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Psychoactive substance use by truck drivers: a systematic review

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ABSTRACT

The aim of this study was to summarise the scientific evidence on the prevalence of psychoactive substance use and on the factors associated with their intake among truck drivers. A systematic review was performed in the databases PubMed, Scientific Electronic Library Online, Latin American and Caribbean Health Sciences, and Cochrane and 36 cross-sectional studies were identified with quantitative results about the use of psychoactive substances by truck drivers. Out of these, 28 were carried out in countries with large land areas and 23 obtained their information through self-reporting. The most frequently studied substances were alcohol (n=25), amphetamines (n=17), marijuana (n=16) and cocaine (n=13). The prevalence of the use of these substances greatly varied: alcohol (0.1–91.0%); amphetamines (0.2–82.5%), marijuana (0.2–29.9%), cocaine (0.1–8.3%). The frequency of substance use was lower in studies that investigated the presence of these substances in biological samples than in those based on self-reported use. In 12 studies that evaluated factors associated with the intake of psychoactive substances, the following stood out: younger age, higher income, longer trips, alcohol consumption, driving in the night shift, travelling interstate routes, long or short sleep, fewer hours of rest, little experience of the driver, connection with small and medium sized companies, income below levels determined by labour agreements, productivity-based earnings and prior involvement in accidents. The frequency of psychoactive substance use by truck drivers seems to be high, although that greatly varies according to the type of substance and the method of collecting the information. The use of these substances was mainly associated with indicators of poor working conditions.

What this paper adds

- There are still few studies on the prevalence of psychoactive substance use by truck drivers.
- The prevalence is higher when information is obtained by self-report in comparison to biological samples.
- Individual characteristics were mainly associated with alcohol consumption while poor working conditions were mostly associated with amphetamine intake.
- It is recommended that future studies use standardised measurements that allow them to be properly compared, including meta-analyses to estimate joint association measures.

INTRODUCTION

Road transportation of goods drives the economic development in several countries,[1 2] especially in those with large territories and insufficient or inadequate railroad transport. Truck drivers are the main agents in this transportation system[3] and their activity has unique features regarding work organisation, such as goals and short deadlines to achieve them, and also strenuous working hours.[4]

These drivers are subjected to countless factors that influence their professional practice, among which the intake of psychoactive substances stands out,[5 6] used for reducing sleepiness during the trips and increasing willingness for work and socialisation. However, the use of these substances may cause harmful effects to the individual and to society. Amphetamines, when used to aid in sleepiness reduction, may cause agitation, tachycardia, vertigo and hallucinations, besides altering the body's perceptions and reactions, thus raising the risk of traffic accidents.[7–9]

Despite the relevance of the subject, both socially and economically and also in the workers' health, the currently available evidence on the use of psychoactive substances by truck drivers consists of localised studies in specific contexts of each place studied. Considering that the analysis of individual studies provides little knowledge for elaborating measures to address the problem, this systematic review aimed to summarise the scientific evidence on the prevalence of psychoactive substance use and the factors associated with this intake among truck drivers.

METHODOLOGY

A systematic review was performed on the studies about the intake of psychoactive substances by truck drivers. Studies were selected if they were original and with quantitative results specifically on the use of psychoactive substances by truck drivers. No restrictions were made regarding language and year of publication. The recommendations of the *Preferred Reporting Items of Systematic Reviews and Meta-Analyses*[10] were followed when applicable.

The studies were identified by consulting the databases PubMed, Scientific Electronic Library Online (SciELO), Latin American and Caribbean Health Sciences (LILACS) and Cochrane until the 30 April 2013. The PubMed search was carried out by combining the following keywords in the title or abstract: 'truck', "lorry', 'lorries', 'heavy vehicle', 'heavy transport', 'motorist', 'driver', 'conductor', 'worker', 'job', 'professional', 'drug', 'stimulant', 'substance',

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'medicine', 'medication', 'psychoactive', 'amphetamine', 'cocaine', 'marijuana', 'crack', 'alcohol' and 'caffeine' (the search strategy can be found in the online supplemental material). For the SciELO and LILACS database searches, the terms 'truck', 'truck drivers' or 'load transport' were used, while in the Cochrane database the studies selected included the terms 'truck', 'lorry', 'lorries', 'heavy vehicle' or 'heavy transport'. The search strategy was based on language and syntax adequate to each database.

After the initial selection, studies whose titles clearly indicated they were not related to the subject were discarded. In a second step, the analysis of the abstracts made it possible to exclude other studies. During these steps, the review papers were kept. The remaining publications were obtained and analysed thoroughly. Moreover, their references were examined so that other papers could be located that had not been identified through the search strategy employed. After this process, the studies that fit the previously defined inclusion criteria were kept.

The whole article selection and review process was carried out independently by two researchers, who cross-checked their results in each of the steps and settled the discrepancies through consensus. A third researcher was consulted in case of disagreement. To analyse the selected studies, four tables were produced. The first table contains the general characteristics of each study; the second and third list the main descriptive results; and the fourth presents the studies that assessed factors associated with the intake of psychoactive substances.

RESULTS

The search resulted in 367 studies, excluding those duplicated and including the references of the articles consulted. After exclusions by the title or abstract, 65 studies were selected for complete reading. Out of these, 34 were included.[5–8 11–40] The reasons for excluding 31 papers are specified in figure 1. The reading of these 34 papers identified 36 studies, since two papers presented results from two independent studies.[15 25]

Most studies were carried out in countries with large land areas, Brazil (n=13), the USA (n=10) and Australia (n=4) being those with the highest number of investigations. Most papers were published starting in the year 2000 (n=30) and involved samples below 500 subjects (n=21), 7 of which had less than 200. About 70% of the studies only researched male drivers.

Out of the 36 studies analysed, 6 also investigated drivers of other motor vehicles.[16 22 34 35 37] However, the results distinguished between the types of drivers, allowing truck drivers to be evaluated separately.

The method of data collection varied and included surveys at truck stops (n=16), at events promoted for truckers (n=4), with members of trucker associations (n=3), analyses of biological samples from traffic accident victims (n=4), with employees of a shipping company (n=1), and other non-identified sources (n=8). Among the inclusion criteria for the sample, drivers who drove long routes (n=5) and vehicle characteristics (n=7) were the most common. Nineteen studies did not have inclusion criteria for truck drivers (see table 1S in online supplemental material).

Among the 36 investigations, 21 assessed the intake of substances only through truckers' self-reporting, 13 only through biological samples and two through both.[36 38] Out of the 15 studies with biological samples, four used forensic data.[8 16 24] Snowden *et al*[24] and Gates *et al*[40] evaluated 71 606 and 10 190 results from biological samples, respectively. The

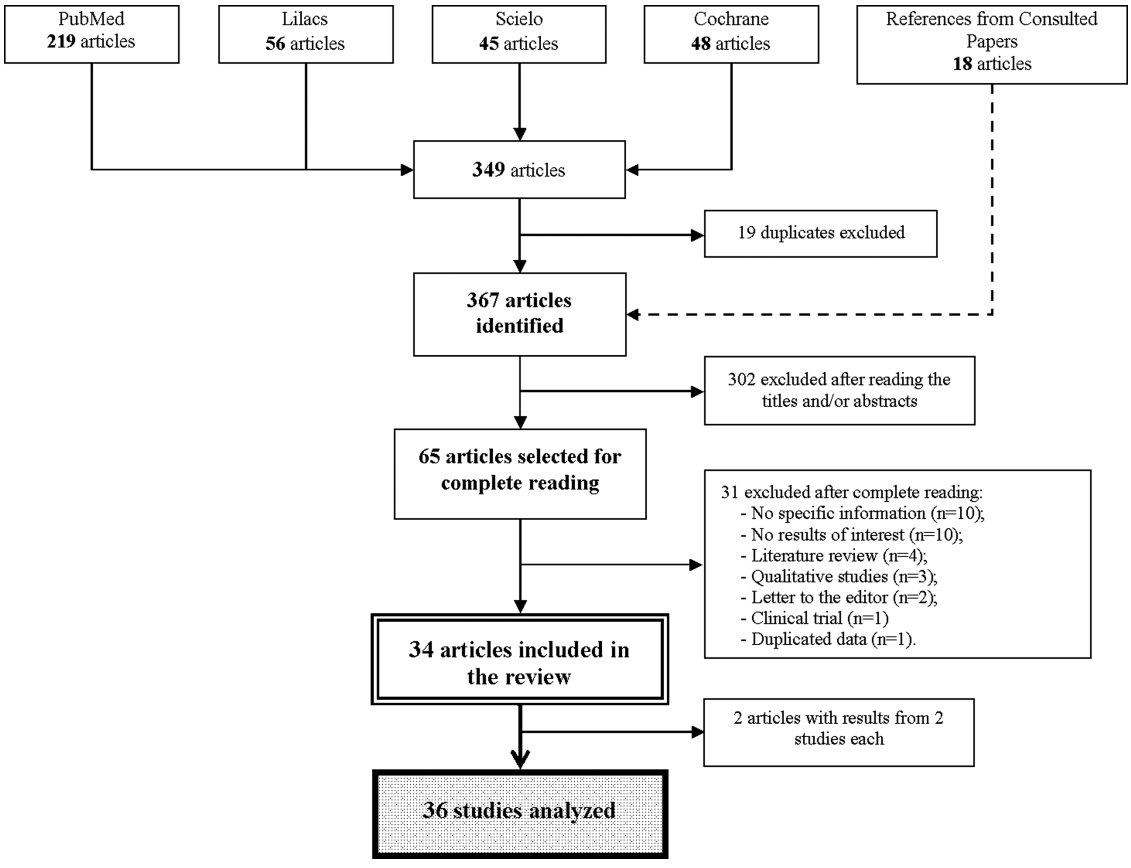

Figure 1 Flow chart for selecting papers.

Table 1 Description of the studies on self-reported psychoactive substance use by truck drivers

Study	Alcohol	Other substances
Guinn[11]	NA	Drug use while trucking: 80.4%
Korelitz *et al*[13]	59.2% (current)	NA
Mabbott and Hartley[14]	NA	Illicit and prescribed stimulant: 8.9% Illicit or prescribed stimulant: 11.9% Over-the-counter stimulants: 6.8%
Yildirim[18]	NA	Gripin: 65.0%
Souza *et al*[19]	50.9% (current)	Amphetamine: 11.1% Caffeine: 95.6%
Moreno *et al*[20]	51.1% (current)	NA
Domingos *et al*[21]	72.0% (last 12 months)	NA
Nascimento *et al*[5]	91.0% (current)	Amphetamine: 66.0%
Sakurai *et al*[23]	54.8% (current)	NA
Williamson[25]	NA	Stimulant drug use: 44.0%
Williamson[25]	NA	Stimulant drug use: 31.1%
Gay Anderson *et al*[26]	63.0% (last 12 months)	NA
Penteado *et al*[27]	43.5% (current)	Stimulants: 7.5% Coffee: 85.75% Energy drinks: 19.5% Illicit drugs: 2.0%
Domingos *et al*[28]	73.8% (last 12 months)	NA
Jora *et al*[29]	71.1% (last 12 months)	NA
Masson *et al*[30]	74.0% (current)	Amphetamine: 70.0%
Masson *et al*[31]	49.5% (current)	Use of psychoactive drugs: 54.2%
Riva *et al*[33]	49.2% (current)	Amphetamine: 0.9% Marijuana: 15.9% Cocaine: 5.3%
Laraqui *et al*[34]	11.8% (current)	Marijuana: 12.0% Coffee: 71.8% Psychotropic medicines: 3.9%
Leyton *et al*[36]	NA	Amphetamine: 16.6%
Mir *et al*[37]	9.9% (while driving)	Marijuana: 29.9%
Knauth *et al*[39]	73.1% (current)	Amphetamine: 12.4% Caffeine: 14.8% Guarana powder: 2.7% Energy drinks: 3.9% Cocaine: 0.4%
Yonamine *et al*[38]	25.9% (previous day)	Drugs: 1.2%

NA, not available.

main substances consumed or identified in the studies were alcohol (n=25), amphetamines (n=17), marijuana (n=16) and cocaine (n=13) (see table 1S in online supplemental material).

Tables 1 and 2 describe the main results found in the studies. Among the 23 studies with self-reported information, alcohol was the most frequently reported substance (n=18). Meanwhile, in the 15 studies with biological samples, analyses for identifying amphetamines, marijuana and cocaine were the most common.

The average frequency of self-reported alcohol consumption was 54.3%, ranging from a minimum of 9.9% (Pakistan)[37] to a maximum of 91.0% (Brazil)[5] (table 1). The identification of alcohol in biological samples was, on average, 3.6%, a minimum of 0.1% (Australia and Norway)[22 35] and a maximum of 12.5% (USA)[8] (table 2).

The average frequency of self-reported amphetamine intake was 29.5%, ranging from 0.9% (Italy)[33] to 70.0% (Brazil)[30] (table 1). Amphetamines in biological samples averaged 8.5%, from a minimum of 0.2% (Norway)[35] to a maximum of 82.5% (Thailand).[12]

Marijuana and cocaine self-reported intake had average frequencies of 19.3% and 2.9%, respectively (table 1). In the biological samples, averages of 4.7% for marijuana and 1.8% for cocaine were found (table 2). Marijuana use ranged from 0.2%[32] to 29.9%,[37] while cocaine ranged from 0.1%[6] to 8.3%.[8] Besides these substances, others were occasionally analysed, such as opioids,[6 8 15 16 32 33] phentermine,[7 14] codeine,[8 35] caffeine-based medication,[18] pure coffee,[27 34] energy drinks,[27] antihistamines,[15] benzodiazepines,[6 16] among others. Six studies examined only the intake of psychoactive substances in general, without specifying them.[11 14 25 27 30]

Only 12 studies analysed factors associated with the intake of psychoactive substances,[5 11 14 18 21 23 25 28 35 36 39] two of which were carried out with biological samples.[35 36]

Alcohol intake was associated with overweight and obesity in a Brazilian study,[28] however in a Japanese study, it was associated with lower average body mass index .[23] Alcohol intake was also associated with younger age,[23] smoking,[23] high blood pressure,[23] catholic religion,[21] fewer hours of rest,[5] involvement in accidents[5] and sleep-disordered breathing.[23] In Norway, Gjerde *et al*[35] identified that alcohol intake was more frequent among foreign drivers (table 3). The study by Sakurai *et al*[23] was the only one to use adjustment variables (age, smoking and collection site) when analysing factors associated with alcohol intake.

The use of amphetamines was associated with driving during the night shift and with longer time in the profession.[5] Another study,[39] the only one identified in this review that used multiple regression analysis to identify factors associated with the use of amphetamines, found that younger age, higher income, longer trips, and alcohol consumption were positively associated with self-reported amphetamine intake (table 3), even after controlling for socio-demographic characteristics and religion.

A study carried out in Turkey found a positive correlation between the intake of medication containing caffeine and more hours driving during the day, years at the wheel and degree of stumbling.[18] Williamson[25] found that, in Australia, the use of stimulating medication was associated with less driver experience, work in medium and small sized companies, income below levels defined by union agreements, productivity-based earnings and fatigue (table 3).

It was also observed that drug intake (drug types were not specified in the studies) was associated with age less than 35 years,[35 36] male sex,[35] contraproductive behaviours (inadequate work, stealing merchandise, failure to report damage to goods transported),[11] driving on interstate routes,[14] and short or long sleep times (table 3).

DISCUSSION

Despite its importance to public health, the current review detected that there are still few studies on the prevalence of psychoactive substance use by truck drivers. Most of these studies were carried out in countries with large land areas, such as Brazil, the USA and Australia. This shows that there is greater interest in the subject in areas where road cargo is predominant, especially for long routes, due to a possible relation with the use of psychoactive substances.[14]

Most studies included a small number of respondents, which highlights the difficulty in identifying and approaching this population group because they usually do not have regular sites for resting, loading and unloading.[41] Moreover, half of the studies defined inclusion criteria for selecting drivers. Therefore, the results are representative of specific subgroups and caution must

Table 2 Main results of the studies on psychoactive substance use by truck drivers analysed in biological samples

Study	Alcohol	Amphetamine/ methamphetamine	Cannabinoids	Cocaine metabolites	Other substances
Lund *et al*[7]	0.6%	2.2%	14.8%	2.2%	Phenylpropanolamine/ephedrine/pseudoephedrine: 12.0% Phentermine: 3.2%
Mongkolsirichaikul *et al*[12]	NA	82.5%	NA	NA	NA
Crouch *et al*[8]	12.5%	7.1%	12.5%	8.3%	Caffeine: 32.7% Codeine: 0.6% Ephedrine: 4.2% Phenylpropanolamine: 0.6% Pseudoephedrine: 3.0%
Couper *et al*[15]	0.3%	1.4%	3.3%	1.1%	Caffeine: 93.4% Ephedrine/pseudoephedrine: 5.5% Phentermine: 0.6% Opiates/opioids: 2.2%
Couper *et al*[15]	2.2%	2.0%	5.0%	1.1%	Caffeine: 94.1% Ephedrine/pseudoephedrine: 6.7% Opiates/opioids: 1.1% Phentermine: 0.4%
Drummer *et al*[16]	8.6%	NA	6.5%	NA	Benzodiazepines: 0.7% Opioids: 0.7%
Silva *et al*[17]	NA	4.8%	0.27%	0.27%	NA
Drummer *et al*[22]	0.1%	1.4%	2.5%	NA	NA
Snowden *et al*[24]	3.3%	NA	NA	NA	NA
Labat *et al*[6]	5.0%	0.3%	8.5%	0.1%	Benzodiazepines: 0.4% Buprenorphine: 1.8% Opiates: 4.1% Methadone: 0.5%
Mieczkowski[32]	NA	0.14%*	0.21%† 0.35%*	0.27%† 2.12%*	NA
Gjerde *et al*[35]	0.1%	0.2%	0.7%	0.8%	Codeine: 0.2%
Leyton *et al*[36]	NA	6.0%	1.1%	2.2%	NA
Gates *et al*[40]	NA	2.3%	NA	0.7%	Benzoylecgonine: 0.6% Phentermine: 0.1% Chlorphentermine: 0.1%
Yonamine *et al*[38]	1.4%	0.6%	0.4%	0.6%	NA

*Hair.
†Urine.
NA, not available.

be used in extrapolating the results to the whole trucker community.[42 43] Nevertheless, they provide an important overview of the psychoactive substance use profile of these professionals.

The prevalence in the intake of psychoactive substances varied greatly, possibly influenced by the methodologies used to obtain data and the different populations studied. The working conditions of these professionals may also be significantly different, such as loading and unloading wait times, the lack of return cargo and the conservation conditions of roads and fleets,[44–46] which may stimulate a greater or lower intake of psychoactive substances at work.

Biological analyses identify the presence of alcohol and other substances only if they have been used hours or a few days prior to sample collection.[47] Therefore, although biological analyses are more specific, they tend to underestimate the intake prevalence. However, self-reported information can include the use of substances a few minutes prior to the investigation and covers the whole professional life. This methodology is therefore more sensitive but is subject to biases such as memory limitations and, especially, withholding information due to the legal implications of using these substances, thus also underestimating the prevalence. Therefore, the prevalence in studies using biological samples or self-reported information must be analysed separately since the methods used to measure the outcomes, in this case, are not comparable.

Alcohol intake is legal in the countries where the studies were conducted. However, legislation normally forbids alcohol intake prior to or while driving motor vehicles. The Worldwide Brewing Alliance reports that the maximum blood ethanol concentration for professional drivers in the countries where the studies were carried out is as follows: Italy 0.5 g/L, the USA 0.4 g/L, Japan 0.3 g/L, and Australia, Brazil, France and Norway 0.2 g/L.[48] These limits, which are related to cultural and oversight issues, partly explain differences in alcohol intake and driving behaviours.

The prevalence of other important psychoactive substances (amphetamines, cocaine and marijuana) also varied. The study carried out by Mongkolsirichaikul *et al*[12] in Thailand stands out for identifying an intake of amphetamines in urine samples (82.5%) well above the average compared with other studies using biological samples. According to these authors, the excessive work hours (around 20–22 h) and possible addiction may be the reasons for these high levels.

Self-reporting was a method less frequently used to measure the intake of substances such as amphetamines, marijuana and cocaine given the difficulty in obtaining such information through interviews, especially since these are illicit drugs. Development and validation of questionnaires for obtaining such information anonymously may help further studies that attempt to determine the intake of illicit psychoactive substances

Table 3 Main factors associated with the intake of psychoactive substances by truck drivers

	Outcome		
Factors associated	**Alcohol**	**Amphetamine**	**Psycho-stimulant drugs**
Personal characteristics			
Younger age	Sakurai *et al*[23]*	Knauth *et al*[39]† Leyton *et al*[36]	
Alcohol consumption		Knauth *et al*[39]†	
Current smoker	Sakurai *et al*[23]*		
Lower mean values of body mass index	Sakurai *et al*[23]*		
Overweight and obesity	Domingos *et al*[28]		
Hypertension and use of antihypertensive medication	Sakurai *et al*[23]*		
Sleep-disordered breathing	Sakurai *et al*[23]*		
Catholic religion	Domingos *et al*[21]		
Foreign nationality	Gjerde *et al*[35]		
Job characteristics			
Road accidents	Nascimento *et al*[5]		
Longer time in the occupation		Nascimento *et al*[5]	
Less experienced driver			Williamson[25]
Longer trips		Knauth *et al*[39]†	
Night-time travel		Nascimento *et al*[5]	
Fewer hours of rest	Nascimento *et al*[5]		
Higher income		Knauth *et al*[39]†	
Salary on a piece-rate pattern			Williamson[25]
Salary less than the award rate			Williamson[25]
Drivers employed by small or medium sized companies			Williamson[25]
Contraproductive behaviour			Guinn[11]
Fatigue			Williamson[25]

*Adjustment variables: age, smoking and place of collection.
†Adjusted for socio-demographic characteristics and religion.

in a more reliable way, in addition to representing a simpler and less costly methodology.

Since surveys show a higher prevalence of the intake of psychoactive substances, they are probably more reliable for identifying factors associated with the intake of these substances. These factors included less resting time and working night shifts,[5] possibly because the workers need to resort to strategies to keep awake, among which the intake of psychoactive substances stands out. Lower incomes and productivity-based earnings[25] were also associated with the use of these substances, which could be explained by the possible motivation of the drivers to increase their income.[27 30 31] In fact, a study conducted in Brazil found that truck drivers with higher incomes and engaged in longer trips were more prone to use amphetamines, probably to remain awake to face their unfavourable working conditions.[39] The authors also highlight the higher vulnerability of these individuals to other diseases and the lack of policies that address improvements in their health and working conditions.[39] The association between the use of amphetamines and the involvement in accidents[5] confirms the risks of using these substances while driving a vehicle.

Unlike the stimulant substances such as amphetamines, alcohol intake was associated more with the drivers' individual characteristics and health conditions, suggesting that alcohol intake is more common in a social or leisure context.[29 49] Thus, the harmful effects of alcohol go beyond a greater risk of traffic accidents in truck drivers as it is also related to their health conditions.

The small number of analytic studies exposes a gap in the knowledge in identifying cargo drivers more vulnerable to the intake of psychoactive substances. Studies on representative samples of this population that identify factors associated with the intake of these substances are important, including the use of adjustment variables when needed. Moreover, it is recommendable that future studies use standardised measurements that allow them to be properly compared, including carrying out meta-analyses to estimate joint association measures.

Psychoactive substances have been proved to impair driving and cause a greater risk of traffic accidents.[50–52] Therefore, gas stations, trucker stops and companies that employ these professionals must be more closely observed regarding the sale and consumption of these substances. There is some evidence that well planned and well executed multicomponent programmes, when implemented along with community action efforts, are effective in reducing alcohol-derived traffic accidents,[53] although no studies were found that were performed specifically in truck drivers. Likewise, regulations for truck drivers, such as suitable working hours and income more compatible with the profession, in addition to better working conditions such as roads and vehicles in good repair, would contribute to a reduction in accidents and the implications these have for individual truck drivers and public health.[3 54]

In summary, the intake of psychoactive substances by truck drivers is a relatively frequent occurrence, although the prevalence varies according to the place and methodology employed. Furthermore, intake seems to be higher when working conditions are poor and can have a direct impact on the health of individual truck drivers and society as a whole due to the increase in traffic accidents. Although from a scientific standpoint the knowledge on the use of psychoactive substances by these professionals still needs to be broadened, the available evidence is more than enough to justify facing and addressing the problem. Well planned and well executed studies are crucial for assessing the effectiveness of strategies for reducing psychoactive

substance use by truck drivers before or while driving, in addition to improving their working conditions.**Acknowledgements** The authors thank the National Council for Scientific and Technological Development (CNPq) for granting a research productivity bursary.

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Online Supplemental Material

Appendice 1

SEARCH HISTORY (April 30, 2013)

Search	Query	Items found
#27	Search **#6 AND #13 AND #26**	219
#26	Search **#14 OR #15 OR #16 OR #17 OR #18 OR #19 OR #20 OR #21 OR #22 OR #23 OR #24 OR #25**	1549030
#25	Search **caffeine*[Title/Abstract]**	21162
#24	Search **alcohol*[Title/Abstract]**	221124
#23	Search **crack*[Title/Abstract]**	10879
#22	Search **marijuana*[Title/Abstract]**	7477
#21	Search **cocaine*[Title/Abstract]**	28315
#20	Search **amphetamine*[Title/Abstract]**	20156
#19	Search **psychoactive*[Title/Abstract]**	5610
#18	Search **medication*[Title/Abstract]**	179100
#17	Search **medicine*[Title/Abstract]**	281099
#16	Search **substance*[Title/Abstract]**	211584
#15	Search **stimulant*[Title/Abstract]**	18960
#14	Search **drug*[Title/Abstract]**	723576
#13	Search **#7 or #8 or #9 or #10 or #11 or #12**	325871
#12	Search **professional*[Title/Abstract]**	162458
#11	Search **job*[Title/Abstract]**	39517
#10	Search **worker*[Title/Abstract]**	120048
#9	Search **conductor*[Title/Abstract]**	4223
#8	Search **driver*[Title/Abstract]**	21462
#7	Search **motorist*[Title/Abstract]**	353
#6	Search **#1 OR #2 OR #3 OR #4 OR #5**	2790
#5	Search **heavy transport*[Title/Abstract]**	8
#4	Search **heavy vehicle*[Title/Abstract]**	108
#3	Search **lorries[Title/Abstract]**	47
#2	Search **lorry[Title/Abstract]**	143
#1	Search **truck*[Title/Abstract]**	2532

Online Supplemental Material

Appendice 2

ARTICLES EXCLUED AFTER COMPLETE READING

NO ESPECIFIC INFORMATION

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DUPLICATED DATA

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Table 1S: Description of the studies on psychoactive substance use by truck drivers.

Author(s)	Country Year	Characteristics of participants		Form of obtaining data	Main psychoactive substances evaluated
		N Age (years) Gender	Criteria for inclusion		
Guinn, 1983[11]	USA 1981-1982	112 NA NA	Drivers of tractor-trailer trucks	SR	Drugs for the purpose of remaining awake and alert while trucking (non-specified drugs)
Lund *et al.*, 1988[7]	USA 1986	317 NA NA	Drivers of trucks weighing more than 4.5t	U/B	Alcohol, amphetamines, cannabinoids, cocaine, ephedrine/phenylpropanolamine/pseudoephedrine, phentermine
Mongkolsirichaikul *et al.*, 1988[12]	Thailand 1987	57 22-45 NA	NA	U	Amphetamines
Crouch *et al.*, 1993[8]	USA 1987-1988	168 NA NA	Drivers of trucks weighing more than 4.5t	B	Alcohol, amphetamines, caffeine, cannabinoids, cocaine, codeine, ephedrine/ phenylpropanolamine/pseudoephedrine, opiates
Korelitz *et al.*, 1993[13]	USA 1988	2945 18+ M	NA	SR	Alcohol
Mabbott *et al.*, 1999[14]	Australia 1997	236 21-69 M/F	NA	SR	Illicit stimulant (amphetamines), over-the-counter stimulants (herbal drugs, caffeine tablets, pseudoephedrine), prescription stimulants (phentermine, diethylpropion)
Couper *et al.*, 2002a[15]*	USA 1998	361 NA NA	NA	B/U	Alcohol, amphetamines, antihistamines, caffeine, cannabinoids, cocaine, ephedrine/pseudoephedrine, opiates
Couper *et al.*, 2002b[15]*	USA 1999	461 NA NA	NA	B/U	Alcohol, amphetamines, antihistamines, caffeine, cannabinoids, cocaine, ephedrine/pseudoephedrine, opiates
Drummer *et al.*, 2003[16]	Australia 1990-1999	139 NA M/F	Truckers killed in motor vehicle accidents	B	Alcohol, benzodiazepines, stimulants, cannabinoids, opiates
Silva *et al.*, 2003[17]	Brazil	728	Drivers who were not under	U	Amphetamines, cannabinoids, cocaine

Author(s)	Country Year	Characteristics of participants		Form of obtaining data	Main psychoactive substances evaluated
		N Age (years) Gender	Criteria for inclusion		
	NA	NA NA	suspicion of having driven under the influence of drugs		
Yildirim, 2003[18]	Turkey 1999	500 NA NA	Long-distance drivers	SR	Gripin® (Drug containing caffeine)
Souza *et al.*, 2005[19]	Brazil NA	260 21-79 M	NA	SR	Alcohol, amphetamines, caffeine
Moreno *et al.*, 2006[20]	Brazil NA	4878 40±10 M	NA	SR	Alcohol
Domingos *et al.*, 2007[21]	Brazil 2006	1014 18-72 M/F	NA	SR	Alcohol
Drummer *et al.*, 2007[22]	Australia 2004-2005	318 NA M/F	Drivers of trucks weighing more than 4.5t	OF/B	Alcohol, amphetamines, cannabinoids
Nascimento *et al.*, 2007[5]	Brazil 2005	91 NA NA	Long-distance truck drivers	SR	Alcohol, amphetamines
Sakurai *et al.*, 2007[23]	Japan 2004-2005	1465 20-69 M	NA	SR	Alcohol
Snowden *et al.*, 2007[24]	US 1988-2003	71.606 21-65 NA	Drivers of trucks weighing more than 4.5t involved in a fatal motor vehicle crash	B	Alcohol
Williamson, 2007a[25]*	Australia 1991	970 NA M/F	Long-distance drivers, completing trips of at least 300 km	SR	Psychostimulant drugs to stay awake while driving

Author(s)	Country Year	Characteristics of participants		Form of obtaining data	Main psychoactive substances evaluated
		N Age (years) Gender	Criteria for inclusion		
Williamson, 2007b[25]*	Australia 1998	1,007 NA M/F	Long-distance drivers, completing trips of at least 300 km	SR	Psychostimulant drugs
Gay Anderson *et al.*, 2008[26]	US 2003-2006	987 ≥21 M/F	Those who spend one or more nights away from home and ability to speak English	SR	Alcohol
Labat *et al*., 2008[6]	France 2003-2004	1,000 18-65 M/F	NA	U	Alcohol, amphetamines, benzodiazepines, buprenorphine, cannabinoids, cocaine, opiates, methadone
Penteado *et al.*, 2008[27]	Brazil 2005	400 21-65 M	NA	SR	Alcohol, coffee, energetic drinks, illicit drugs (cocaine, cannabis, crack), stimulants
Domingos *et al.*, 2010[28]	Brazil 2007	827 ≥18 M/F	NA	SR	Alcohol
Jora *et al*., 2010[29]	Brazil 2008	496 >18 M/F	NA	SR	Alcohol
Masson *et al.*, 2010a[30]	Brazil 2005	50 ≥20 M	NA	SR	Alcohol, psychoactive drugs
Masson *et al.*, 2010b[31]	Brazil 2008	105 ≥20 M	NA	SR	Alcohol, amphetamines.
Mieczkowski, 2010[32]	USA NA	1,458 NA NA	NA	U/H	Amphetamines, cannabinoids, cocaine, opiates
Riva *et al.*, 2010[33]	Italy 2008	226 42.7±9.5	NA	SR	Alcohol, amphetamines, cannabinoids, cocaine, ecstasy, methadone, opiates

Author(s)	Country Year	Characteristics of participants		Form of obtaining data	Main psychoactive substances evaluated
		N Age (years) Gender	Criteria for inclusion		
		NA			
Laraqui *et al.*, 2011[34]	Morocco 2004-2008	2,134 39.3±7.7 NA	NA	SR	Alcohol, cannabinoids, coffee, psychotropic medicines
Gjerde *et al.*, 2012[35]	Norway 2008-2009	882 NA M/F	NA	OF	Alcohol, amphetamines, cannabinoids, cocaine, codeine, morphine
Leyton *et al*., 2012[36]	Brazil 2009	452 40±10.8 M	Drivers of trucks weighing more than 30t	U SR	Amphetamines, cannabinoids, cocaine
Mir *et al.*, 2012[37]	Pakistan 2008	461 18-68 M	Drivers who drove more than 160 km daily	SR	Alcohol, cannabinoids
Knauth *et al*., 2012[39]	Brazil 2006	854 NA NA	NA	SR	Alcohol, amphetamines, caffeine, energy drinks, guarana powder, cocaine
Yonamine *et al*., 2013[38]	Brazil 2002-2008	1,277 18-80 M	NA	U SR	Alcohol, amphetamines, cannabinoids, cocaine
Gates *et al*., 2013[40]	USA 1993-2008	10,190 NA M/F	Drivers aged 20 years or over who were driving a truck-tractor or a truck with a gross vehicle weight rating greater than 26,000 lbs	U/B	Amphetamines, cocaine, benzoylecgonine, phentermine, chlorphentermine

B: blood; **H**: hair; **NA:** not available; **OF**: oral fluid; **SR**: self-report; **U**: urine; **USA:** United States of America; *****Refer to results of two investigations published in one article.

OCCUPATIONAL AND ENVIRONMENTAL MEDICINE

Use of booze and drugs common among truck drivers on the road

Prevalence varies widely, but mainly linked to poor working conditions

[Psychoactive substance use by truck drivers: a systematic review Online First doi 10.1136/oemed-2013-101452] (research)
[Psychoactive substance use in truck drivers: occupational and public health Online First doi 10.1136/oemed-2013-101791] (editorial)

The use of booze and drugs among truck drivers on the road is common, but seems to be mainly linked to poor working conditions, finds a systematic analysis of the available evidence published online in ***Occupational and Environmental Medicine***.

An accompanying editorial describes the research findings as "a cause for concern," not only in terms of the impact on drivers' health, but also because of the risk posed to road safety.

The researchers carried out a comprehensive review of published evidence on the use of mind altering substances among truck drivers by combing through international research databases.

They found 36 relevant studies, dating back to 2000, 28 of which had been carried out in countries with a large land mass, such as Australia, the US, and Brazil, and 23 of which obtained their information through survey data rather than biological samples.

The pooled data showed that the substances truckers used most frequently while on the road were alcohol, amphetamines ('speed'), cannabis, and cocaine. But the extent to which these were used varied widely, depending on the substance itself and the way in which the data had been collected.

So drinking on the job ranged from 0.1% to 91%, while the use of amphetamines ranged from 0.2% to 82.5%, cannabis from 0.2% to 30%, and cocaine from 0.1% to over 8%.

Prevalence was lower in studies relying on biological samples. But as the authors point out, these analyses only detect a substance that has been used hours or a few days beforehand, so tend to underestimate the true extent of use.

The prevalence of drinking on the job, for example, ranged from 10% (Pakistan) to 91% (Brazil), averaging out at 54%, for studies relying on survey data. But studies relying on biological samples suggested an average prevalence of 3.6%.

Twelve studies looked at the factors associated with the use of drugs on the job. The pooled data revealed certain common themes, among which were younger age; higher income; longer trips; night driving; alcohol consumption; fewer hours of rest; and pay below union recommended rates or that was linked to productivity.

"Psychoactive [mind altering] substances have been proved to impair driving and cause a greater risk of traffic accidents," write the authors. "Therefore gas stations, trucker stops and companies that employ these professionals must be more closely observed regarding the sale and consumption of these substances."

In a linked editorial, Professor Allard van der Beek, of the Institute for Health and Care Research at VU University, Amsterdam, The Netherlands, points out: "The results of this review are a cause for concern, not only for truck drivers using psychoactive substances, but also for the general public."

"It is beyond doubt" that alcohol and cannabis dull reaction times, he says, while amphetamines can stave off fatigue and boost concentration, but over the long term, continued use of high doses can be harmful to health.

Furthermore, other research shows that the use of stimulants prompts drivers to take more risks on the road and they are linked to an increased risk of falling asleep at the wheel and a subsequent road traffic collision, he says. Given the size and weight of trucks, this obviously increases the risks of serious injury and death.

Truckers use these substances to cope with long working hours and fatigue, he explains. But trying to change the culture will be hard. "Both road transport companies and truck drivers benefit financially from these long working hours," he writes.