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Obstructive Sleep Apnea Disparity among Truck Drivers: Danger on American Roads

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ABSTRACT

Obstructive sleep apnea (OSA), a common sleep disorder, can cause perilous levels of fatigue that impact commercial drivers who operate vehicles such as tow trucks, tractor trailers, and buses. In this study, we explored this population for its awareness of obstructive sleep apnea, the risk factors, and its impact on health for all. We conducted a qualitative study using 33 semi-structured in-depth interview questions with 12 male commercial truck drivers ages 28 to 44 years old, who were Florida residents. Participants had basic knowledge of OSA, minimal awareness of the underlying risk factors that impact their overall health, and of OSA treatment. There was awareness of the effect of OSA on sleep partners of study participants. All participants felt it was important for truck drivers to receive routine OSA screening, even among those who expressed concern about having results negatively impact their occupational status. Consistent policies of trucking companies, which ensure trucker involvement and maintenance of the necessary preventive behaviors, are necessary. Further, truck drivers and their families should receive direct and consistent support of health conditions that have a direct effect on the driver's health and the industry's future.

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BACKGROUND

Obstructive sleep apnea (OSA), the most common sleep disorder, is a growing public health problem and affects a great percentage of middle aged male adults who work as commercial truck drivers. According to the American Academy of Sleep Medicine (AASM), obstructive sleep apnea affects over 28 million adults in the US, including both diagnosed and undiagnosed individuals (AASM, 2016). Over the years, a great number of drivers were involved in motor vehicle collisions caused by obstructive sleep apnea. As a result, the economic impact related to this sleep disorder costs the United States (U.S.) \$12.4 billion per year and has taken thousands of lives (National Highway Transportation Safety Administration [NHTSA], 2016).

OSA, also known as sleep apnea, is a debilitating disorder that causes breathing to halt during sleep. The body's muscles relax, during sleep, which can cause tissue to collapse into the upper airway and obstructs breathing. When breathing is interrupted by an obstruction in the airway, the body reacts by waking enough to start breathing again (Guilleminault, Stoohs, Simmons, Clerk, & Labanowski, 1994). Individuals that suffer from obstructive sleep apnea

usually don't get the proper amount of rest. The lack of restful sleep impacts health such as severe fatigue, loss of concentration, memory loss, depression, sexual dysfunction, and morning headaches. Depending on the severity, obstructive sleep apnea is a potentially life-threatening condition and if left undiagnosed or untreated can result in a heart attack, stroke, cardiac arrest during sleep, accidents in the workplace (Young, Skatrud, & Peppard, 2004).

OSA is a prevalent disorder with considerable morbidity and mortality rates (Anwar, Kales, Patel et al, 2014). Moreover, the prevalence of OSA among high-risk occupations, such as commercial drivers, is thought to be even higher than in the general population. Sleepiness in long-haul truck drivers is relevant because they may possibly suffer from sleep deprivation due to long working hours, tight delivery schedules, suboptimal sleeping conditions at resting areas, long shifts, and lengthy performance of a frequently monotonous task (Chada, Videla, O'Flaherty et al., 2005). As a result, it is estimated that up to 20% of all large truck crashes are due to drowsy or fatigued driving, which would account for almost 9,000 fatalities and up to 220,000 serious injuries (Anwar, Kales, Patel et al., 2014).

A study by the Federal Motor Carrier Safety Administration and the American Trucking Association estimates that nearly one in three commercial truck drivers have OSA (Pack, Maislin, Staley et al., 2006). Commercial truck drivers' behavioral habits are also a contributing risk factor that leads to obstructive sleep apnea. Some of the risk factors that affect this target population is the high prevalence of sedentary habits, alcohol and drug consumption, inadequate diet, smoking, lack of physical activity and obesity. Consequently, commercial truck drivers have a greater chance for many chronic diseases and health conditions such as heart disease, diabetes, hypertension, and obesity compared to U.S. adult workers (Centers for Disease Control and Prevention [CDC], 2012).

In 2010, the National Institute for Occupational Safety and Health conducted a national survey on long-haul truck drivers to better understand the combined effects of these health conditions, behaviors, and work environments on safety and health. Their findings suggest that obesity (69% vs. 31%) and current smoking (51% vs. 19%) were twice as prevalent in long-haul truck drivers as in the 2010 U.S. adult working population. Sixty-one percent reported having two or more of the risk factors: hypertension, obesity, smoking, high cholesterol, no physical activity, and six or fewer hours of sleep per 24-hour period (Seiber, Robinson, Birdsey, et al., 2014).

According to NHTSA (2016), drowsy driving was responsible for 72,000 crashes, 44,000 injuries, and 800 deaths in 2013. Conversely, these numbers show an underrepresentation of the 6,000 or more fatal crashes related to drowsy driving (CDC, 2016). As with any public health crisis, risk management is key in reducing disparities. Garbarino et al. (2016a) found rest breaks and naps to be protective factors against motor vehicle accidents (MVs) and non-motor vehicle accidents (NMVs). Furthermore, in a similar study, Garbarino et al. (2016b) found the use of continuous positive airway pressure (CPAP) therapy significantly reduced NMVs among dangerous-goods truck drivers. Although protective factors have been identified, understanding the barriers and facilitators to enacting such protective measures is imperative for industry professionals and scholars alike.

Due to demanding schedules, and lack of time for naps or rest breaks, truck drivers frequently depend on caffeine to keep them alert (Gates, Dubois, Mullen, Weaver & Bedard, 2013; Heaton & Griffin, 2015). Among habitual caffeine users, consuming caffeinated beverages may serve as a protective factor (Heaton & Griffin, 2015). Heaton and Griffin (2015) discovered an overall 6% reduction of safety-critical events among habitual caffeine users. However, in contrast,

researchers have also found caffeine use to be a positive predictor of unsafe driving actions in fatal crashes (Gates et al., 2013). Taken together, the present study can increase knowledge regarding the experienced benefits and risks of caffeine use among truck drivers with OSA.

The Center of Fatal Occupational Injuries indicates that workers employed in the transportation and material moving occupations, truck drivers in particular, had far higher fatality rates than workers in any other occupation group (National Institute of Occupational and Safety Health [NIOSH], 2003). In the trucking industry alone, there are over eight million professional truck drivers including industry-related jobs in the U.S. On average in the nation, large trucks made up over 8% of all vehicles involved in fatal crashes and in 2014 and 85% of large trucks were involved in fatal traffic crashes (NHTSA, 2016). Furthermore, in the U.S. there were an estimated 438,000 large trucks involved in police-reported traffic crashes, 3,903 people killed and 111,000 people injured in crashes involving large trucks; an increase of seventeen percent from an estimated 95,000 in 2013 (NHTSA, 2016). The totality of research evidence is substantial and warrants that obstructive sleep apnea among commercial truck drivers is undeniably a major public health issue.

PURPOSE

Despite the considerable research that addresses obstructive sleep apnea among this population and its associated risk, there is a significant gap in a qualitative research design that focuses on the context of commercial truck drivers and obstructive sleep apnea and the potential impact on their overall health and safety. Therefore, the purpose of this study is to gain insight into the views of this population regarding OSA, their awareness or knowledge of the condition, and how they felt personally about the effect this condition could have in their lives and work.

Theoretical Framework

In this study, we applied the Health Belief Model to the development of an interview guide, as well as to provide insight into the correlation between truck driver knowledge and perceptions about OSA. The Health Belief Model was one of the first models that adapted theory from the behavioral sciences to health problems and remains one of the most widely recognized conceptual frameworks of health behavior (Glanz, Rimer, et al, 2015). It attempts to explain and predict health behaviors by addressing one's perception of the threat of a health problem and the accompanying appraisal of a recommended behavior for preventing or managing the problem (Cottrell et al., 2006). Table 1 shows the key constructs of HBM

that guided the research questions for this exploratory study.

Table 1. *Selected Health Belief Model constructs employed in the study (Glanz, Rimer, & Vizwanath, 2015)*

Perceived Susceptibility	Belief about one's chance of getting a condition
Perceived Severity	Beliefs about the severity of a condition and its consequences
Perceived Benefits	Beliefs about the effectiveness of taking action to reduce risk or severity
Perceived Barriers	Beliefs about the material and psychological costs of taking action
Cues to Action	Factors that activate readiness to change
Self-efficacy	Confidence in one's ability to take action

The constructs of the Health Belief Model were used to identify if: (1) commercial truck drivers felt predisposed to a sleeping disorder and associated risk factors (perceived susceptibility); (2) commercial truck drivers believe that undiagnosed or untreated obstructive sleep apnea is serious (perceived severity); and (3) commercial truck drivers are confident and believe that taking action can potentially reduce the manifestation of this disorder as well as its associated consequences (self-efficacy). The research questions that guided this study included:

- What do truck drivers know about OSA including the definition, symptoms, treatment and its impact on truck driving and their quality of life?
- What perceptions do truck drivers have about their sleep patterns? What perceptions do their sleeping partners/significant others have about their sleeping patterns?
- What factors motivate truck drivers to seek screening and/or treatment of OSA? Why don't truck drivers seek the necessary screening/treatment to combat disorder?
- What sources of information do truck drivers rely on for information related to OSA?

Although this model is widely used to explain and predict behaviors, the application of this model to the context of this sleep disorder and its intended population is absent from the literature.

METHODS

Study Design

We sought to conduct a qualitative study to gain a clearer understanding of the knowledge, attitudes, and beliefs of commercial truck drivers in relation to obstructive sleep apnea and its overall impact on truck driver's health. After obtaining Institutional Review Board approval for the research protocol, we conducted semi-structured in-depth interviews that

consisted of thirty-three questions that were developed using constructs from the Health Belief Model.

Participants

A snowball sampling technique was applied, where the researcher secured initial contact with a local truck driver community member which was the gateway in the recruitment of all participants for this study. A total of twelve male commercial truck drivers between the ages of 28 and 44 were interviewed, with a median age of 35. All the drivers had over five years of truck driving experience (range from 5 to 22 years, with a median year of 10). Most participants were married; the rest were in a relationship. Most participants were African-American. Only males were recruited, as past studies have shown that the high prevalence of OSA in truck drivers tends to be among ones who are middle-aged, male, and obese (Gurubhagavatula, 2012). All participants were residents of the Leon County area and other surrounding Florida counties.

Data Analysis

QSR International's NVIVO 8 was used to conduct all analyses for this study. All interviews were transcribed verbatim from audio tapes, saved as rich text format, and document loaded onto NVIVO. All 12 interview transcripts were coded by the co-investigator using a codebook containing broad domains based on the research questions and factors identified in the literature. The codebook was revised as new data emerged, and early transcripts were recoded based on the final set of codes.

The principal investigator coded interviews independently to assess inter-rater reliability in application of the codes, from there any discrepancies were consensually resolved. All transcripts and codes assigned to relevant passages were loaded into NVIVO search engine and used to extract coded passages from the interviews. All sorted passages were read by the principal and co-investigator, to detect patterns in responses, prepare summary and

interpretive statements, and mark passages worthy of quotation.

Measures

Interview questions were developed using constructs from the Health Belief Model. The construct linked to *perceived susceptibility/seriousness* inspired questions that identifies: (1) how the truck driver feels about sleep apnea affecting their driving capability and the danger involved; (2) how they describe their sleeping pattern, how they see sleep apnea having an effect on one's job, day-to-day activities; and (3) what their feelings were regarding other drivers that don't seek necessary assistance in the diagnosis and/or treatment of this disorder.

The modifying factors consisted of six demographic characteristics which include: age, sex, race/ethnicity, number of years driving trucks, residence, and marital status. Questions surrounding one's *knowledge* consisted of questions related to drivers being able to identify the definition for sleep apnea, as well symptoms, treatment, and other health conditions linked to this disorder. The *cues to action* construct consisted of questions related to the drivers' feelings on the availability of educational tools so that they are able to recognize symptoms on their own and take the necessary steps to improve health and minimize injury and fatalities on the road. The questions surrounding the *perceived benefits* construct questions focused on identifying how truck companies can take more responsibility in assisting their drivers' various ways, in gaining understanding on how and why they feel screening can be beneficial, and why seeking help can increase one's ability to perform their job and day-to-day activities. Lastly, the *perceived barriers* question concentrated on understanding why one would not seek treatment.

RESULTS

Our main coded theme categories are based on the HBM constructs. Each have subcategories presented below.

Knowledge Themes

Definition of OSA. When asked to give a definition of sleep apnea, the majority were able to provide general definitions of sleep apnea, by identifying the most significant symptoms and associated risk factors. Yet, their understanding was less not complete and did not include a complete appreciation of the gravity of OSA.

It sounds like a problem with drivers on the road. The tiredness, getting sleepy for a long

period of time while driving. - 5 years driving experience, age 28

[When you] stop breathing at night while you sleep, being tired form no sleep during the day...health problems...possibly diabetes, bad heart. - 7 years driving experience, age 31

When you don't breathe when you sleep ...and you just stay tired all the time. - 10 years driving experience, age 34

Symptoms. Participants were able to name some of the symptoms related to sleep apnea. Although most were able to name 'a symptom', few could identify cessation of breathing as the key symptom of sleep apnea.

You do a lot of snoring and stay sleepy most of the time. - 9 years driving experience, age 35

Besides fatigue? Well we call it the black dog and it's when you've been riding for so long that you just start staring and zone out. - 22 years driving experience, age 44

Treatment. Few of the participants were able to display some type of knowledge related to treatment for sleep apnea. Although these individuals were unable to identify the proper term for treatment, they were able to provide some type of description of what they thought was treatment for this disorder. Additionally, only two participants were able to name stroke and heart disease as complications related to undiagnosed and/or untreated sleep apnea.

The only thing I know about is the oxygen machine. - 6 years driving experience, age 28

You wear a mask that gives you oxygen that helps with your breathing and sleep or something like that. - 5 years driving experience, age 31

Perceived Susceptibility/Seriousness Themes

Driving accident dangers. All drivers were asked questions regarding the seriousness of sleep apnea and its effect on their profession. The question was asked on how the drivers felt about OSA affecting their driving capability and the responses to these questions were safety-centered:

I think it's dangerous, you can hurt yourself behind that wheel and other people on the road. - 14 years driving experience, age 39

It can affect it very much so, cause you're behind that wheel and it's just you and the highway and you focus on one thing and just in that period of time you tend to zone out a little bit. - 11 years driving experience, age 38

Driving danger to others. One of the points consistently made throughout each interview was not only concern about their well-being, but the well-being of other drivers affected by those that suffer from sleep apnea related symptoms. Another question addressed how the drivers felt about whether or not having undiagnosed and/or untreated sleep apnea can be dangerous, especially while driving. The drivers' responses were unanimous regarding the seriousness of this behavior.

To me it's one thing to have a sleep problem and want to get help but if you have problems and then don't want to get help then you don't need to be driving. - 10 years driving experience, age 41

Effect on loved ones. When asked to describe their sleeping habits, most drivers agreed to having troubled sleep patterns. Several reported that they are extremely tired all of the time, and can barely muster up enough energy to perform other activities outside of work, such as washing cars, playing football or any other sports, or household chores, etc. When asked if their spouses or partners have complained about their troubled sleep pattern, several agreed that their partners or spouses have complained about their sleeping patterns.

My girlfriend keeps telling me that I snore too loud and sometimes she has to nudge me to make sure that I'm breathing because she says that I stop in my sleep often and it makes her nervous. - 10 years driving experience, age 35

My wife bugs me all the time about me snoring...sometimes I wake up and she's in the other room. - 15 years driving experience, age 43

Perceived Barriers Themes

Participants were asked to cite five reasons why one would not seek treatment. The first reason was *time*. Several agreed that once they get home it's hard to make the effort to go and seek help partly due to the lack of energy. The second reason was *money and/or the lack of insurance*. Participants reported that many truck drivers are the breadwinners for their family and do not want to take the days off to get checked because this results in losing money and not having the

financials for the necessary test. The third reason was the *risk of job loss or being looked over for employment opportunities*. Some respondents acknowledged that some sleep apnea sufferers, although very necessary, may not seek medical assistance due to fear of receiving a sleep apnea diagnosis which may result in cut back of hours and/or termination of employment. Additionally, if a sleep apnea disorder is revealed in the hiring process they will be overlooked for the job. The fourth reason was *denial*. It was noted that there are drivers in the field that don't believe sleep apnea to be serious, consequently ignoring the symptoms and attempting to manage them on their own. Fifth and last is *embarrassment*; some drivers are hesitant about seeking help and would rather keep it to themselves because they don't know what it is and/or how to take care of the disorder or associated risk factors. One participant stated clearly:

If people know that there is treatment for it, there's nothing to be embarrassed about. - 7 years driving experience, age 31

Perceived Benefits Themes

In addressing perceived benefits, the drivers were asked how they think they benefit from truck companies taking more responsibility in assisting their drivers as it relates to this sleep disorder. All participants expressed that a good start would be to provide necessary information to their drivers.

They can start by getting us this information...if it can affect us, and the job that we're doing for them, then why not? - 14 years driving experience, age 39

All companies should do something and make you aware, put it out there...so that they'll know what it is...to me it's a safety issue...so all companies should make it a part of their hiring criteria and ongoing process. - 22 years driving experience, age 44

Each driver was also asked about their feelings on routine screenings for this disorder and all participants expressed that screening should be done on a routine basis, to not only protect the company, but the general population.

Cues to Action Themes

Information sources at work. Cues to action for this sample included how the drivers felt about receiving information regarding sleep apnea. In this sample, all participants expressed openness to having information provided to them at work.

I feel that it should be out there, I feel like just when you post anything in the bulletin board about random information, you should and need to post information about that, you may not get every truck driver to look at it. I would say you may get 2 out of 10 that may look at it.... But those two can save a bunch of lives. - 10 years driving experience, age 34

Having this education available so that we can know what we're dealing with and to actually take care of this problem will be very helpful. - 5 years driving experience, age 31

Just as it's important for us as drivers to deliver merchandise to their locations, it is equally as important that companies deliver information and assistance to help us know what this is and how we can fix it and prevent all of these deaths! - 22 years driving experience, age 44

Limitations

Whereas the strengths of qualitative research center on the richness of the information acquired to elucidate a phenomenon (obstructive sleep apnea among truck drivers), the individuals who agreed to participate in the study may present different views from those who otherwise refuse to participate. Although the measures employed in this study relied solely on recall and self-reports of each participant, the provision of context of answers strengthens the contributions of the study. Another limitation consisted of the all-male sample.

DISCUSSION

Contrary to popular misconceptions, truck drivers expressed a great deal of concern regarding sleep apnea and its effect on their profession. Although some may feel that truck drivers have no regard for other drivers on the road, participants expressed a great deal of concern for other drivers and how one affected by sleep apnea can cause a negative impact to others.

Lack of knowledge regarding specifics about the disease was also identified. Most participants did not have a complete understanding about sleep apnea and the associated symptoms, risk factors, and treatment associated with this disorder. Most drivers associated sleep apnea with sleep deprivation but did not fully appreciate the underlying issues.

Regarding the provision of education and screening, all of the drivers were open to receiving information related to sleep apnea, as well as sleep apnea screening being included in their bi-annual physical. This was found to be quite altruistic considering that some may

feel that routine screening can affect their job if they are found to have the disorder. The effect of OSA on their loved ones, as well as increased risk for others on the road was described in detail. In addition, their information about the treatment of OSA was inconsistent at best.

IMPLICATIONS FOR PUBLIC HEALTH

One of the questions asked of the participants was: *Have you ever received sleep apnea information from your current trucking company or truck companies you worked for in the past?* All participants agreed that they have never received information regarding sleep apnea from any truck company in which they were employed. This is a true representation of why public awareness among this population needs to be increased. In conclusion, the following are recommendations for public health education and policy interventions:

- Information should be diverse, not just in printed literature. One driver stated that if he's just given something to read, more than likely he will put it down and never look at it. Therefore, information sources must include presenters, videos, and electronic sources.
- Diverse organizations involved in OSA prevention should be engaged in such public health efforts, including: The National Sleep Foundation, National Transportation Safety Board, Truck Net: Truckers Roundtable, American Sleep Apnea Association, and Centers for Disease Control and Prevention. The collaboration of these organizations can result in the truck driving industry gaining the necessary institutional support for educational interventions.
- Health education interventions should include the drivers' sleeping partner. In each case, OSA was a significant issue that affected the relationship. Involving these partners may assist to recognize the symptoms so that the drivers can seek help.
- Day-to-day activities were impaired due to lack of energy. Therefore, in addition to OSA knowledge, health education interventions should include other health screenings and treatment options to increase overall quality of life (i.e., physical activity, healthy eating, adult vaccinations).
- Truck companies need to take more responsibility in the educational process for the safety of their workforce. Not only will this provide safety for their drivers, but

it will decrease fatalities associated with sleep apnea, loss of productivity, and the billions of dollars spent on accidents.

- Additionally, legislators should be included in the health education efforts, and educated on the devastating impacts that sleep apnea causes. This will facilitate the increased awareness for this disorder and also assist in the development of policies and regulations that address sleep apnea as a public health problem.
- Future research is warranted to understand not only the impact of this sleep disorder, but the social context of OSA among commercial truck drivers. Also, social marketing should be initiated and address the knowledge gaps about sleep apnea among this population. Industry-wide survey instruments also need to be developed to compliment the present study's qualitative understanding of sleep apnea and its negative impact.

REFERENCES

- American Academy of Sleep Medicine (AASM). (2016). Hidden health crisis costing American billions: Underdiagnosing and undertreating obstructive sleep apnea draining healthcare system. Retrieved from <http://aasm.org/resources/pdf/sleep-apnea-economic-crisis.pdf>.
- Anwar, S., Kales, S., Patel, S.R., et al. (2014). Obstructive sleep apnea and psychomotor vigilance task performance. *Nature of Science and Sleep*, 6, 65-71.
- Centers for Disease Control and Prevention. (2012). Overweight and obesity: causes and consequences. Retrieved from <https://www.cdc.gov/obesity/adult/causes/index.html>.
- Centers for Disease Control and Prevention. (2016). Drowsy driving; Asleep at the wheel. Retrieved from <https://www.cdc.gov/features/dsdrowsydriving/index.html>.
- Chada, D., Videla, A., O'Flaherty, M., et al (2005). Sleep habits and accident risk among truck drivers: A cross-sectional study in Argentina. *Sleep*, 28, 1103-1108.
- Cottrell, R.R., Girvan, J.T., & McKenzie, J.F. (2006). *Principles and foundations of health promotion and education*. (3rd ed.). San Francisco, CA: Benjamin Cummings.
- Desai, A., Ellis, E., Wheatley, J., & Grunstein, R. (2003). Fatal distraction: A case series of fatal fall-asleep road accidents and their medicolegal outcomes. *Medical Journal of Australia*, 178, 396-399.
- Federal Motor Carrier Safety Administration. (2002). *Large truck crash facts 2000*. Washington, DC: Author.
- Findley, L., Sassani, A., Kreiger, M., Goldlust, E., George, C., & Davidson, T. (2004). Reducing motor vehicle collision costs and fatalities by treating obstructive sleep apnea. *Sleep*, 27, 453-458.
- Garbarino, S., Guglielmi, O., Campus, C., Mascialino, B., Pizzorni, D., Nobili, L., ... Ferini-Strambi, L. (2016a). Screening, diagnosis, and management of obstructive sleep apnea in dangerous-goods truck drivers: To be aware or not? *Sleep Medicine*, 25, 98-104.
- Garbarino, S., Durando, P., Guglielmi, O., Guglielmo, D., Bersi, F., Fornarino, S., ... Magnavita, N. (2016b). Sleep apnea, sleep debt and daytime sleepiness are independently associated with road accidents. A cross-sectional study on truck drivers. *PLoS ONE*, 11(11), e0166262.
- Gates, J., Dubois, S., Mullen, N., Weaver, B., & Bedard, M. (2013). The influence of stimulants on truck driver crash responsibility in fatal crashes. *Forensic Science International*, 228(1-3), 15-20.
- Glanz, K., Rimer, B.K., & Viswanath, K. (2015). *Health Behavior and Health Education: Theory, Research, and Practice*, (5th ed.). San Francisco, CA: Jossey-Bass.
- Guilleminault, C., & Brooks, S. (2001). Excessive daytime sleepiness. *Journal of Neurology*, 124, 1482-1491.
- Guilleminault, C., Stoohs, R., Simmons, J. Clerk, A., & Labanowski, M. (1994). From obstructive sleep apnea to upper airway resistance syndrome. *Sleep*, 15(6 Suppl), S13-S16.
- Gurubhagavatula, I. (2012). Does the rubber meet the road? Addressing sleep apnea in commercial truck drivers. *Sleep*: 35(11), 1443-1444.
- Heaton, K., & Griffin, R. (2015). The effects of caffeine use on driving safety among truck drivers who are habitual caffeine users. *Workplace Health & Safety*, 63(8), 333-341.
- Kales, S., Straubel, M. (2014). Obstructive sleep apnea in North American commercial drivers. *Industrial Health* 52(1), 13-24.
- Montserrat, J., Monteserrat, F., Hernandez, L., Farre, R., Gemma, V., Navajas, D., et al. (2001). Effectiveness of CPAP treatment in daytime function in sleep apnea. *American Journal of Respiratory and Critical Care Medicine*, 164, 608-613.
- National Highway Transportation Safety Administration. (2016). Large trucks: 2014 data. (Traffic Safety Facts. Report No. DOT HS 812 279). Washington, DC: Author.
- National Institute of Occupational and Safety Health. (2003). *Work-related roadway crashes, challenges and opportunities for prevention*.

Department of Health and Human Services (CDC & NIOSH). Retrieved from <http://www.cdc.gov/niosh/docs/2003-119.html>.

Pack, A., Maislin, G., Staley, B., Pack, F. (2006). Impaired performance in commercial drivers: Role of sleep apnea and short sleep duration. *American Journal of Respiratory and Critical Care Medicine*, 174, 446-454.

QSR International. (2008). NVIVO qualitative data analysis software. Melbourne, Australia: Author.

Young, T., Skatrud, J., & Peppard, P.E. (2004). Risk factors for obstructive sleep apnea in adults. *Journal of the American Medical Association*, 298: 2013-2016.

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