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Drug use among drivers who drank on alcohol outlets from Porto Alegre, Brazil

Raquel B. De Boni[a,*], Francisco Inacio Bastos[a], Mauricio de Vasconcellos[c], Fernanda Oliveira[b], Renata P. Limberger[b], Flavio Pechansky[b]

[a] Department of Health Information, Oswaldo Cruz Foundation, Rio de Janeiro, Brazil
[b] Center for Drug and Alcohol Research, Federal University of Rio Grande do Sul and Hospital de Clínicas de Porto Alegre, Brazil
[c] National School of Statistics, Brazilian Geography and Statistics Institute, Rio de Janeiro, Brazil

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ABSTRACT

Background: Driving under the influence of multiple substances is a public health concern, but there is little epidemiological data about their combined use and putative impact on driving in low and middle-income countries where traffic crashes have been clustering in recent years. The aim of this study is to estimate the prevalence of alcohol and drug use – as well as their associated factors – among drivers in the context of alcohol outlets (AOs).
Methods: A probability three-stage sample survey was conducted in Porto Alegre, Brazil. Individuals who were leaving AO were screened, with the selection of 683 drivers who met the inclusion criteria. Drivers answered a structured interview, were breathalyzed, and had their saliva collected for drug screening. Prevalences were assessed using domain estimation and logistic regression models assessed covariates associated with substance use.
Findings: Benzodiazepines 3.9% (SE 2.13) and cocaine 3.8% (SE 1.3) were the most frequently detected drugs in saliva. Among drivers who were going to drive, 11% had at least one drug identified by the saliva drug screening, 0.4% two, and 0.1% three drugs in addition to alcohol. In multivariable analyses, having a blood alcohol concentration (BAC) > 0.06% was found to be associated with a 3.64 times (CI 95% 1.79–7.39) higher chance of drug detection, compared with interviewees with lower BACs.
Conclusions: To drive under the influence of multiple substances is likely to be found in this setting, highlighting an association between harmful patterns of consume of alcohol and the misuse of other substances.

1. Introduction

Substance misuse is a major public health issue worldwide. Cannabis is by far the most widely used illicit drug, followed by amphetamines, opiates, and cocaine (UNODC, 2011). In the last ten years different studies have been assessing the consequences of drug (mis)use among drivers (Bernhoft et al., 2005; Elliott et al., 2009; Longo et al., 2000; Senna et al., 2010; Zhuo et al., 2010), especially in high-income countries, where a stabilization of the prevalence of driving under the influence of alcohol has been observed (Drummer et al., 2003; Gjerde et al., 2011).

Even though cannabis is the most prevalent drug found among drivers – and its prevalence seems to be increasing (Fergusson et al., 2008; Johnson et al., 2012), a recent study conducted in Australia by Chu et al. (2012) documented a 8% point prevalence for cocaine in 853 oral fluid samples collected from drivers, and Mura et al. reported high prevalences of both cocaine and amphetamines among injured drivers in a study carried out in France (Mura et al., 2006). Evidence on how every illicit drug affects, as well as their combined use, driving abilities remains far from comprehensive. Notwithstanding, most studies have found that combinations of illicit drug use and alcohol increase the risk of traffic accidents, as revised by Penning et al. (2010).

Brazil is the largest South American country and ranks fifth in terms of annual road absolute traffic deaths (around 36,000 in 2006), with 18 deaths per 100,000 inhabitants (WHO, 2009). The country has experiencing a fast economic growth and progressive motorization. Traffic accidents were estimated to be the fourth cause of premature death in 2010 (Institute for Health Metrics and Evaluation, 2012). General population data on the prevalence of alcohol related traffic deaths are far for complete and most results

* Corresponding author at: Oswaldo Cruz Foundation – FIOCRUZ, Biblioteca de Manguinhos Suite 229, Av. Brasil 4365, Rio de Janeiro 21045-900, Brazil.
E-mail address: raqueldeboni@msn.com (R.B. De Boni).

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come from local studies. For example, in a study conducted in São Paulo, 42.3% of fatal injured drivers blood samples had blood alcohol concentrations (BACs) above 0.6 g/L (de Carvalho Ponce et al., 2011). In another study, from Porto Alegre, alcohol was found in blood samples from 32.2% of the accident victims, whereas substances other than alcohol were found in about 11% of the samples (Stampe et al., 2010).

Impaired driving laws were changed in 2008, when a alcohol zero tolerance legislation was implemented, but enforcement of people driving under the influence of alcohol remains uneven and little regulation has been implemented in respect to other drugs (Pechansky and Chandran, 2012).

Studies with specific populations – such as truck drivers – have made evident high prevalences for amphetamines (Nascimento and Silva, 2007; Souza and Reimão, 2005) and cocaine (Leyton et al., 2012; Silva et al., 2003). Data from emergency rooms in Porto Alegre have documented a higher prevalence rate of cannabis/cocaine use than alcohol among injured drivers (De Boni et al., 2011). These high, combined, prevalences for different substances impose a complex challenge for policies aiming to reduce traffic-related deaths in Brazil.

Accordingly to the literature (Furr-Holden et al., 2006; Siliquini et al., 2010) and to our own empirical findings, driving after drinking is frequent among drivers who drunk on alcohol outlets (De Boni et al., 2012), and the distribution and characteristics of drivers who used cocaine and benzodiazepines markedly differ in high- and low-alcohol outlet concentration areas. The present paper estimates the combined use of alcohol and drugs among drivers, as well as assesses its associated factors.

2. Methods

This study is a post hoc exploratory analysis profiting from a probability three-stage sampling survey conducted in Porto Alegre, Southern Brazil. As described in detail elsewhere (De Boni et al., 2012), 3118 individuals who were leaving AO were approached, 683 met inclusion criteria and were interviewed. Inclusion criteria were as follows: to be 18 years or more, to live in Porto Alegre, to have driven a motor vehicle in the previous 12 months, and to have been drinking on the premises of an alcohol outlet (AO, used here to represent establishments where people can drink on premises, such as bars, restaurants, pubs, discos) at the time of interview. Refusal rate was 5.6% ($n = 41$). Data were collected between April and December 2009.

The following variables were analyzed in this manuscript:

High AO concentration areas were defined through Kernel density estimator, as described elsewhere (De Boni et al., 2013) and constituted one given geographic stratum in the sample design. Kernel estimation is a spatial smoothing method for point data used to detect "hot spots" of a given event of interest (Bailey and Gatrell, 1995).
Demographics were obtained with the application of a structured questionnaire. Driver destination was assessed through the question as follows: "Where are you going now?" and the answer was categorized as "home" (own, of family or friends), "work" (including school), and "bar, restaurant, party".
Intention to drive was assessed through the question as follows: "Are you going to drive in the next 60 minutes?"
DUI situations were assessed through the questions: "In the last 12 months, did you drive after drinking any alcohol beverage?" and "Have you ever been a passenger of a DUI driver in your lifetime?" and "Did you have any traffic crash (TC), which required any kind of medical assistance in your lifetime?"
Respondent opinion about the law (i.e. the legislation regulating DUI in Brazil, passed as a federal law in 2008; possible answers being: "in favor of", "against it", and "Does not know").
Alcohol abuse and/or dependence were assessed by "The Alcohol Use Disorders Identification Test" (AUDIT). The AUDIT score was dichotomized in under and over 8, since scores above 8 (eight) have been associated with harmful alcohol use (Babor et al., 2001).
Binge drinking in the previous year was evaluated by asking the question: "In the last year, did you drink 5 or more drinks (male) or 4 or more drinks (female) in about 2 h?" (NIAAA, 2004).
BAC was assessed using a calibrated breathalyzer (model ALCO-SENSOR IVTM, Intoximeters Inc., Devon, UK). BAC results were dichotomized as follows: below 0.06% and equal/above 0.06%. This is the cut-off for a criminal offense on DUI in the country (even though any positive concentration is considered an infraction).
Saliva samples: oral fluid samples were obtained using a collection device (QuantisalTM, Immunalysis Corporation, Pomona, CA, USA), which uses a pad placed between the subject's cheek and gum. After collecting 1 mL of oral fluid, the pad was transferred to a vial containing 3 mL of buffering solution, capped and labeled, and transferred to the laboratory using containers with temperature monitored at approximately 5 °C for no more than 2 days after sample collection. Samples were kept in the laboratory at −80 °C until analyzed. Due to budget constraints, cocaine and benzoylecgonine (BZE), tetrahydrocannabinol (THC) and benzodiazepines, the three most frequently used substances, as made evident by national surveys, were screened (CEBRID – Centro Brasileiro de Informação sobre Drogas Psicotrópicas, 2006). Ecstasy was also screened given the anecdotal reports of its increasing prevalence in the country in recent years (Pechansky and Remy et al., 2011). ELISA (Enzyme Linked Immuno Sorbent Assay) kits purchased from Immunalysis Corp. (Pomona, CA, USA) were used. Plate reading was conducted by spectrophotometer Anthos Zenyth 200rt (Wals, Austria). The tests were conducted following the recommendations of the manufacturer. Considering the recommended cut-offs of 50 ng/mL (BZE and benzodiazepines), 4 ng/mL (THC).

2.1. Ethical aspects

Informed consent was verbal, as approved by the IRB in charge of evaluating the study (HCPA IRB 06-012).

2.2. Data analysis

Analyses were performed with the help of R open source software, using its Survey library (Lumley, 2008, 2010). An object comprising sample design and weight calibration residuals was created to perform all subsequent analyses.

Prevalence and corresponding standard errors (SE) for those who had any positive drug testing or not were calculated using domain estimation (Cochran, 1977). Pearson's Chi-square homogeneity test with the Rao-Scott adjustment (Rao and Scott, 1984) was used to test the homogeneity of distributions across the two groups. Respecting calibration variables (for which the standard errors must be zero when using calibrated weights), test statistics were estimated using the design sample weights, based on the inverse of the probability to be included in the sample.

Two logistic regression models were fitted to data considering as outcome the use of any drug, besides alcohol. In Model 1, all variables with $p < 0.20$ in bivariate analysis were included. In model 2 variables that had been found to be significantly different in bivariate analysis comparing drivers who provided or not the saliva test were also included in the model.