. London, Royal College of Physicians. 24 pages.  
[http://www.npsa.nhs.uk/site/media/documents/1516\\_nightshiftbooklet.pdf](http://www.npsa.nhs.uk/site/media/documents/1516_nightshiftbooklet.pdf).

Provides a practical guide to help junior doctors prepare, survive and recover from working night shifts. The guide examines the evidence concerning the hazards of shift work, and techniques that can be used to reduce risk.



Training programs by a shift work consultant firm have been developed for other types of workers in large businesses (personal communication, A. Heitmann, 2/28/2000). The training is presented in a seminar format to groups of workers at a company site and the cost is significant. To our knowledge, tailored training has not been developed by these consultation firms for healthcare, retail, mining, or truck drivers.

No previous publications have evaluated the effectiveness of work schedule training programs for the four types of workers planned for this project. Very few studies have evaluated the effectiveness of training programs for shift workers in any type of industry (Holbrook, et al., 1994; Tepas, 1993). Future studies will be useful to evaluate the effectiveness of training.

### C. DESCRIPTION OF THE METHOD

**Brief Overview of the Method:** The target population for this project is drivers of heavy trucks (gross vehicle weight > 26,000 pounds) who will be exposed to the previously developed informational products. Self-reported attitudes about the fatigue messages and behaviors will be measured using selected questions from the CDC Health Message testing System.

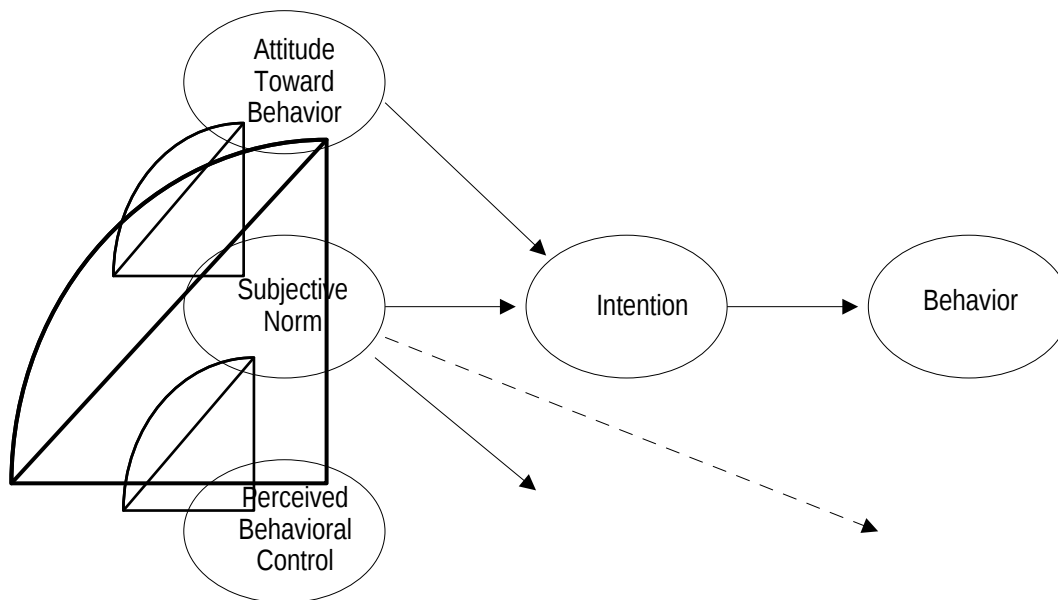
**Content of Truck Driver Website:** The web-based messages are designed to increase awareness of eight topics: 1) how demanding work schedules lead to health and safety risks, including information on circadian rhythms and need for sleep; 2) common complaints, illnesses, errors, and injuries associated with shift work and long work hours; potential safety risks to patients and other persons due to worker fatigue; 3) difficult work scheduling patterns; 4) liabilities and responsibilities of the worker and employer when a worker works when extremely fatigued or sleepy and the shared responsibility of the workplace and the worker to reduce risks; 5) signs and symptoms that indicate an extremely fatigued state, including pointing out common misconceptions (ie., a person knows when they are too fatigued; effects of sleep deprivation can be overcome through motivation, training, or experience); 6) evidence for similarities between fatigue-related impairment and impairment due to alcohol; 7) strategies to reduce health and safety risks: lifestyle and coping strategies (such as creating a conducive sleep environment by blocking out light, noise, etc; eliciting support from family and friends); use of light to shift circadian rhythms; use of caffeine and medications; naps; breaks at work; diet; exercise; forward movement of sleep, light exposure, diet/caffeine to adapt to forward rotating shifts; 8) appropriate actions when experiencing excessive fatigue, and services to consider such as transportation home after completing unavoidable demanding work shifts.

Content for the training products was adapted from several sources: previous shift work training programs for other occupational groups conducted by the U.S. Department of Transportation, a shift work consultation firm, and other existing educational materials (listed in Background and Significance Section); NIOSH publications (Rosa and Colligan, 1997; Caruso et al., 2004b); and the literature (e.g., Rosa et al., 1990; Monk, 2000; Knauth and Hornberger, 2003; Lennernäs, 2004; Arendt and Skene, 2005; Caldwell and Caldwell, 2005; Revell and Eastman, 2005).

The truck driver sleep and fatigue web pages are included in the HMTS submission as a separate PDF file titled "NIOSH Training Program for Truck Drivers".

**Evaluation of Truck driver educational messages:** Ajzen's Theory of Planned Behavior (1988) will provide the theoretical framework for the small scale evaluation comparing the message exposure responses. The theory states the intention to perform a behavior is influenced by three factors: the person's attitude about performing the behavior (positive or negative evaluation), perceived ease or difficulty of performing the behavior based on past experience and anticipated impediments and obstacles, and subjective norm (belief about what other

influential persons would want them to do) (see Figure 1). This theory has been used widely to study persuasion and attitude change (Petty and Cacioppo, 1996). As shown in Figure 1, a person's intention to perform (or not perform) a voluntary behavior is highly correlated and predictive of the behavior.



**Figure 1. Theory of Planned Behavior (Ajzen, 1988)**

C. PARTICIPANT RECRUITMENT AND COMPENSATION; DATA MANAGEMENT AND ANALYSIS

**Participant Recruitment:** Truck drivers will be directed to the fatigue and sleep information web pages primarily through advertisements that will be aired on Sirius XM satellite radio. These are described in more detail below. No other recruitment of truck drivers by CDC NIOSH researchers will take place. CDC NIOSH researchers have no control over the demographic make-up of the participant population, as going to the website will be entirely voluntary by truck drivers - however, age and gender will be asked. Age and gender are being asked to establish representativeness of the population and for use in comparison to a recently completed nationally representative sample of long haul truck driver responses to health and safety issues conducted by NIOSH. In particular, age has long been shown to have an effect on sleep quality and quality.

**Participant Compensation:** No compensation will be given for participant's feedback using the HMTS questions.

**Data Management, Documentation, and Disposition:** No personally identifiable information will be asked, collected or stored on the website.

**From Health Message Testing System (HMTS), OMB No. 0920-0572, Supporting Statement Part A:**

## A.10. Assurance of Confidentiality Provided to Respondents

The CDC Privacy Act Officer has determined that the Privacy Act does not apply to data collections conducted according to the procedures described in this application. Although personal information (e.g., gender and age) will be gathered in message testing activities, no personal identifiers (e.g., full name, address or phone number, social security number, etc.) will be collected or maintained.

**Data Analyses:** Descriptive statistics will be computed to assess demographic characteristics of the sample and for the message exposure changes in knowledge, attitudes, and intended behavior.

**CDC/NIOSH Radio Spots:** NIOSH researchers wrote three “public service announcement” (PSA) style messages to direct truck drivers to the fatigue information website. In collaboration with the CDC Creative Services, voice talent was secured and these messages were recorded in a digital format for airing on Sirius XM satellite radio. The transcripts (and duration in seconds) of the three developed “spots” are:

### Sleep Debt Public Service Announcement (:30)

[Adult Male] Credit card debt. Mortgage debt. Loan debt. It’s overwhelming! Sleep debt is another serious form of personal debt, and it grows when you don’t sleep well or long enough.

Insufficient sleep can lead to poor health and reduced quality of life. Fortunately, sleep debt is easy to pay off by taking a few simple steps.

For information that truck drivers and companies can use to prevent sleep debt, visit [w-w-w-dot-healthysleepfortruckers-dot-org](http://w-w-w-dot-healthysleepfortruckers-dot-org).

A message from the CDC.

### Sleep Changes Your World PSA (:30)

[Young Child Voice] When I go to sleep, the whole world changes.

[Adult Male Narrator] Kids have funny ideas about sleep—and so do some of us.

[Adult Male Truck Driver 1] I don’t get paid to sleep.

[Adult Male Truck Driver 2] Sleep is a luxury I can’t afford.

[Adult Male Narrator] Sleep can change your world. It’s as important as proper nutrition and exercise. During sleep, our bodies repair wear and tear and get us in shape for a new day.

For information that truck drivers and companies can use to promote better sleep and reduce fatigue, visit [w-w-w-dot-healthysleepfortruckers-dot-org](http://w-w-w-dot-healthysleepfortruckers-dot-org).

A message from CDC.

### Sleep Changes Your World PSA (:60)

[Young Child Voice] When I go to sleep, the whole world changes.

[Adult Male Narrator] Kids have funny ideas about sleep—and so do some of us.

Frankly, many of us who make our living on the road have funny ideas about sleep too.

[Adult Male Truck Driver 1] I don't get paid to sleep.

[Adult Male Truck Driver 2] Sleep is a luxury I can't afford.

[Adult Male Narrator] Good sleep is as important to our overall health as proper nutrition and exercise. When we sleep, our bodies repair wear and tear, fight germs, increase learning, optimize our blood sugar insulin system, balance appetite hormones, and get us in shape for a new day. That's just what we need for healthier, happier lives.

[Young Child Voice] When I go to sleep, the whole world changes.

[Adult Male Narrator] Maybe it's not a funny idea after all. Learn how sleep can change your world. For information that truck drivers and companies can use to promote better sleep and prevent risks linked to fatigue, visit [w-w-w-dot-healthysleepfortruckers-dot-org](http://w-w-w-dot-healthysleepfortruckers-dot-org).

A message from CDC.

Sirius XM Satellite radio has been contracted to air the PSA radio spots and the pre-invoices are shown below. The contract air dates are estimated and the spots will not run until authorized by CDC NIOSH researchers. The PSA spots will be aired on channels that Sirius XM has determined to have the highest listening rates among commercial truck drivers.



Invoice No. **Pre Invoice**

**INVOICE**

<b>Customer</b>			
Name	Centers for Disease Control and Prevention		
Address	PO Box 15580		
City	Atlanta	State	GA ZIP 30333-0080
Phone	404-498-4050		

<b>Misc</b>	
Date	9/19/2012
Order No.	523827
Rep	Steve Scheu
FOB	

Qty	Description	Unit Price	TOTAL
	Advertiser- NIOSH		
7	FOX News (:30) M-F 6am-12am	\$ 150.00	\$ 1,050.00
7	FOX News (:60) M-F 6am-12am	\$ 300.00	\$ 2,100.00
4	FOX News (:30) Sa-Su 6am-12am	\$ 150.00	\$ 600.00
2	FOX News (:60) Sa-Su 6am-12am	\$ 300.00	\$ 600.00
8	Road Dog Trucking (:30) M-F 6am-12am	\$ 150.00	\$ 1,200.00
6	Road Dog Trucking (:60) M-F 6am-12am	\$ 285.00	\$ 1,710.00
4	Road Dog Trucking (:30) Sa-Su 6am-12am	\$ 150.00	\$ 600.00
4	Road Dog Trucking (:60) Sa-Su 6am-12am	\$ 285.00	\$ 1,140.00
8	Road Dog Trucking (:30) M-Su 6am-12am	\$ -	\$ -
Please make payment to: Sirius XM Satellite Radio 88262 Expedite Way Chicago, IL 60695-0001 Tax ID: 52-1700207 DUNS #: 19-5852186			

SubTotal	\$ 9,000.00
Shipping	\$ -
Tax Rate(s)	0.00%
<b>TOTAL</b>	<b>\$ 9,000.00</b>

<b>Payment</b>	Select One...
Comments	Page 1 of 1
Name	_____
CC #	_____
Expires	_____

Tax Rate(s)

Office Use Only
-----------------

Contract 523827 airs 10/15 through 10/28/12



Invoice No. **Pre Invoice**

**INVOICE**

<b>Customer</b>			
Name	Centers for Disease Control and Prevention		
Address	PO Box 15580		
City	Atlanta	State	GA
Phone	404-498-4050	ZIP	30333-0080

<b>Misc</b>	
Date	9/19/2012
Order No.	525021
Rep	Steve Scheu
FOB	

Qty	Description	Unit Price	TOTAL
	Advertiser- NIOSH		
9	FOX News (:30) M-F 6am-12am	\$ 150.00	\$ 1,350.00
9	FOX News (:60) M-F 6am-12am	\$ 300.00	\$ 2,700.00
6	FOX News (:30) Sa-Su 6am-12am	\$ 150.00	\$ 900.00
3	FOX News (:60) Sa-Su 6am-12am	\$ 300.00	\$ 900.00
15	Road Dog Trucking (:30) M-F 6am-12am	\$ 150.00	\$ 2,250.00
15	Road Dog Trucking (:60) M-F 6am-12am	\$ 285.00	\$ 4,275.00
6	Road Dog Trucking (:30) Sa-Su 6am-12am	\$ 150.00	\$ 900.00
6	Road Dog Trucking (:60) Sa-Su 6am-12am	\$ 285.00	\$ 1,710.00
12	Road Dog Trucking (:30) M-Su 6am-12am	\$ -	\$ -
Please make payment to: Sirius XM Satellite Radio 88262 Expedite Way Chicago, IL 60695-0001 Tax ID: 52-1700207 DUNS #: 19-5852186			

SubTotal	\$ 14,985.00
Shipping	\$ -
Tax Rate(s)	0.00%
<b>TOTAL</b>	<b>\$ 14,985.00</b>

<b>Payment</b>	Select One...
Comments	Page 1 of 1
Name	_____
CC #	_____
Expires	_____

Tax Rate(s)

Office Use Only
-----------------

Contract 525021 airs 9/24 through 10/14/12

## Literature Cited

- Ajzen I. (1988) Attitudes, personality, and behavior. Open University: Buckingham, GB.
- Åkerstedt T. Sleepiness as a consequence of shift work. (1988) *Sleep*;11:17-34.
- Barger LK, Cade BE, Ayas NT, Cronin JW, Rosner B, Speizer FE, Czeisler CA. (2005) Extended work shifts and the risk of motor vehicle crashes among interns. *N Engl J Med* 352, 125-97.
- Barton J, Spelten E, Totterdell P, Smith L, Folkard S, Costa G. (1995) The standard shiftwork index - a battery of questionnaires for assessing shiftwork-related problems. *Work Stress* 9(1): 4-30.
- Bøggild H, Knutsson A. (1999) Shift work, risk factors and cardiovascular disease. *Scand J Work Environ Health*; 25: 85-99.
- Bureau of Labor Statistics. 2011. Occupational outlook handbook – heavy and tractor trailer drivers. Retrieved July 25, 2012 from <http://www.bls.gov/ooh>.
- Caruso CC, Bushnell T, Eggerth D, Heitmann A, Kojola B, Newman K, Rosa RR, Sauter SL, Vila B. (2006) Long work hours health and safety: toward a national research agenda. *Am J Ind Med*; 49: 930-42.
- Caruso CC, Hitchcock EM, Dick RB, Russo JM, Schmit J.M. (2004b) Overtime and extended work shifts: recent findings on illnesses, injuries, and health behaviors. (DHHS (NIOSH) PubNo. 2004-143). Cincinnati, OH: DHHS, PHS, CDC, NIOSH.
- Caruso CC, Lusk SL, Gillespie B. (2004a) Relationship of work schedules to gastrointestinal diagnoses, symptoms, and medication use in auto factory workers. *Am J Ind Med*; 46: 586-598.
- Caruso CC. (2006) Possible broad impacts of long work hours. *Industrial Health*; 44: 531-6.
- Catalano JD, Dugan MK, Heyer N, Tucker K, Story-Yenken M. (2002) Summary report on healthcare industry stakeholder meetings. (NIOSH contract no. 200-2000-08018, task order no. 5).
- Cole HP. (1997) Stories to live by: A narrative approach to health-behavior research and injury prevention. D. S. Gochman Handbook of health behavior research methods: Vol. 4 (pp. 325-349). New York, NY: Plenum.
- Cranton P. (1994) Understanding and promoting transformative learning: A guide for educators of adults. San Francisco, CA: Jossey-Bass.
- Cullen ET. (2005) Tell Me A Story: Why Stories are Essential to Effective Safety Training. NIOSH Report of Investigation #9664, DHHS (NIOSH) Publication no. 2005-152. September, 2005, 71 pp.
- Darwin, A. (2000) Critical reflections on mentoring in work settings. *Adult Education Quarterly*, 50(3), 197-211.
- Dembe AE, Erickson JB, Delbos RG, Banks SM. (2005) The impact of overtime and long work hours on occupational injuries and illnesses: new evidence from the United States. *Occup Environ Med* 62, 588-97.
- Dinges DF. 1995. An overview of sleepiness and accidents. *J Sleep Res* 4: 1-11.

- Drake CL, Roehrs T, Richardson G, Walsh JK, Roth T. (2005) Shift work sleep disorder: prevalence and consequences beyond that of symptomatic day workers. *Sleep*; 27: 1453-1462.
- Duffy JF. (2003) Shift work and aging roles of sleep and circadian rhythms. *Clin Occup Environ Med*; 3:311-332.
- Durrance, B. (1997) Stories at work. *Training & Development*, 51(2), 25.
- Federal Register / Vol. 65, No. 85 / Tuesday, May 2, 2000 / Proposed Rules. Federal Motor Carrier Safety Administration. Hours of Service of Drivers; Driver Rest and Sleep for Safe Operations.
- Folkard S, Tucker P. (2003) Shift work, safety and productivity. *Occup Med (Ox)*; 53: 95-101.
- Frazier LM, Grainger DA. (2003) Shift work and adverse reproductive outcomes among men and women. *Clin Occup Environ Med*; 3:279-292.
- Greenhaus JH, Bedeian AG, Mossholder KW. (1987) Work experiences, job performance, and feelings of personal and family well-being. *Journal of Vocational Behavior* 31, 200-15.
- Institute of Medicine. (2004) Keeping Patients Safe. National Academies: Washington DC.
- Institute of Medicine. (2006) Sleep Disorders and Sleep Deprivation, An Unmet Public Health Problem. National Academies: Washington DC.
- Jacobs JA. (2004) The faculty time divide. *Sociol Forum* 19, 3-27.
- Jacobs JA, Gerson K. (2004) The time divide: work, family, and gender inequality. Cambridge: Harvard University Press.
- Knauth P, Hornberger S. (2003) Preventive and compensatory measures for shift workers. *Occup Med (Ox)*; 53:109-116.
- Knowles MS, Holton EF, Swanson RA (1998) The adult learner: Fifth edition. Woburn, MA: Butterworth-Heinemann.
- Knutsson A. (2003) Health disorders of shift workers. *Occup Med (Ox)*; 53:103-108.
- Kowalski KM, Vaught C. (2002) Principles of adult learning: Application for mine trainers. R. H. Peters (Editor), Strategies for improving miners' training (, Chap. IC 9463, pp. 3-8). Pittsburgh, PA: National Institute for Occupational Safety and Health.
- Kubo T, Ozasa K, Mikami K, Wakai K, Fujino Y, Watanabe Y, Miki T, Nakao M, Hayashi K, Suzuki K, Mori M, Washio M, Sakauchi F, Ito Y, Yoshimura T, Tamakoshi A. (2006) Prospective cohort study of the risk of prostate cancer among rotating-shift workers: findings from the Japan collaborative cohort study. *Am J Epidemiol* 164:549-555.
- Luckhaupt S. 2012b. Short sleep duration among workers-United States, 2010. Accessed May 9, 2012 at: [http://www.cdc.gov/mmwr/preview/mmwrhtml/mm611a2.htm?s\\_c1d=mm6116a2\\_w](http://www.cdc.gov/mmwr/preview/mmwrhtml/mm611a2.htm?s_c1d=mm6116a2_w).



- Landrigan CP, Rothschild JM, Cronin JW, Kauschal R, Burdick E, Katz JT, Lilly CM, Stone PH, Lockley SW, Bates DW, Czeisler CA (2004) Effect of reducing interns' work hours on serious medical errors in intensive care units. *N Engl J Med* 351, 1838 – 48.
- Lee KA, Landis C, Chasens ER, Dowling G, Merritt S, Parker KP, Redeker N, Richards KC, Rogers AE, Shaver JF, Umlauf MG, Weaver TE. (2004) Sleep and chronobiology: recommendations for nursing education. *Nursing Outlook*. 52(3):126-33.
- Massie DL, Blower D, Campbell KL. 1987. Short-haul trucks and driver fatigue: final report. Ann Arbor, MI: University of Michigan Transportation Research Institute.
- Megdal SP, Kroenke CH, Laden F, Pukkala E, Schernhammer ES. (2005) Night work and breast cancer risk: a systematic review and meta-analysis. *Eur J Cancer*; 41: 2023-2032.
- Mitler MM, Carskadon MA, Czeisler CA, Dement WC, Dinges DF, Graeber RC (1988) Catastrophes, sleep, and public policy: consensus report. *Sleep* 11, 100-9.
- Monk TH. (2000) What can the chronobiologist do to help the shift worker? *J Biol Rhythms*; 15:86-94.
- National Sleep Foundation. 2012. 2012 Sleep in America poll: Planes, trains, automobiles. Transportation workers' sleep. Washington, D.C.: the foundation: Accessed May 4, 2012 at: <http://www.sleepfoundation.org/2012poll>.
- Parkin M. (1998) Tales for trainers: Using stories and metaphors to facilitate learning. Stirling, VA: Kogan Page.
- Petty RE, Cacioppo JT. (1996) Attitudes and persuasion: Classic and contemporary approaches. Westview: Boulder, Colorado.
- Phipps SA, Lethbridge L, Burton P. (2006) Long-run consequences of parental paid work hours for child overweight status in Canada. *Social Science & Medicine* 62, 977-86.
- Revell VL, Eastman CI. (2005) How to trick Mother Nature into letting you fly around or stay up all night. *J Biol Rhythms*; 20:353-365.
- Rohr SM, Von Essen SG, Farr LA. (2003) Overview of the medical consequences of shift work. *Clin Occup Envir Med*; 3: 351-361.
- Rosa RR, Bonnet MH, Bootzin RR, et al. (1990) Intervention factors for promoting adjustment to nightwork and shiftwork. *Occup Med*;5:391-415.
- Schernhammer ES, Laden F, Speizer FE, Willett WC, Hunter DJ, Kawachi I, Fuchs CS, Colditz GA. (2003) Night-shift work and risk of colorectal cancer in Nurses' Health Study. *J Natl Cancer I*; 95: 825-828.
- Simmons A. (2001) The story factor: Inspiration, influence, and persuasion through the art of storytelling. Cambridge, MA: Perseus Publishing.
- Slater MD. (2002) Entertainment education and the persuasive impact of narratives. T. Brock, J. J. Strange, & M. C. Green (Editors), *Narrative impact: Social and cognitive foundations* . Hillsdale, NJ: Erlbaum.

- Sood A. (2003) Medical screening and surveillance of shift workers for health problems. Clin Occup Environ Med; 3: 339-349
- Sparks K, Cooper CL, Fried Y, Shirom A. (1997) The effects of hours of work on health: a meta-analytic review. J Occup Organ Psychol; 70:391-408.
- Spurgeon A, Harrington JM, Cooper CL. (1997) Health and safety problems associated with long working hours: a review of the current position. Occup Environ Med 1997; 54:367-375.
- Stone, D. (1999) Social cognitive theory [Web Page]. URL [www.med.usf.edu/Ekmbrown/Social\\_Cognitive\\_Theory\\_Overview.htm](http://www.med.usf.edu/Ekmbrown/Social_Cognitive_Theory_Overview.htm).
- Thomas HR, Raynar KA. (1997) Scheduled overtime and labor productivity: quantitative analysis. Journal of Construction Engineering and Management; 123, 181-8.