Highly reported prevalence of drinking and driving in Brazil: data from the first representative household study

Alta prevalência relatada de beber e dirigir no Brasil: dados do primeiro estudo representativo realizado em domicílios

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Abstract

*Objective: Brazil lacks information about driving under the influence of alcohol (DUI) originated from representative samples obtained from the general population. **Method:** 333 subjects with a valid driver's license and drinking in the last 12 months were drawn from a multistaged sample of 2,346 adults from the first Brazilian Household Survey of Patterns of Alcohol Use. A multivariate analysis was conducted to understand the associations between risk factors and driving after drinking three or more drinks. **Results**: the overall DUI prevalence reported in the sample was 34.7% – 42.5% among males and 9.2% among females. Being male (OR = 6.0, 95% CI 2.9-12.6), having a previous DUI accident (OR = 7.9, 95% CI 2.5-24.9), binging in the last year (OR = 2.2, 95% CI 1.03-4.5) and having an unfavorable opinion towards policies (OR = 2.9, 95% CI 1.4-6.2) remained associated with heavy drinking and driving after model adjustments. **Discussion**: This was the first study evaluating driving under the influence of alcohol in a representative sample of the Brazilian population. The prevalence of DUI found is alarming, and possibly underestimated in the sample. Results demonstrate the need for more studies on this association and show directions towards preventive strategies for the specific high-risk group of male drivers with previous problems with alcohol and unfavorable opinions about prevention policies.*

Descriptors: Prevalence; Alcoholic beverages; Epidemiology; Risk factors; Brazil

Resumo

*Objetivo: O Brasil carece de informação sobre beber e dirigir a partir de amostras representativas da população. **Método:** Uma amostra de 2.346 adultos do I Levantamento Nacional Domiciliar sobre Padrões de Consumo de Álcool forneceu 333 indivíduos com carteira de motorista e que haviam bebido álcool nos últimos 12 meses. Utilizou-se análise multivariada para compreender associações entre fatores de risco e dirigir após três ou mais drinques. **Resultados:** A prevalência de beber e dirigir na amostra foi 34,7% - 42,5% nos homens e 9,2% nas mulheres. Ser homem (OR = 6,0; IC95% 2,9-12,6), ter tido acidente prévio com beber e dirigir (OR = 7,9; IC95% 2,5-24,9), ter tido "consumo excessivo episódico" no ultimo ano (OR = 2,2; IC95% 1,03-4,5) e ter uma opinião desfavorável sobre políticas públicas (OR = 2,9; IC95% 1,4-6,2) mantiveram-se associados com consumo pesado e dirigir após ajustes no modelo. **Discussão:** Este é o primeiro estudo que avalia beber e dirigir em uma amostra representativa da população brasileira. A prevalência de beber e dirigir encontrada é alarmante e possivelmente subestimada nesta amostra. Os achados demonstram a necessidade de outros estudos sobre esta associação, e dão indicações sobre possíveis estratégias preventivas para este grupo específico de motoristas masculinos com problemas prévios com álcool e opiniões desfavoráveis sobre políticas de prevenção.*

Descritores: Prevalência; Bebidas alcoólicas; Epidemiologia; Fatores de risco; Brasil

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Introduction

Most traffic-related deaths occur in developing countries, where it is estimated that alcohol is present in the blood of 33-69% of drivers involved in fatal accidents.[1] In 2005, there were 36,611 traffic fatalities in Brazil.[2] Numbers of such magnitude have been repetitive, since policies against drinking and driving have not been regularly enforced. Recently, the government has passed a "zero tolerance" law related to drinking and driving that still needs time to show the effects of its implementation.* Among Brazilian men between the ages of 15 and 34, traffic accidents are the second leading cause of death, only surpassed by homicides.[2-4]

Alcohol use is a strong predictor of traffic accidents, but there are few studies reporting on the prevalence of driving under the influence of alcohol (DUI) among Brazilian drivers. A recent roadside survey conducted in an industrial city in Brazil (Diadema, Sao Paulo), showed that 19.4% of drivers had a Blood Alcohol Concentration (BAC) over 0.06%, which until recently was the legal limit in Brazil.[5] Other studies in Brazil showed that knowledge about legislation and belief on its enforcement are low, as well as the subjects' risk perception for DUI.[6,7] Many factors have already been associated with DUI: being male,[8,9] being young (between 20 and 30 years of age),[8] having been a passenger of a DUI driver,[10-12] starting to drink at an early age,[13,14] binge drinking,[15-17] low perception of punishment[18-20] and low perception of the chances of being involved in a traffic accident.[21] The association between DUI and these predictors has not yet been systematically studied in Brazilian samples, and only few studies have been recently conducted. A pilot study was conducted in 2007 by De Boni et al. in a Brazilian state capital. Data showed that even after a restrictive law was passed about the selling of alcohol beverages in convenience stores of gas stations, subjects continued to drink and subsequently drive one month after the law had been passed.**

Some recent epidemiological reports suggest that alcohol use is increasing in Brazil, as well as early drinking among youth.[22] Data from the first Brazilian Household Survey of Patterns of Alcohol Use showed that 28% of the adult population had binged at least once in the last year, and 40% of men reported alcohol consumption in this manner.[23]

Based on the aforementioned facts, the aims of this paper are: 1) to describe reported DUI prevalence in a sample of Brazilian subjects with a valid driver's license and reported alcohol use; 2) to describe demographic characteristics and alcohol use patterns of this sample, and 3) to describe risk factors associated with DUI in this sample.

Method

This report is a partial analysis of the 1st Brazilian National Survey about Alcohol Use Patterns.*** Data were collected between November 2005 and April 2006 in 143 Brazilian cities. A total of 3,007 subjects, 14 years of age and older, were selected through a multistage area probability procedure, representing the Brazilian adult population, except for special populations such as native Brazilians, military and institutionalized individuals. These were individuals living in households in all Brazilian states, with

485 of them representing an over-sampling of teenagers. All respondents provided informed consent for the original study, which was approved by the Institutional Review Board of Universidade Federal de São Paulo. Further details of sampling methods and other methodological issues are out of the scope of this paper and can be provided upon request along with data provided by the 1st Brazilian National Survey about Alcohol Use Patterns***.

For the purpose of this analysis, the inclusion criteria were reported alcohol use at least once in the 12 months prior to the survey, as well as a valid driver's license. Of the original sample of 2,346 adults, 1,284 (54.7%) reported no alcohol use in the prior 12 months. This paper analyzed 1,152 subjects who reported drinking in the prior 12 months; of these subjects, 333 (28.9%) subjects had a valid driver's license and were included in the final logistic regression analysis.

1. Data collection

Data collection was done during face-to-face interviews. The interviews lasted for an average of 53 minutes and were conducted in the respondents' homes with standardized questionnaires by trained interviewers. The response rate was 66.4%. Refusals were higher among subjects of high socioeconomic status.

2. Measures

Outcome: DUI was defined as driving after having three or more drinks at least once in the prior 12 months.

Alcohol consumption: a modified version of the Cahalan and Cisin (1968) Volume-Variability (V-V) Index was used to classify respondent patterns of alcohol consumption. Respondents were asked about their consumption of wine, beer, liquor and "alcopops" in the 12 months prior to the survey.

Alcohol abuse and dependence: data to ascertain alcohol abuse or dependence were obtained from questions originated from the Composite International Diagnostic Interview-Substance (CIDI-SAM).[24]

Binge drinking: binge drinking was estimated as five or more drinks on one occasion for males and four or more for females. Questions were directly asked in the questionnaire.

Risk factors associated with DUI: these were obtained by means of the following questions:

- Drinking place: "Think about the most recent occasion when you drove after drinking three or more drinks. Where did you drink in that occasion? Please show in the respondent card the place that best describes where you drank (bar, a friend's house, relatives etc.)".

- Passenger of a drunk driver: "How many times have you been a passenger in a vehicle where the driver had drunk too much to drive?"

- Frequency of drunk driving accidents: "How many times have you been involved in a accident while driving after drinking?"

- Age of first drink: "How old were you when you started to drink alcoholic beverages? Please do not consider the times you drank only one or two sips".

- In the last 12 months, how many times have you driven after drinking at least three units of alcohol?

Sociodemographic characteristics: seven sociodemographic variables were included in the analyses: gender, age (dichotomized in up to 30 years old and older than 30 years), reported stable relation with a partner or spouse (yes/no), monthly household income (up to R$ 750,00 or higher – the equivalent of U$ 420), educational level (up to fourth grade, fifth to eighth grade, high school graduate, at least some college), employment status (working/not working) and macro-region of the country (south, southeast, western-central, northeast, north).

Opinion score: this was generated by the following questions: "A) a driver caught by the police after drinking three or more drinks should be sent to prison; B) a driver caught by the police after drinking three or more drinks should have his/her license suspended; C) a driver caught by the police after drinking three or more drinks should have to pay fines". Answers were dichotomized (positive if the answer was "in the majority of times" or "always", and negative if the answer was "never" or "in few or limited situations". Individuals with two or three positive responses were classified as having a "favorable opinion toward the policies"; individuals with zero or one positive response were classified as "unfavorable opinion"; favorable opinion was used as the reference category for analyses.

Punishment: to assess how subjects perceived the possibility of DUI punishment, the following question was asked: "If a person drives after having too much to drink, it is certain that a police officer is going to stop and arrest him/her." Answers were dichotomized (positive if the answer was "totally agree" or "partially agree", and negative if the answer was "don't agree" or "disagree".

3. Data analysis

Data were weighted to adjust for the probability of selection into the sample and non-response rates. Post-stratification weights were calculated to adjust the sample to known population distributions on certain demographic characteristics (sex, age and region of the country). To correct for clustering effects resulting from the multicluster sample design, all analyses were performed with the "complex samples" module from SPSS - version 13. Initially, bivariate analyses compared drivers and non-drivers in relation to demographic variables, frequency of alcohol used; binge drinking; passenger of a drunk driver; frequency of drunk driving accidents; age of first drink; alcohol abuse; alcohol dependence; favorable/unfavorable opinion score for policies; previous DUI accident and "having driven after drinking at least three units of alcohol". This comparison was made to evaluate whether subjects from the subsample were similar to the overall sample. The significance of the associations was tested through likelihood ratio tests.

When analyzing the outcome "driving after drinking three or more drinks", the variables were analyzed with regard to outcome in a logistic regression. Interactions were tested between gender and alcohol abuse or dependence ($p = 0.48$), gender and binge drinking ($p = 0.24$) and gender and previous DUI accident ($p = 0.17$). In a second step, variables with p-values below 0.20 were included in a logistic regression model. In order to avoid colinearity, we excluded variables which were highly correlated or associated among themselves (family income and years of schooling, and age of first drink and binge drinking). The variable chosen was the one most associated with the outcome or the one which made more sense based on the theoretical framework.

Results

The overall prevalence of DUI was 34.7% (42.5% among males, and 9.2% among females). The sample of 333 subjects with a valid driver's license comprised 238 (71.5%) men and 95 (28.5%) women, whose mean age was 40.3 ± 13.4 and 39.8 ± 12.1 years, respectively. It was initially compared to those without a driver's license. Those with a valid driver's license tended to be male, older, with higher schooling and income, and with higher employment rate. Also, there were more residents of the Southeast region of Brazil (Table 1). Subjects with a valid driver's license had a lower prevalence of alcohol abuse and dependence.

Table 2 shows bivariate analyses of demographic variables and those of behaviors related to alcohol use, as well the final model obtained through multivariate logistic regression analysis. Colinearity was avoided in the case of income and schooling – when income was excluded from the regression model, as well as with age of first drink and binge, when binge was kept in the final model. The perception of punishment and educational level were not associated with driving after three or more drinks. Being male, binging at least once, a previous DUI accident and an unfavorable opinion toward DUI policies are risk factors for driving after having three or more drinks.

Discussion

This is the first study that evaluates the prevalence of reported DUI and risk behaviors in a sample of drivers originated from a representative sample of the Brazilian adult population. There have been few prior studies about this topic in Brazil. That is particularly striking if one takes into account that the current Traffic Law has been implemented since 1997,[†] and general statistics from the Brazilian National Traffic Department about accidents and death have been steadily high since that period.[2][††] Numbers have consistently grown since 2003 until 2005 (33,000, 35,000, and 36,000, respectively). In this sense, the description of characteristics of individuals who have a driver's license, which *a priori* are the ones who are subject to drinking and driving, is an important epidemiologic tool. These data can help identify which type of population groups would potentially be targeted for focused preventive interventions. Even so, it is important to consider that many drivers in Brazil have no license whatsoever (either because of lack of enforcement or underage driving) or may have lost it due to DUI or other factors. There are no substantial data on this subject in Brazil, though.

When compared to individuals without a driver's license, drivers in the sample were mostly male, older, with higher schooling and employment rates, and more steady partners. They came mostly from the south and southeastern regions of Brazil. This is in agreement with data from the Brazilian National Traffic Department, where 71.5% of the licenses issued in 2006 belonged to males, and 79.5% of the drivers lived in those regions.[†††] It is important to consider that individuals from the higher socioeconomic strata had a higher level of refusal to participate in the study, which may generate a selection bias, even taking into account the adjustments made.

Table 1 - Comparison of individuals with a driver's license *vs*. the rest of the sample, excluding abstinent individuals (n = 1,152)

Variable		With driver's license (%) n = 333	Without driver's license (%) n = 819	P
Male		76.6	50.8	< 0.001
Age under 30 years		27.9	44.0	< 0.001
Education	≤ 4th grade	16.0	32.3	< 0.001
	5th-8th grade	17.3	31.7	
	High school incomplete/complete	38.6	29.8	
	College incomplete/complete	28.1	6.3	
Steady partner		68.4	55.1	0.001
Income up to R$ 750.00*		20.3	60.3	< 0.001
Employed or with steady work		85.3	67,7	< 0.001
Region	North	3.7	8.3	< 0.001
	Western-Central	8.1	0.9	
	Northeast	13.7	30.4	
	Southeast	51.6	38.5	
	South	22.9	17.3	
Binge	> 3x in the last 12 months	30.7	34.9	0.499
	≤ 2x in the last 12 months	18.5	16.6	
	Never	50.8	48.5	
Age of drinking onset	≥ 18	50.0	50.4	0.899
	16-17	25.5	26.6	
	≤ 15	24.5	23.0	
Alcohol abuse or dependence		14.3	25.3	0.001
Passenger of DUI driver		45.3	43.4	0.599
Other drugs		7.7	8.1	0.906

*R$ 750.00 = U$ 420. The minimum wage in Brazil is around U$ 230

With regard to variables related to drinking and driving, age of first drink, binge drinking, having been a passenger of a drunk driver, and use of other psychoactive substances were not different between groups; however, alcohol abuse and dependence were more frequently reported among the individuals who did not have a driver's license. Among the individuals with a driver's license, the prevalence of driving after drinking any amount of alcohol was of about one third, which is even higher than the figures found in the city of Diadema, São Paulo,[††] where 21.9% of the subjects were positively identified by means of an active breath test. It was also ten times higher than what was found on a phone survey in the U.S.[15] The prevalence of drinking three or more drinks in a small period of time (binging) was about one third for the respondents with a driver's license.

Although alarming, these figures may in fact be underestimated, since data were self-reported. It is likely that the high prevalence found contributes to the high mortality rates due to traffic accidents in Brazil – especially among male youngsters, particularly when associated with other risk factors. That direct effect cannot be objectively measured, since autopsy data about this association are only anecdotal in the country (regional studies show positive BACs in victims of accidents ranging from 15 to 45%).[4,25,26]

Logistic regression analyses showed that the factors associated with driving after drinking three or more alcohol drinks are similar to those found in other countries: being male, having binged at least once, and having previously been involved in a DUI accident. Even considering that the reporting only of previous accidents can already be considered a risk factor for DUI in the international literature, its prevalence and strength of association are highlighted in this study. They could be indicative of a chronic problem. This would make individuals repetitively exposed to this outcome, as

well as to other types of impulse control or psychiatric disorders not ascertained in this sample. However, even when controlled for abuse and dependence, individuals with previous accidents had a chance three times higher of having drunk more than three drinks and subsequently drive.

The relation between opinion scores about policies and the outcome drinking/driving also tends to favor the aforementioned association. Paradoxically, most (73.5%) of the sample was favorable to enforcement and punishment of offending drivers, which supposedly would generate a strong support of society in the implementation of preventive and punishment measures, leading to more successful interventions. As can be seen in Table 2, a negative "opinion score" (being unfavorable of enforcement and strict policies) seems to be a risk factor for driving after having drunk three or more drinks, as has been properly ascertained by Marin-León and Vizzotto in a study with graduate students, showing lower awareness in this specific risk group.[27] On the other hand, only 59.4% of the sample believed that laws against drinking and driving would be put into real practice and strongly enforced.

In summary, the group of males with previous alcohol problems – including binging in the last year and previous DUI accidents – who have an unfavorable opinion towards DUI policies, seems to have a higher odds of being associated with driving after drinking large amounts of alcohol. This is a special group of concern, as has been identified in different studies around the world,[8,9,28] and these data are confirmed in Brazil.

This study has some limitations that must be addressed: a) all data analyzed were self-reported, which might underestimate the prevalence found; specifically, previous studies conducted in Brazil did not draw their samples utilizing the same methodology, and, therefore, could not represent the overall characteristics of

Table 2 - Risk factors associated with driving after drinking three or more drinks (n = 333)

Variable*	Unadjusted OR (CI95%)**	p	Adjusted OR (CI95%)**	p	B	SE*** (CI95%)
Intercept				0.40	-2.49	0.44 (-3.37--1.61)
Age – 30 or lower	2.2 (1.2-4.2)	0.017	1.8 (0.8-3.7)	0.15	0.55	0.38 (-0.20-1.32)
Male gender	7.3 (3.5-15.2)	< 0.001	6.0 (2.9-12.6)	< 0.001	1.80	0.37 (1.06-2.53)
Educational level[#]		0.55	-	-	-	-
High school graduate, at least some college	1.5 (0.7-3.3)					
Fifth to eighth grade	1.2 (0.7-2.2)					
Up to fourth grade	1					
Alcohol abuse or dependence	5.4 (2.6-11.4)	< 0.001	2.6 (0.95-7.3)	0.06	0.97	0.51 (-0.05-1.98)
Binge drinking - at least once 12 months	3.7 (2.0-6.8)	< 0.001	2.2 (1.03-4.5)	0.04	0.77	0.37 (0.03-1.50)
Unfavorable opinion score toward the policies	3.3 (1.7-5.0)	< 0.001	2.9 (1.4-6.2)	< 0.01	-1.07	0.38 (-1.82- -0.31)
Perceived the possibility of DUI punishment[#]	0.9 (0.5-1.6)	0.640	-	-	-	-
Passenger of DUI driver	2.8 (1.6-4.9)	< 0.001	1.7 (0.8- 3.4)	0.15	0.52	0.36 (-0.19-1.24)
Previous DUI accident	13.1 (3.7-47.3)	< 0.001	7.9 (2.5- 24.9)	0.001	2.07	0.58 (0.93-3.22)

*Variables in bold remained significant after model adjustments; **Odds ratio (Confidence interval 95%); ***Standard error; [#]Variable not included in the model

the Brazilian population. Also, there is always underreporting when alcohol/drug consumption are obtained from face-to-face interviews from household samples; this means that all "true" data may be biased towards a lesser proportion overall. However, there is no methodological reason to believe that this underreporting was skewed towards a specific segment of the population; b) we are aware that the response rate of the original study where these data came from was lower than 70%, which might limit the generalization of the findings, even after the pertinent statistical corrections. However, response rates of 60% or above have been clearly accepted in studies of similar type in the international literature, as posed by an editorial by Caetano reviewing this issue.[29] Caetano et al. also showed that non-respondents were more likely to be drinkers than respondents in a large household analysis of 2,577 subjects originated from a population sample; this fact could have specific implications in this paper, since most refusals might have come from potential risky subjects (young drinkers, for example).[30]

However, the ultimate effect of this potential bias is the protection of the study factors, thus lowering the effect of the association between drinking and driving that has already been found; c) no inferences can be made on special populations (incarcerated subjects, military, native Brazilians), since these were not covered in the original sample. Even so, when taking into consideration the "epidemic" absence of data in the country, the original findings reported here may help foster a better understanding of this phenomenon in the Brazilian population. They may also lead to a better understanding of the complex associations between drinking, driving, and perception and implementation of laws related to DUI in Brazil.

Disclosures

Writing group member	Employment	Research grant[1]	Other research grant or medical continuous education[2]	Speaker's honoraria	Ownership interest	Consultant/ Advisory board	Other[3]
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*Modest
** Significant
*** Significant. Amounts given to the author's institution or to a colleague for research in which the author has participation, not directly to the author.
Note: UFRGS = Universidade Federal do Rio Grande do Sul; UNIFESP = Universidade Federal de São Paulo; UFSC = Universidade Federal de Santa Catarina; HCPA = Hospital de Clínicas de Porto Alegre; NIDA = National Institute of Drug Abuse; SENAD = Secretaria Nacional de Políticas sobre Drogas; FIPE/HCPA = Fundo de Incentivo à Pesquisa do Hospital de Clínicas de Porto Alegre; FAPESP = Fundação de Amparo a Pesquisa de São Paulo; NIAAA = National Institute on Alcohol Abuse and Alcoholism; CNPq = Conselho Nacional de Desenvolvimento Científico e Tecnológico.
For more information, see Instructions for authors.

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