

Psychosocial Factors and Tobacco Use Among Commercial Truck Drivers

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Objectives: To explore the relationships between tobacco, social support, job satisfaction, and depression among truck drivers. **Methods:** Cross-sectional data were collected from 797 truck drivers in six US states. Data collected included self-reported medical history and biological samples. Modified Zung depression scale and Work Apgar scores were used to measure depression and social support. Adjusted logistic regression models were used to calculate odds ratios (OR). **Results:** 24.0% of tobacco users were in the least depressed category and 18.2% were most depressed. 22.8% of the tobacco users had the most social support compared with 27.9% of the non-users. Drivers in the two most depressed categories were significantly less likely to use tobacco (OR = 0.62, 95% confidence interval [CI] = 0.39–0.96, and OR = 0.64, 95% CI = 0.41–0.99). **Conclusions:** Drivers with low social support or low levels of depression are more likely to be tobacco users.

Keywords: cross-sectional study, depression, psychosocial factors, smoking, tobacco use, truck driver

BACKGROUND

Despite a declining prevalence of cigarette smoking, tobacco remains the number one global cause of preventable death.¹ Tobacco use varies significantly by race, ethnicity, educational level, socioeconomic status, geographic region, and occupation.² One population with a high prevalence of smoking is truck drivers.³ In fact, a 2015 nationally representative survey by the National Institute of Occupational Safety and Health (NIOSH) found that about half (46.2% of men and 54.9% of women) of long-haul drivers

were smokers, a rate more than double that of the general working population (20.6% of men and 17.4% of women).³ This high prevalence of smoking among truck drivers may potentially be explained by their persistent exposure to high levels of psychological demand.

Professional drivers experience some of the highest levels of work-related stress and psychosocial problems among all occupations.^{4,5} Some studies have suggested that these increased risks are likely due to high job demands, irregular work shifts, scarcity of time for basic needs such as eating, or rest, as well as psychosocial factors.^{4,6,7} Generally, psychosocial factors are defined as characteristics of one's interpretation of their work environment (eg, work shift, supervisor support, family support) measured by self-reported attitudes.⁶

Truck drivers also experience overall higher levels of depression and stress than does the general population.⁸ Although evidence suggests that there is a complex relationship between smoking, mental illness, and/or psychosocial conditions, there is a lack of evidence of the relationships between smoking and psychosocial factors defined as job satisfaction, social support, and depression among truck drivers.

In this paper, we explore the relationships between tobacco use and psychosocial factors among commercial truck drivers. The psychosocial factors were defined as job satisfaction, social support, and depression. We hypothesize that truck drivers with lower levels of social support, lower levels of job satisfaction, and higher levels of depression will have higher rates of tobacco use after adjustment for potential confounders.

METHODS

This study was approved by the University of Utah (IRB#: 22252) and the University of Wisconsin-Milwaukee (IRB#: 07.02.297). A more detailed description of the methods have been published previously,^{9–11} and only a brief description of relevant methods is presented here.

Participants were truck drivers recruited from trucking companies, truck conventions, and truck stops in Utah, Wisconsin, Illinois, Kentucky, Texas, and Nevada. All enrolled participants provided written, informed consent, and received \$20 gift card compensation. All participants were invited to participate, and provided informed consent prior to participating in the study. A computer-administered questionnaire was used to collect cross-sectional data from the 797 truck drivers. All participants completed an 864 item computer questionnaire regarding occupational history, past medical history, health behaviors, physical activity, diet, and psychosocial measures including depression, workplace social support, and job satisfaction. Many of these data were not used in these analyses. Truck drivers' height, weight, blood pressure, heart rate, cholesterol, and hemoglobin A1C were also measured by trained members of the research team.

Drivers were categorized as tobacco users if they reported having smoked at least 100 cigarettes over their lifetime or reported daily cigarette smoking. Additional questions regarding the number of cigarettes per day, duration of smoking, and periods of quitting

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Clinical Significance: Defining the relationships between psychosocial factors and tobacco use among commercial truck drivers is important to identify potential risks for cardiovascular disease as well as target interventions. These poor health measures have been associated with more meaningful concerns including increased crash risk, cardiovascular disease risk, and musculoskeletal disorders. Interventions designed to reduce one or more of these outcomes may be achieved through identifying drivers with depressive symptoms to target interventions to reduce smoking.

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Ethics Review and Approval: Signed informed consent was obtained from each driver or from their legal guardian and the study protocol was reviewed and approved by the University of Utah Institutional Review Board (IRB #: 22252) and the University of Wisconsin—Milwaukee Institutional Review Board (IRB#: 07.02.297).

Conflict of Interest: None.

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were also captured. These data are directly comparable to other large national data including the National Health Interview Survey and the National Health and Nutrition Examination Study questions about tobacco use for adults.

The questionnaire also included questions regarding each truck driver's self-reported depressive symptoms, amount of social support, and job satisfaction. Modified Zung Self-rating Depression Scale and Modified Work Apgar scores were used to assess and categorize depressive symptoms^{12,13} and social support levels¹⁴ respectively. The depression score was calculated from an eight-question modified Zung Self-rating Depression Scale (ZSDS). The full ZSDS¹⁵ is an effective tool for measuring depression severity^{16–18} and distinguishing between depressed and non-depressed patients.¹⁹ Our modified version scored workers from 0 to 24, with 0 being no depressive symptoms and 24 indicating the highest depression severity. Zung Depression levels were grouped into five approximately equally-sized categories ranging from 0 to 4, with 0 as least depressed and 4 as most depressed. The Apgar social support score was calculated from the seven-question Modified Work Apgar score, which scores perceived workplace social support using a 1 to 4 scale for each of the seven questions, resulting in a possible range of scores from 7 to 28. Using the Modified Work Apgar scores, social support was also grouped into five approximately equally-sized categories ranging from 0 to 4, with 0 representing the most social support, and 4 the least social support. Job satisfaction was classified by one question asking "How satisfied are you with your job" and responses of "very satisfied," "satisfied," "neither satisfied nor dissatisfied," "dissatisfied," and "very dissatisfied."

STATISTICAL ANALYSIS

Statistical analyses were performed using SAS 9.3 (SAS Institute, Cary, NC). Missing data were verified by pulling individual charts. Imputation using the sample mean was used when missing data could not be verified. Less than 0.01% of data were imputed.

Descriptive statistics including means, medians, standard deviations, and frequencies were calculated for purposes of describing the population. Data were analyzed for normality and skewness. Continuous data were analyzed for both linear and non-linear relationships. Non-linear relationships were assessed by grouping continuous variables into commonly accepted categories (eg, continuous body mass index [BMI] was categorized into normal weight, overweight, obese, and morbidly obese using standard cutpoints) where available, or tertiles to maximize statistical power when there were no commonly accepted categorical cutoffs. Statistical significance was determined using α level of 0.05.

A test for trend was conducted for factors with three or more ordered categories (Zung, Apgar, and Job satisfaction psychosocial measures). Continuous variables were also tested for non-linear relationships with the tobacco use outcome.

Variables were classified into personal and occupational factors and were analyzed separately. Univariate logistic regression analyses were performed to evaluate associations and calculate odds ratios (OR) and corresponding 95% confidence intervals (95% CI) between potential associated factors and self-reported tobacco use. Variables with meaningful evidence of association to the tobacco outcome ($P < 0.20$) or those that were clinically meaningful were considered for inclusion in multivariate models.

Multiple logistic modeling was performed using an epidemiological approach incorporating both statistical significance and clinical significance to create models for factors potentially related to tobacco use. Potential co-linearity between psychosocial factors were assessed prior to multivariate model building to ensure stability of multivariate model estimates.

RESULTS

A total of 797 truck drivers were included in the study, with 49% ($n = 395$) categorized as tobacco users, and 51% ($n = 402$) as non-tobacco users (Table 1). Approximately 66.6% (531/797) of these drivers self-identified as long-haul or over-the-road drivers. Drivers were between 21 and 77 years old for both tobacco and non-tobacco users. Similar to other studies of commercial truck drivers, the mean age was 47.3 years, with a large majority (86%) who were male.^{20–22} Tobacco users were similar to non-tobacco users for sex ($P = 0.476$), race ($P = 0.194$), education ($P = 0.286$), and for self-reported diseases of diabetes mellitus ($P = 0.102$), high blood pressure ($P = 0.877$) or high cholesterol ($P = 0.928$), and self-reported near-miss crashes in the past year ($P = 0.194$). There were significant differences between tobacco users and non-users for body mass index ($P = 0.021$), age ($P = 0.046$), marital status ($P = 0.017$), measured systolic blood pressure ($P = 0.002$), measured diastolic blood pressure ($P = 0.018$), having health insurance ($P = 0.032$), amount of fat in their diet ($P = 0.024$), and having had heart surgery ($P = 0.018$), see Table 1.

For depressive symptoms, 24.0% of tobacco users were in the least depressed category, while 18.2% were in the most depressed category. In comparison, there were 18.1% and 21.4% of the non-tobacco users in the least and most depressed categories, respectively (Table 2). Regarding social support, 20.8% and 22.8% of tobacco users reported the least and most social support respectively, compared with 13.7% and 27.9% as least and most social support among the non-tobacco users (Table 2).

Unadjusted odds ratios from logistic regression models showed significant relationships between tobacco use and both depression levels and social support. Truck drivers in the two most depressed categories were unexpectedly significantly less likely to be tobacco users (OR = 0.62; 95% CI = 0.39, 0.96, and OR = 0.64; 95% CI = 0.41, 0.99 respectively) as compared with drivers who were in the least depressed category (Table 3). After adjustment for age, sex, BMI, near miss crashes, alcohol use, fat intake, drug use, and health insurance, the relationships between increased depression and tobacco use remained, with the 2nd, 4th, and 5th most depressed categories being statistically significantly related to tobacco use.

Conversely, drivers with lower social support were more likely to be tobacco users. Truck drivers in the lowest social support category were significantly more likely to be tobacco users (OR = 1.80, 95% CI 1.13–2.86) compared with drivers in the highest social support category. After adjustment for potential confounders, there were two statistically significant categories of social support related to tobacco use, with the 3rd and 5th least supported categories being significant OR = 1.68 (95% CI 1.04, 2.71) and OR = 1.84 (95% CI 1.13, 2.99). There were no significant associations between job satisfaction and tobacco use (Table 3).

DISCUSSION

This study suggests there are considerable relationships among truck drivers between psychosocial factors and tobacco use. Unexpectedly, increased levels of depression are inversely related to tobacco use, while we confirmed our expectations that decreased levels of social support are related to increased prevalence of tobacco use. These findings also suggest that an intervention to reduce tobacco use among some truck drivers may likely be effective.

The trends seen between tobacco use and psychosocial factors are not monotonic linear relationships, suggesting there may be a threshold relationship or that there may be other factors involved in these relationships. The inverse relationship observed between depression and tobacco use may, in part, be attributed to the stimulant effect of nicotine as a form of mild self-medication. These results are different from a study that examined relationships

TABLE 1. Descriptive Statistics of Truck Drivers Stratified by Tobacco Use

<i>N</i> = 797	Tobacco Users*, <i>n</i> = 395 (49.6%)	Non-Tobacco Users, <i>n</i> = 402 (50.4%)
Variables	<i>n</i> (%) or mean (SD), min–max	<i>n</i> (%) or mean (SD), min–max
Age, yr	47.98 (10.25), 21–74	46.48 (10.68), 21–74
Male	343 (86.8%)	342 (85.07)
Race		
White	345 (87.3%)	339 (84.3%)
Black/African American	20 (5.1%)	17 (4.2%)
Latino/Hispanic	16 (4.0%)	32 (8.0%)
Other	14 (3.6%)	14 (3.5%)
Education		
College graduate	28 (7.1%)	40 (10.0%)
Some college	151 (38.2%)	162 (40.3%)
High School/GED	165 (41.8%)	159 (39.5%)
<High School	51 (12.9%)	41 (10.2%)
Marital status		
Divorced	96 (24.3%)	63 (15.7%)
Married	232 (58.7%)	259 (64.4%)
Never married	48 (12.2%)	66 (16.4%)
Separated	12 (3.0%)	8 (2.0%)
Widowed/Widower	7 (1.8%)	6 (1.5%)
Near miss crash in the past year [‡]	196 (49.6%)	181 (45.0%)
Alcohol use	254 (64.3%)	215 (53.5%)
Fat in diet		
Low	46 (11.6%)	56 (13.9%)
Medium	237 (60.0%)	265 (65.9%)
High	112 (28.4%)	81 (20.2%)
Drug use	16 (4.1%)	1 (0.3%)
Health insurance	217 (54.9%)	251 (62.4%)
Body mass index (kg/m ²)	32.35 (7.62), 16.54–69.44	33.43 (7.26), 18.16–66.21
Systolic blood pressure, mmHg	130.24 (17.53), 90–191	133.63 (17.04), 88–192
Diastolic blood pressure, mmHg	83.74 (11.52), 45–144	84.80 (9.79), 50–117
Self-reported high cholesterol	105 (26.6%)	108 (26.9%)
Self-reported diabetes mellitus	35 (8.9%)	50 (12.4%)
Self-reported heart attack	24 (6.1%)	4 (1.0%)
Self-reported heart surgery	17 (4.3%)	6 (1.5%)

*Drivers were categorized as tobacco users if they reported having smoked at least 100 cigarettes in their lifetime or reported daily cigarette smoking.

[‡]Self-report.

between tobacco use and depression among adolescents and showed a higher likelihood of tobacco use with increased levels of depression.²³

These relationships mirror other findings reporting relationships between psychosocial factors and common occupational health outcomes including musculoskeletal disorders.^{24–27}

TABLE 2. Psychosocial Factors and Tobacco Use Among Truck Drivers (2009 to 2012)

Variables	Tobacco Users		Non-Tobacco Users	
	Frequency	Percent	Frequency	Percent
Zung depression				
0.00–0.250 (least depressed)	94	24.04	72	18.09
0.375–0.500	76	19.44	87	21.86
0.625–0.750	85	21.74	73	18.34
0.875–1.125	65	16.62	81	20.35
1.250–2.875 (most depressed)	71	18.16	85	21.36
APGAR social support				
0.00 (most social support)	90	22.78	112	27.93
0.01–0.33	55	13.92	73	18.20
0.34–0.99	94	23.80	80	19.95
1.00	74	18.73	81	20.20
1.01–2.00 (least social support)	82	20.76	55	13.72
Job satisfaction				
Very satisfied	167	42.28	158	39.40
Satisfied	156	39.49	172	42.89
Neither satisfied nor dissatisfied	48	12.15	52	12.97
Dissatisfied	17	4.30	11	2.74
Very Dissatisfied	7	1.77	8	2.00

TABLE 3. Crude and Adjusted Odds Ratios and 95% Confidence Intervals for Relationships Between Psychosocial Factors and Tobacco Use

Variables	Crude		Adjusted*	
	Odds Ratio	95% CI	Odds Ratio	95% CI
Zung depression				
0.00–0.250 (least depressed)	1.00	Reference	1.00	Reference
0.375–0.500	0.67	0.43, 1.03	0.58	0.37, 0.92
0.625–0.750	0.89	0.58, 1.38	0.82	0.52, 1.29
0.875–1.125	0.62	0.39, 0.96	0.60	0.38, 0.95
1.250–2.875 (most depressed)	0.64	0.41, 0.99	0.62	0.39, 0.98
APGAR social support				
0.00 (most social support)	1.07	0.68, 1.67	1.11	0.69, 1.77
0.01–0.33	1.00	Reference	1.00	Reference
0.34–0.99	1.56	0.99, 2.20	1.68	1.04, 2.71
1.00	1.20	0.73, 1.98	1.26	0.75, 2.13
1.01–2.00 (least social support)	1.80	1.13, 2.86	1.84	1.13, 2.99
Job satisfaction				
Very satisfied	1.17	0.86, 1.58	1.17	0.85, 1.61
Satisfied	1.00	Reference	1.00	Reference
Neither satisfied nor dissatisfied	1.02	0.65, 1.59	0.91	0.56, 1.46
Dissatisfied	1.70	0.77, 3.75	1.68	0.74, 3.81
Very dissatisfied	0.97	0.34, 2.72	0.82	0.28, 2.37

*Adjusted for age, sex, body mass index, number of near miss crashes, alcohol use, fat intake, drug use, and health insurance.

JOB SATISFACTION

Job satisfaction has been defined as one's specific attitude towards the reaction to one's overall work or certain specific aspects of that work.^{28,29} Job satisfaction has been intrinsically linked to safety climates, or the policies, practices, procedures, and the extent to which employees feel that safety is a priority in their organization.^{28,30} In one study, long haul trucker drivers reported that they were assigned unrealistically tight delivery schedules, which may contribute to speeding, driving while extremely tired, or not being compliant with road rules.^{31,32} The truck drivers' work environment, which includes schedules, long work hours, shiftwork, and pay-by-the-mile, all make for a complicated safety climate.^{31,33,34} Not only does this safety climate and job satisfaction contribute to high turnover and low engagement, but preliminary research has associated a poor safety climate with an increased risk of smoking and other risky worker behaviors.^{28,35}

Social Support and Work Stressors

Truck drivers in the tobacco users group had the lowest levels of social support compared with those in the non-tobacco users group. These findings are also consistent with other studies that have shown that individuals who have greater levels of social support are less likely to smoke.^{36,37} Social tobacco use has been declining in the in the general US population for many years, and this relationship may be an indicator.

Truck drivers, especially most long-haul drivers, are continually isolated from others, making them lone workers.⁸ Research has observed that lone workers have lower job satisfaction and/or social support.²⁸ Truck drivers experience substantial isolation periods and sleep deprivation, both of which are significant occupational stressors.^{8,38} The trucking work environment also emphasizes a culture of stoicism and emotional control that limits drivers' ability to access assistance.^{38,39}

Professional drivers, such as long-haul bus drivers, have been found to have an increased risk of stroke, coronary heart disease, and myocardial infarction.^{4,40} One way to explain the association between work stress and stress-related diseases, such as cardiovascular diseases and depression, is an indirect pathway through behavioral actions or habits of individuals exposed to work

stressors.^{41,42} These behavioral actions may include the intake of foods rich in saturated fats, cigarette smoking, or inability to participate in physical exercise.⁴² Other studies have indicated that a dose-response exists between work stress and engagement in a number of health risk behaviors.^{42,43} The burden of disease attributable to adverse psychosocial work environments can be explained by acquired unhealthy behaviors such as smoking.^{42,44}

Depression Among Truck Drivers

In the US working population, a 30-day prevalence of depressive, anxiety, and substance use disorders was reported to be 18.2%, while the annual major depressive disorders prevalence was estimated to be 6.4%.^{45,46} Researchers found that the depression prevalence among workers in Washington State varied among occupations, with truck drivers having a 6.18-fold higher odds of depression.⁴⁵ Studies regarding motor vehicle crashes, a leading cause of death in the United States, occur commonly among individuals with high prevalence of psychiatric problems such as depression.^{47–49} Depression is associated with attention and concentration problems and is often a self-reported factor in crashes.^{47,50,51}

Depressive disorders among workers are common among those with lower education levels, lower income, or with chronic conditions such as obesity, cardiovascular disease, diabetes, and those with unhealthy behaviors of smoking, binge drinking, or low physical activity.^{45,52,53} Many other studies have suggested that individuals diagnosed with psychiatric disorders like depression, bipolar disorder, schizophrenia, and panic disorders experience high rates of smoking.^{54–56} While all smokers have increased tobacco-related morbidity and mortality rates when compared with the general population, the complex relationship between psychiatric conditions and smoking is thought to expose smokers with mental health related-problems to even greater smoking-related risks.⁵⁷

The relationships between tobacco use and both BMI and cardiovascular issues seen in these data support other large studies, particularly with measured cardiovascular measures such as systolic and diastolic blood pressure.⁵⁸ These consistencies suggest that these relationships may be valid. However, drivers may also be more likely to begin and or maintain using tobacco with the intention to control their weight and lower their BMI. Another complicating

factor is that BMI has been strongly associated with sleep apnea, which has been a medical condition that disqualifies drivers from obtaining a commercial driver license.^{59,60} There is anecdotal evidence in other populations that tobacco is used as a means to control weight.⁶¹ It is unclear, however, whether such anecdotal evidence is true for truck drivers.²⁰ Similarly, there is anecdotal evidence that drivers use tobacco to help stay awake during long drives.⁶²

This study has many strengths. These strengths include the large, diverse population of active truck drivers, most of which are long-haul over the road drivers, who were recruited from many locations. These data are similar to data reported in other publications,^{20,22,63–65} suggesting potential representativeness of the population of US truck drivers. Additionally, this study was able to control for many personal and occupational potential confounders. We are unaware of another study that has assessed relationships in these diverse domains among this population.

This study also has some limitations, most of which are related to the cross-sectional study design. These data cannot demonstrate a temporal relationship between psychosocial factors and tobacco use and are therefore limited in the ability to suggest a causal relationship. There is also a possibility of both recall bias and healthy worker effect.

There are many impactful and actionable results from this study that can be applied to prevent or intervene to improve driver health and safety. The relationships between social support at work is the most impactful finding. These data suggest that increasing driver perception of social support may have a buffering effect on tobacco use, which may also relate to a driver's cardiovascular risk and risk for lung cancer. The relationship between depression and tobacco use may also help identify drivers with increased feelings of depression, as well as target interventions to improve depression among drivers who also smoke.

While there are available options for treatment and intervention regarding common mental health problems, including depression, unfortunately many workers do not receive these measures due to issues such as an inability to seek care, lack of access, or socioeconomic barriers.^{45,66,67} Studies are needed to investigate whether these same issues could be barriers to receiving tobacco cessation treatment among truck drivers.

CONCLUSION

Truck drivers with low social support or, unexpectedly low levels of depression are more likely to use tobacco as compared with drivers with high levels of social support or high levels of depression after controlling for confounders. An understanding of these factors may provide means to identify drivers who would benefit from effective smoking cessation interventions.

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