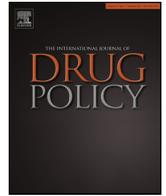




ELSEVIER

Contents lists available at ScienceDirect

International Journal of Drug Policy

journal homepage: www.elsevier.com/locate/drugpo

Research paper

Patterns of drinking and driving offenses among nightclub patrons in Brazil

Gabriela A. Wagner^{a,b,*}, Zila M. Sanchez^a^a Department of Preventive Medicine, Universidade Federal de São Paulo, Rua Botucatu, 740, 4^o andar, São Paulo, SP, Brazil^b Department of Physiological Sciences, Santa Casa School of Medical Sciences, R Cesário Motta Jr, 61, São Paulo, SP, Brazil

ARTICLE INFO

Article history:

Received 18 November 2016

Received in revised form 29 January 2017

Accepted 24 February 2017

Available online xxx

Keywords:

Drinking and driving

Nightclubs

Alcohol

Traffic law

Brazil

ABSTRACT

Background: Brazil has a strict drinking and driving law known as the Brazilian “Dry Law”. The aim of the present study was to investigate characteristics associated with the breaking of the Brazilian traffic law, on drinking and driving, at nightclub exit among a representative sample of nightclub patrons in the city of São Paulo, Brazil.

Methods: Portal survey realized with a two-stage cluster sampling survey design to collect data from 2422 patrons at the entrance and 1822 patrons at the exit of 31 nightclubs in the city of São Paulo, Brazil. Patrons’ breath alcohol concentrations (BrACs) at the entrance and exit of the nightclubs were categorized according to the law as either a “traffic offense” or a “traffic offense and crime”. Weighted multinomial logistic regression was used to analyze factors associated with different patterns of drinking and driving offenses.

Results: Of the subjects, 16.5% (n = 369) were identified as driving patrons at the entrance and exit of the nightclubs. At entry, 80.1% of the patrons had a zero BrAC, 14.9% had a BrAC meeting the traffic offense criteria and 5.0% had a BrAC meeting the traffic offense and crime criteria. Women were less likely to have BrACs meeting the traffic offense criteria. At nightclub exit, 63.4% of patrons had maintained a zero BrAC, 24.7% had a BrAC that had increased and now met the traffic offense and crime criteria, and 11.9% had a decreased or stable BrAC. An increased BrAC was more frequently identified in patrons who were men, were single, and had used illicit drugs inside the nightclub.

Conclusion: Despite the existence of a strict law regarding drinking and driving, a significant proportion of nightclub patrons in the city of São Paulo had violated this law, suggesting a perception of impunity and need for law enforcement.

© 2017 Elsevier B.V. All rights reserved.

Introduction

Alcohol consumption is a major component of the global burden of disease and a major risk factor for social damage, morbidity and mortality worldwide, especially in the Americas and Europe (WHO, 2014). Unintentional injuries have been found to be strongly associated with blood alcohol concentration and its effects on psychomotor abilities. Higher levels of alcohol ingestion have been reported to be associated with an exponential increase in the risk of several types of injuries, including fatal traffic accidents (Taylor et al., 2010).

Nightclubs and bars are places in which intensive consumption of alcohol and other drugs may occur (Calafat et al., 2011). A study conducted in nine European countries found that 40% of nightclub patrons had driven under the influence of alcohol or other drugs during the past month (Calafat et al., 2009). However, little attention has been paid to the role of these environments as high-risk locations for alcohol abuse and behaviors occurring as a result of abusing alcohol, such as drinking and driving. According to Gruenewald, Stockwell, Beel, and Dyskin (1999), it may be more common to identify people who engage in drinking and driving in the vicinity of nightclubs than in other locations in which alcoholic beverage are sold (Gruenewald et al., 1999).

In Brazil, most fatal motor vehicle accidents have been found to occur at dawn during the weekends, which is the moment when many patrons are leaving nightclubs to return to their houses (Ponce, Munoz, Andreuccetti, de Carvalho, & Leyton, 2011). According to a nationally representative household survey, 42% of men who drove during the year preceding the survey stated that

* Corresponding author at: Department of Physiological Sciences, Santa Casa School of Medical Sciences, R Cesário Motta Jr, 61, São Paulo, SP, Brazil.

E-mail addresses: gabrielaaw@usp.br, gabriela.wagner@gmail.com (G.A. Wagner).

they drove at least once under the influence of alcohol. In this sample, binge drinking was found to be associated with drinking and driving (Pechansky et al., 2009).

On the other hand, Brazil has one of the strictest drinking and driving laws, known in Brazil as the “Dry Law”, which was first implemented in 2008 (law 11.705) and then modified in 2012 (law 12.760) and 2013 (resolution #432) (*Resolução n° 432, de 23 de janeiro de, 2013*). The law states that any presence of alcohol in the breath or blood of drivers is not accepted throughout the country. According to Resolution #432, passed January 23, 2013, a breath alcohol concentration between 0.05–0.33 mg/l is defined as a “traffic offense” and ≥ 0.34 mg/l is defined as a “traffic offense and crime”, with punishments ranging from expensive fines to prison. This extremely strict law arose from a demand for governmental action to cope with the excess in traffic-related fatalities that had been identified in the country. As a result, in the years after the implementation of the law, there has been a general reduction in episodes of drinking and driving in most state capitals. However, in São Paulo, the largest city in Latin America, a similar reduction has not occurred and an increase in the rate of drinking and driving among women was identified (Malta et al., 2014).

Considering that nightclubs have been identified as environments in which the practice of binge drinking occurs (Lomba, Apostolo, & Mendes, 2009), and that drinking and driving has been targeted as the major risk behavior practiced just after leaving these establishments (Sanchez, Ribeiro, & Wagner, 2015), it is necessary to understand the profile of patrons that continue to engage in this risk behavior, even with the possibility of being severely punished by law.

Therefore, the aim of the present study was to investigate characteristics associated with the breaking of the Brazilian traffic law, on drinking and driving, at nightclub exit among a representative sample of nightclub patrons in the city of São Paulo, Brazil.

Methods

Sample and procedures

This was a portal survey with the inclusion of 369 driving patrons constituting a population-based representative sample of Brazilian nightclub patrons in the megacity of São Paulo, Brazil (“*Balada com Ciência*” portal survey study). Data collection took place from January to July 2013, mainly on Friday, Saturday and Sunday nights ($n = 26$, 8% of the nightclubs), from 11 pm to 7 am, at each day.

This study used a 2-stage cluster sampling portal survey. The first stage consisted of identifying a systematic sample of nightclubs using a selection probability proportional to the nightclub’s maximum capacity. The second stage consisted of completing systematic sampling of every third person in the entrance line of the selected nightclubs.

A target sample size of 1600 patrons was calculated by considering an absolute precision of 5%, a confidence interval (CI) of 95%, the use of 2-stage cluster sampling and a design effect of (Lwanga & Lemeshow, 1991). Given a possible refusal rate of 30% and a maximum loss to follow-up from entrance to exit of 40% (Clapp et al., 2007), it was determined that a total of 2912 patrons should be approached. A total of 3063 approaches were completed at the 31 nightclubs that participated in the study, and 2422 interviews (79.1% rate of acceptance among respondents at the time of nightclub entry) were performed. Of the young people who agreed to participate at the time of nightclub entry, 1833 were also interviewed at the time of nightclub exit (76% completed the follow-up interview). Details regarding the sample selection procedure used in the nightclubs have been presented by Carlini

et al. (2014) and Santos, Paes, Sanudo, Andreoni, and Sanchez (2015).

The Research Ethics Committee of the Universidade Federal de São Paulo (protocol 21477) approved this study. No interviews were conducted with patrons showing signs of severe intoxication, following the guidelines for screening described by (Perham, Moore, Shepherd, & Cusens, 2007).

Measures

Patrons participated in entrance and exit survey interviews and completed a breathalyzer test after each interview (calibrated Dräger Alcotest 7410 plus, Germany). They received a bracelet with a unique code to identify them at the nightclub exit. Seven field researchers used Samsung Galaxy Tablets (Manaus, Brazil) to collect the interview data, and data were sent to a central database in real time.

Breath Alcohol Concentration (BrAC) and Brazilian law

Brazilian Resolution No. 432, passed January 23, 2013, defines the procedures to be adopted by transit authorities and their agents when monitoring the consumption of alcohol or other psychoactive substances to determine criminal sanctions according to the Brazilian Traffic Code (CTB). Drivers with a BrAC from 0.05 to 0.33 mg/l are cited with a “traffic offense” and issued administrative penalties, including losing the right to drive, financial penalties and retention of vehicles and licensing documentation. Drivers detected to have a BrAC ≥ 0.34 mg/l are cited for a “traffic offense and crime”, prosecuted as criminals and suffer penalties including detention (six months to three years of imprisonment), financial penalties and suspension of the right to drive motor vehicles. For the analyzes described in this article, patron BrAC was categorized according to this resolution and then classified as: *zero BrAC* (≤ 0.04 mg/l), *traffic offense* (0.05–0.33 mg/l) or *traffic offense and crime* (≥ 0.34 mg/l).

Outcome measure: drinking and driving offense

The outcome measure was created based on two variables: BrAC and self-reported driving. Only self-reported drivers were included in these analyses. Changes in BrAC measures from entrance to exit were estimated in 3 groups of driving patrons: (1) individuals who remained at “zero BrAC” (zero at entrance and zero at exit), (2) individuals with an “increased BrAC” (“zero BrAC” or “traffic offense” at entrance and “traffic offense and crime” at exit) and (3) individuals with a “decreasing/stable BrAC”, or those who remained at the “traffic offense” level or had a decreased BrAC at exit when compared to the BrAC measured at entry.

Covariates under investigation: individual and social environment characteristics

The following variables collected during the entrance interview were analyzed: sex (male/female); age range (18–24 years, 25–34 years, 35–44 years, 45+ years), marital status (single, other), and education (high school, some college, college graduate). The “type of nightclub” was classified by musical style and categorized into eclectic/pop–rock (plays several musical styles on the same night), electronic, funk/hip-hop, or forró/zouk according to the type of music played in the nightclub, and this categorization was recorded by field staff during data collection (Sañudo, Andreoni, & Sanchez, 2015). The variable “illicit drug use inside nightclub” included a self-report of at least one of the following substances: marijuana or hashish, cocaine, ecstasy, tobacco, crack, inhalants, ketamine,

methamphetamine, other amphetamines, benzodiazepines or hallucinogens (such as LSD, magic mushrooms and peyote).

Statistical analysis

Descriptive analyses were carried out on the individual and social environment characteristics and BrAC concentration categorized according to Brazilian law at nightclub entry (baseline). Comparisons were made using the Pearson's chi-square (χ^2) test with the Rao–Scott correction (Rao & Scott, 1987). The analyses incorporated weights to correct for the different selection probabilities of the participants, and the results are expressed as weighted values. All p-values <0.050 were considered statistically significant. The survey (svy) package in Stata version 12 was used for analyses, which offers procedures for the analysis of complex sample data, allows for the incorporation of the different weights of observations that may influence the parameter estimates of the total population and considers the effect of sampling on the variance estimates.

Multinomial logistic regression was used for 2 analyses: (1) factors associated with meeting the BrAC criteria for drinking and driving offenses at baseline (nightclub entry) and (2) factors associated with changes in meeting drinking and driving offense criteria according to BrAC measured at nightclub entry and exit among drivers. The reference category for the analyses was zero BrAC. Associations with a p-value <0.20 in the univariate analyses were incorporated into the multinomial logistic regression using forward selection. The magnitude of the associations was estimated using odds ratios and their respective 95% confidence intervals. Nonsignificant variables were excluded if there was not a change of greater than 10% in the other estimated parameters upon their exclusion.

Results

Of the 2422 patrons interviewed at the entrance of the 31 selected nightclubs in the city of São Paulo, 35.5% (n = 869) were passengers; 25.0% (n = 602) arrived by bus; 12.1% (n = 297) arrived by taxi; 4.5% (n = 105) arrived in another way but did not drive (walking, bicycle, metro); 0.4% (n = 9) arrived by motorcycle and 22.4% (n = 520) were driving patrons (20 missing data). During follow-up at nightclub exit of the 520 patrons that reported driving at nightclub entry, 71.0% (n = 369) reported intention to drive and 29.0% (n = 151) reported not intending to drive at nightclub exit.

The focus of the present study was on the 369 patrons that drove to and from the nightclub on the night of the survey. These patrons were primarily adults (25–34 years old), single, of middle to high socioeconomic status and college graduates. BrAC levels at nightclub entry were detected, and 80.1% of patrons had a zero BrAC, 14.9% had a BrAC meeting the traffic offense criteria and 5.0% has a BrAC meeting the traffic offense and crime criteria. The individual and social environment characteristics of the driving patrons were compared according to their BrAC at the nightclub entrance, as shown in Table 1. The BrAC groups [zero BrAC, traffic offense; traffic offense and crime] only differed by sex (p < 0.001). However, an association was observed between education and tested BrAC level, however the relationship is not statistically significant (p = 0.072). (Table 1).

In the multinomial logistic regression analyses using zero BrAC patrons as the reference group, women were significantly less likely to meet the BrAC criteria for a traffic offense in the unadjusted model (OR = 0.09; 95%CI 0.02–0.35) and after adjusting for education and type of nightclub (OR = 0.09; 95%CI = 0.02–0.33). Meeting the BrAC criteria for a traffic offense and crime was only inversely associated with having a college education (OR = 0.33; 95%CI = 0.12–0.98) in the unadjusted model (Table 2).

Table 1
Distribution of baseline characteristics by BrAC level classified according to the Brazilian drinking and driving law at the entrance of the nightclub among driving patrons in São Paulo, Brazil – “Balada com Ciência” portal survey (N = 369).

		Total (n = 369) wt%(95%CI)	Zero BrAC ^{a,b} (n = 282) wt%(95%CI)	Traffic offense ^{a,b} (n = 61) wt%(95%CI)	Traffic offense and crime ^{a,b} (n = 22) wt%(95%CI)	p-Value ^c
Sex	Male	100.0	80.1(71.2–86.8)	14.9(10.1–21.5)	5.0(2.3–10.5)	<0.001
	Female	67.3(54.7–77.8) 32.7(22.2–45.3)	72.9(36.9–80.4) 94.8(84.1–98.5)	21.0(15.1–28.3) 2.5(10.1–21.5)	6.1(3.0–11.9) 2.7(2.3–10.5)	
Age	18–24 years	24.4(16.5–34.4)	73.8(62.3–82.8)	17.5(9.8–29.1)	8.7(3.1–21.6)	0.563
	25–34 years	49.4(39.5–59.4)	81.8(70.0–89.5)	14.3(8.3–23.6)	3.9(1.4–10.3)	
	35–44 years	18.0(11.9–26.2)	83.7(66.0–93.1)	14.3(6.0–30.1)	2.0(0.4–9.8)	
	45+ years	8.2(3.9–16.6)	81.0(59.5–92.4)	12.0(4.3–29.0)	7.0(1.6–25.7)	
Marital status	Single	79.4(70.0–86.4)	78.6(68.8–85.8)	15.8(10.4–23.1)	5.7(2.6–11.9)	0.265
	Other	20.6(13.6–30.0)	85.9(75.2–92.4)	11.8(6.1–21.3)	2.3(0.4–10.6)	
Education	High school	37.5(29.2–46.6)	74.7(65.2–82.3)	17.8(11.4–26.6)	7.5(3.8–14.0)	0.072
	Some college	46.6(40.6–52.7)	81.9(71.6–88.9)	15.4(9.5–23.7)	2.8(0.9–7.8)	
	College graduate	15.9(11.9–20.9)	90.4(75.2–96.6)	7.6(2.3–21.7)	2.0(0.2–15.5)	
Type of nightclub	Eclectic/Pop–rock	43.1(22.6–68.6)	77.9(67.4–85.7)	17.5(10.5–27.7)	4.6(1.3–14.7)	0.168
	Electronic	27.1(8.1–45.2)	76.4(55.0–89.5)	13.0(6.6–23.7)	10.3(3.8–26.4)	
	Funk/Hip-hop	5.4(1.1–11.8)	62.3(35.7–83.0)	33.2(14.8–58.6)	4.4(0.6–23.8)	
	Forró/Zouk	24.4(10.0–62.2)	88.3(72.3–95.5)	10.3(4.3–22.2)	1.5(0.2–8.6)	
Illicit drug use inside the nightclub ^d	Yes	20.4(13.8–29.1)	76.2(61.4–86.5)	19.1(10.8–31.5)	4.7(1.2–15.9)	0.543

^a Weighted proportions (data were weighted to be representative of the nightclubs in São Paulo, Brazil).

^b Drivers' breath alcohol concentration (BrAC) classified according to Resolution No. 432, passed January 23, 2013: traffic offense (0.05–0.33 mg/l) and traffic offense and crime (≥ 0.34 mg/l).

^c Rao–Scott chi-square test.

^d Illicit drug use inside the nightclub included the use of at least one of the following substances: marijuana or hashish, cocaine, ecstasy, tobacco, crack, inhalants, ketamine, methamphetamine, other amphetamines, benzodiazepines or hallucinogens (such as LSD, mushrooms and peyote).

Table 2

Association between sociodemographic characteristics, nightclub type and BrAC level classified according to the Brazilian drinking and driving law at the **entrance of the nightclub** among driving patrons in São Paulo, Brazil – “Balada com Ciência” portal survey (N = 369).

		Traffic offense ^{a,b,c}				Traffic offense and crime ^{a,b,c}			
		UnOR(95%CI)	p-Value	AdOR(95%CI)	p-Value	UnOR(95%CI)	p-Value	AdOR(95%CI)	p-Value
Sex	Male	1		1		1		1	
	Female	0.09(0.02–0.35)	0.001	0.09(0.02–0.33)	0.001	0.34(0.04–1.40)	0.128	0.69(0.15–3.07)	0.604
Education	High school	1		1		1		1	
	Some college	0.78(0.42–1.46)	0.439	0.95(0.48–1.86)	0.890	0.33(0.12–0.98)	0.047	0.40(0.12–1.29)	0.121
	College graduate	0.35(0.10–1.17)	0.087	0.50(0.15–1.62)	0.240	0.22(0.03–1.65)	0.137	0.28(0.04–2.29)	0.229
Type of nightclub	Eclectic/Pop-rock	1		1		1		1	
	Electronic	0.75(0.26–2.13)	0.583	0.58(0.250–1.67)	0.304	2.37(0.40–13.83)	0.323	2.84(0.56–14.30)	0.197
	Funk/Hip-hop	2.37(0.68–8.22)	0.166	2.03(0.44–9.33)	0.348	1.21(0.11–13.44)	0.871	1.15(0.09–13.98)	0.908
	Forró/Zouk	0.51(0.17–1.57)	0.236	0.66(0.24–1.86)	0.427	0.28(0.03–2.91)	0.281	0.44(0.05–3.74)	0.446

UnOR = Unadjusted odds ratio.

AdOR = Adjusted odds ratio.

^b Drivers' breath alcohol concentration (BrAC) classified according to Resolution No. 432, passed January 23, 2013; traffic offense (0.05–0.33 mg/l) and traffic offense and Crime (≥ 0.34 mg/l).

^a Weighted proportions (data were weighted to be representative of the nightclubs in São Paulo, Brazil).

^c Multinomial logistic regression with zero BrAC patrons as the reference group.

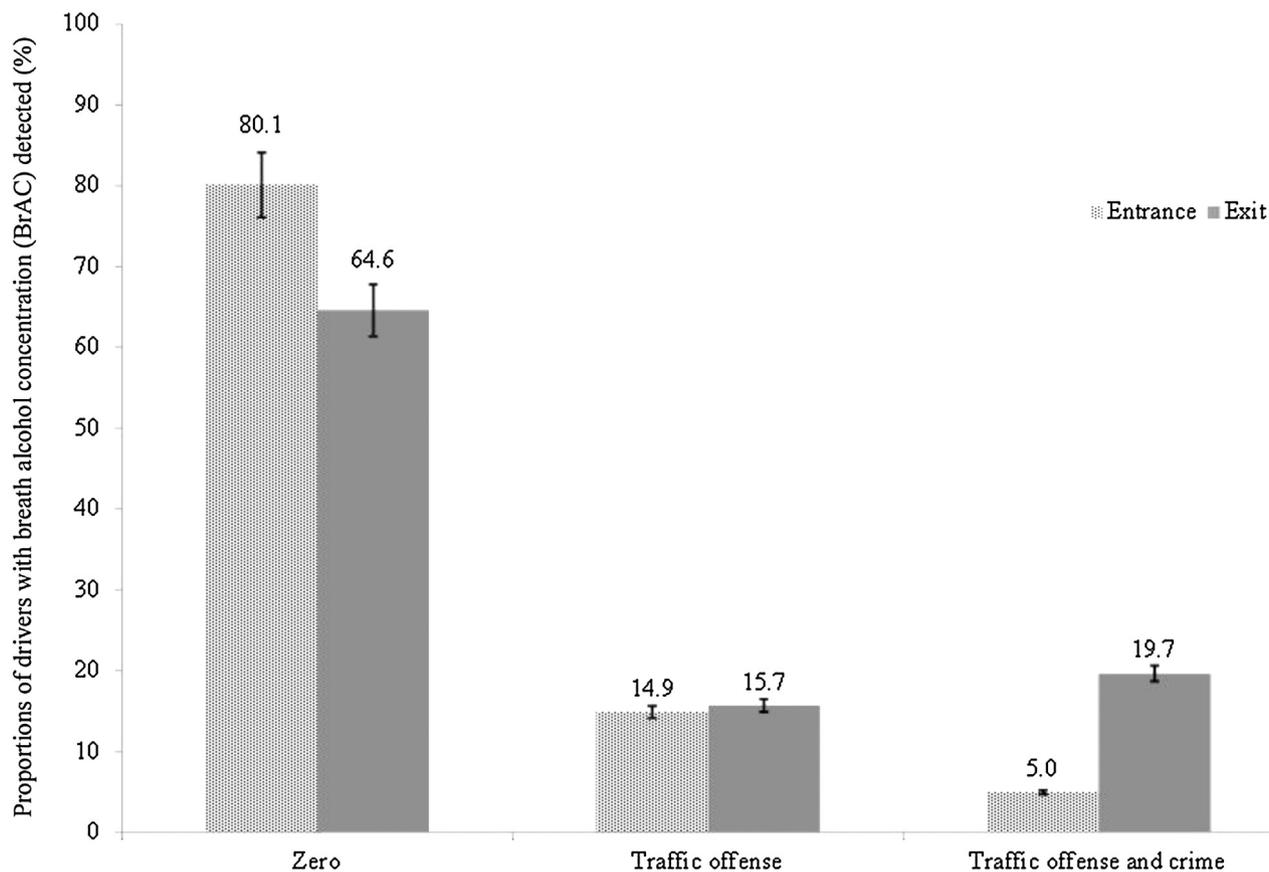


Fig. 1. Proportions of drivers with breath alcohol concentration (BrAC) detected in categories defined according to Resolution No. 432, passed January 23, 2013—traffic offense (0.05–0.33 mg/l) and traffic offense and crime (≥ 0.34 mg/l) – at entrance and at the exit of the nightclub among patrons in São Paulo, Brazil – “Balada com Ciência” portal survey (N = 369).

Of the driving patrons, 63.4% maintained a zero BrAC, 24.7% had a BrAC that increased to meet the traffic offense and crime criteria, and 11.9% had a decreased or stable BrAC. Fig. 1 illustrates the significant differences identified in BrACs detected at nightclub entry and exit ($p < 0.001$). An increase in the proportion of patrons with a BrAC meeting the traffic offense and crime criteria (5.0% at

entrance versus 19.7% at exit), increase in the proportion of patrons with a BrAC meeting the traffic offense criteria (14.9% at entrance versus 15.7% at exit) and decrease in the proportion of patrons with a zero BrAC (80.1% at entrance versus 64.6% at exit) were identified.

Table 3 shows the changes in patron BrAC from nightclub entrance to exit according to baseline characteristics. The

Table 3
Weighted distribution of sociodemographic characteristics, nightclub type and illicit drug use inside the nightclub in categories defined according to Brazilian law and evaluated based on changes in the BrAC detected at the exit of the nightclub and the entrance of the nightclub among driving patrons in São Paulo, Brazil – “Balada com Ciência” portal survey (N = 369).

		Changes in BrAC detected at the exit and at the entrance of the nightclub			p-Value ^d
		Zero BrAC ^{a,c} (n = 217) wt%(95%CI)	Increasing BrAC ^{a,c} (n = 100) wt%(95%CI)	Decreasing/Stable BrAC ^{a,c} (n = 52) wt%(95%CI)	
Sex	Male	55.5(46.0–64.5)	28.4(20.6–37.7)	16.1(11.4–22.4)	0.005
	Female	79.6(61.6–90.4)	17.2(8.3–32.3)	3.2(0.7–12.6)	
Age	18–24 years	58.4(49.3–66.8)	23.9(16.0–33.9)	17.7(10.3–28.6)	0.180
	25–34 years	62.0(46.1–75.7)	29.0(18.1–42.7)	9.0(4.8–16.1)	
	35–44 years	67.5(47.9–82.4)	23.0(11.9–39.5)	9.5(3.3–24.2)	
	45+ years	77.0(55.7–89.8)	5.8(1.3–21.5)	17.2(6.5–38.2)	
Marital status	Single	60.5(49.4–70.6)	26.6(19.0–35.9)	12.9(8.1–19.5)	0.052
	Other	74.9(61.9–84.6)	16.7(8.4–30.4)	8.4(4.0–16.3)	
Education	High school	55.8(48.0–63.3)	30.0(22.7–38.4)	14.2(8.8–21.9)	0.154
	Some college	67.6(52.7–79.5)	21.7(12.1–35.6)	10.7(6.9–16.2)	
	College graduate	70.6(54.4–82.9)	22.5(12.7–36.5)	6.8(2.1–19.3)	
Type of nightclub	Eclectic/Pop-rock	59.8(51.0–68.0)	29.1(19.9–40.2)	11.1(6.2–18.7)	0.123
	Electronic	56.7(39.2–70.9)	27.6(20.7–35.7)	16.7(6.3–37.1)	
	Funk/Hip-hop	38.8(24.6–55.0)	47.0(29.4–65.2)	14.2(5.6–31.4)	
	Fórró/Zouk	77.2(55.1–90.3)	13.5(5.1–30.9)	9.3(4.7–17.3)	
Illicit drug use inside the nightclub ^b	Yes	52.5(40.1–64.6)	37.7(26.6–50.2)	9.7(3.9–22.1)	0.032
	Total	63.4(52.3–73.1)	24.7(17.2–34.2)	11.9(7.8–17.6)	

^a Weighted proportions (data were weighted to be representative of the nightclubs in São Paulo, Brazil).

^b Illicit drug use inside the nightclub included the use of at least one of the following substances: marijuana or hashish, cocaine, ecstasy, tobacco, crack, inhalants, ketamine, methamphetamine, other amphetamines, benzodiazepines or hallucinogens (such as LSD, mushrooms and peyote).

^c Drivers' breath alcohol concentration at the nightclub exit in relation to their BrAC at nightclub entry.

^d Rao-Scott chi-square test.

chi-square test reveals differences of gender and illicit drug use among the three groups of patrons (Table 3). The associations between changes in BrAC and baseline characteristics in the final multinomial logistic regression using zero BrAC patrons as reference group are shown in Table 4. Having an increased BrAC was negatively associated with female gender and having a marital status other than single (married or widowed) and positively associated with being interviewed at a funk/hip-hop type of

nightclub and illicit drug use inside the nightclub in the unadjusted model. After controlling for all variables, only illicit drug use inside the nightclub was positively associated with increased BrAC. Driving patrons who reported the use of illicit drugs inside the venue had 90% greater odds of having an increased BrAC measured when exiting the nightclub. Having a decreased or stable BrAC was inversely associated with sex: women had 85% lower odds of having a decreased BrAC at nightclub exit (Table 4).

Table 4
Association between having a BrAC that changed from nightclub entry to exit according to baseline characteristics among driving patrons in São Paulo, Brazil – “Balada com Ciência” portal survey (N = 369).

		Increasing BrAC ^c		Decreasing/Stable BrAC ^c					
		UnOR(95%CI)	p-Value	AdOR(95%CI)	p-Value	UnOR(95%CI)	p-Value	AdOR(95%CI)	p-Value
Sex	Male	1		1		1		1	
	Female	0.42(0.20–0.94)	0.037	0.51(0.23–1.10)	0.084	0.14(0.03–0.63)	0.012	0.15(0.04–0.66)	0.014
Marital status	Single	1		1		1		1	
	Other	0.50(0.26–0.96)	0.038	0.57(0.29–1.11)	0.101	0.52(0.22–1.22)	0.130	0.56(0.21–1.50)	0.238
Type of nightclub	Eclectic/Pop-rock	1		1		1		1	
	Electronic	1.01(0.52–1.99)	0.953	0.73(0.35–1.60)	0.430	1.62(0.44–5.97)	0.453	1.37(0.40–4.68)	0.605
	Funk/Hip-hop	2.50(1.02–6.06)	0.045	2.36(0.78–7.10)	0.121	1.98(0.62–6.30)	0.233	2.11(0.42–10.64)	0.351
	Fórró/Zouk	0.36(0.10–1.23)	0.102	0.45(0.13–1.50)	0.188	0.64(0.23–1.84)	0.405	0.94(0.35–2.53)	0.910
Illicit drug use inside nightclub ^b	No	1		1		1		1	
	Yes	2.15(1.18–3.92)	0.014	1.91(1.04–3.52)	0.037	1.00(0.41–2.41)	0.993	0.76(0.32–1.80)	0.528

Multinomial logistic regression with zero BrAC patrons as the reference group.

UnOR = Unadjusted odds ratio.

AdOR = Adjusted odds ratio.

^b Illicit drug use inside the nightclub included the use of at least one of the following substances: marijuana or hashish, cocaine, ecstasy, tobacco, crack, inhalants, ketamine, methamphetamine, other amphetamines, benzodiazepines or hallucinogens (such as LSD, mushrooms and peyote).

^c BrAC at nightclub exit in relation to BrAC at nightclub entry.

Discussion

Our results demonstrated that 16.5% ($n = 369$) of interviewed subjects were driving patrons at nightclub entry and exit. At the entrance, the patrons reported that they have drove to the venue and at the exit, they reported the intention to drive just after the interview. These patrons were primarily adults (25–34 years old), single, of middle to high socioeconomic status and college graduates. At entry, 80.1% had a zero BrAC, 14.9% had a BrAC meeting the “traffic offense” criteria and 5.0% had a BrAC meeting the “traffic offense and crime” criteria according to Brazilian legislation. Among these patrons, meeting the traffic offense criteria was negatively associated with female gender. At nightclub exit, 63.4% of patrons had maintained a zero BrAC, 24.7% had a BrAC that had increased and now met the traffic offense and crime criteria, and 11.9% had a decreased or stable BrAC. An increased BrAC was more frequently identified patrons who were men, were single, and had used illicit drugs inside the nightclub.

We highlight the finding that intention to drive was generally associated with a low BrAC, which was supported by the high prevalence of drivers with a “zero BrAC” in the sample. Similar findings have been reported by [Martin, Chaney, and Cremeens-Matthews \(2015\)](#) in a study conducted among college students in the USA. However, at baseline, approximately 20% of patrons entered the nightclub with a detectable alcohol concentration according to Brazilian law. Noteworthy is the fact that these patrons were driving under the influence of alcohol. This may reflect two situations. The first situation, in which young people have a perception of impunity in this context, would indicate that patrons believed that they would not be captured by alcohol or drug breathing tests while driving on the streets, and the second situation would suggest that these individuals underestimated their breath alcohol concentration. It has been reported that the enforcement of more restrictive laws in certain locations may cause young people to have a greater concern regarding their blood or breath alcohol concentration [Martin, Chaney, Cremeens-Matthews, and Vail-Smith \(2016\)](#), which may be reflected in a decrease in the prevalence of drunk drivers ([Xuan et al., 2015](#)). According to [Martin et al. \(2016\)](#), women under the age of 21 years were identified to be the population most likely to underestimate their blood alcohol concentration; however, this finding not supported by our results because neither female gender nor younger age were identified as risk factors for drinking and driving.

Female gender was identified as a protective factor for having a high BrAC among drivers, which was reflected by the maintained or decreased alcohol concentrations frequently identified in women at nightclub exit. Although men have been reported to usually drink more than women ([Holmila & Raitasalo 2005](#); [Kuntsche, Rehm, & Gmel, 2004](#)) gender differences in alcohol consumption represent a universal phenomenon of concern ([Wilsnack, Wilsnack, & Obot, 2005](#)). Several studies have shown that male drivers were more likely to be involved in traffic accidents when they imbibed any amount of alcohol and decided to drive, especially during nights and on weekends. Similar findings have not been reported in women ([Hingson & Winter, 2003](#); [Horwood & Fergusson, 2000](#)). A study conducted by the Forensic Medicine Institute of São Paulo on alcohol consumption and traffic accidents revealed that of the 907 accident victims studied, the majority (79.6%) involved males, and high BACs were more frequently detected in men (44.7%) than women (18.4%). It has also been reported that half of traffic accidents were associated with bars and parties and occurred during the period between midnight and six in the morning on weekends ([Ponce et al., 2011](#)).

In this study, it was identified that 24.7% of patrons had a BrAC that had increased from nightclub entrance to exit; this finding was particularly common in patrons that were men, were single and

had used drugs inside the nightclubs. Similar behavioral patterns have been observed in other countries, such as Australia, where a study evaluating blood alcohol concentrations (BACs) measured at nightclub exit identified that a higher proportion of drunk drivers were men, were office workers, had engaged in pre-drinking and had used drugs inside the venues ([Curtis et al., 2016](#)). Even in Brazil, a national sample showed that a higher prevalence of drinking and driving was identified in men, those who had engaged in binge drinking during the past 12 months and those who had unfavorable opinions about driving laws and public policies ([Pechansky et al., 2009](#)). Moreover, fatal traffic accidents in Brazil have been reported to be more prevalent among men aged 25 years and persons with a higher BAC ([Ponce et al., 2011](#)), suggesting that the group at risk for increased BrACs at nightclub exit may be similar to the group that is more frequently involved in fatal car crashes in Brazil.

It is known that in Brazil, in spite of the existence of a law strictly defining a BrAC of <0.05 mg/l for driving, this law is often not enforced ([Bulletin of the World Health Organization, 2011](#)), which may be observed in the fact that, in this study, there was a higher prevalence of drivers with increased alcohol concentrations compared to those whose alcohol concentrations remained stable or decreased. A systematic review published in 2008 including 32 studies showed strong evidence of an association between increased law enforcement and a reduction in the occurrence of adverse consequences, such as drinking and driving, in several countries ([Goss et al., 2008](#)).

Among patrons, drug use inside the nightclub was associated with greater odds of having a BrAC that had increased from nightclub entrance to exit. An association between increased alcohol use and increased illicit drug use has been reported in other studies, which may contribute to the occurrence of fatal accidents. A study conducted by [Romano, Torres-Saavedra, Voas, and Lacey \(2014\)](#) that assessed whether sober individuals who tested positive for drugs had a higher risk of being involved in traffic accidents found that, despite both alcohol and drug use, alcohol remained the major cause of traffic accidents. However, one of the major concerns regarding the association between alcohol and other drug use is that the effects of individual drugs are usually compounded and harmful physiological effects can accumulate in the body, increasing the likelihood of physical and physiological damage ([Smith, Farrell, Bunting, Houston, & Shevlin, 2011](#)). In Brazil, in an attempt to confront the issue of polydrug use by drivers, Federal Law 13,103/15, passed in 2016, required the completion of drug testing by professional drivers of trucks, trailers and buses. These testing regulations did not, however, apply to car drivers. In that sense, car drivers may only be tested to alcohol use and may feel safe engaging in illicit drug use and driving behaviors.

Moreover, owners of Brazilian nightclubs may be unprepared to control alcohol sales, such as the prohibition of alcohol sales to intoxicated individuals within their establishments. Ideally, Brazilian law should limit alcohol intoxication among patrons by controlling sales. According to [Rammohan et al. \(2014\)](#), the delegation of this responsibility to an establishment may result in a reduction in the average number fatal accidents caused by alcohol consumption. Therefore, the adoption of limits of sale or taxation or the introduction of best practices for staff at bars and nightclubs aimed at reducing the damage to intoxicated individuals can also reduce the occurrence of accidents caused by excessive alcohol consumption.

Some authors have focused on the need to create policies or strategies to reduce the risk of problems associated with alcohol consumption in bars and nightclubs, mainly in an attempt to reduce the level of alcohol intoxication, thereby decreasing other risky behaviors associated with alcohol, especially drinking and driving. Such strategies may include the following: application of

tests to determine the extent to which a person is 'drunk' through the use of breathalyzer equipment; implementation and enforcement of consequences such as traffic tickets; using advertising to increase awareness of the high risk of being caught and punished; and, most importantly, increasing political will to support these strategies (Graham et al., 2014; Jones, Hughes, Atkinson, & Bellis, 2011).

Our study has some limitations. First, this study included a population-based sample of nightclub patrons in the City of São Paulo, and these results cannot be extrapolated to the general Brazilian population. The main limitation of this study was the acceptance rate (66%) among the sampled nightclubs, which may have compromised the inclusion of certain categories of patrons. The 76% follow-up rate shows that a portion of the entrance sample was lost; however, to minimize the bias, the nightclub patrons lost to follow-up were corrected for by weighting. We hypothesize that patrons who were intoxicated may have been more likely to leave the establishment without participating in the exit interview. Thus, the number of non-intoxicated patrons may be over-estimated. Finally, considering that only regular nightclubs with entrance and exit control were included and that these almost always charge an entrance fee, our final sample included wealthier patrons. In addition, the funk parties that happen in slum area streets or sheds were not included on the sample.

We noted that a large proportion of patrons did not appear to feel intimidated by the Brazilian "Dry Law", which suggests the need for law enforcement and more sobriety checkpoints. Even in the context of an extremely restrictive law, these regulations appeared not to be feared by patrons. However, the force behind this law depends on the political will to create strategies to support the enforcement of drinking and driving laws.

Role of funding Source

Funding for this study was provided by the São Paulo State Research Support Foundation (Fundação de Amparo a Pesquisa do Estado de São Paulo – FAPESP), Grant number 11/51658-0. The FAPESP had no further role in study design, the collection, analysis and interpretation of data, the writing of the report or the decision to submit the paper for publication.

Conflict of interest statement

The authors are aware of the Journal's conflict of interest policy and have no related activities to disclose.

References

Bulletin of the World Health Organization (2011), 89, 474–475. doi:10.2471/BLT.11.020711.

Calafat, A., Adrover-Roig, D., Blay, N., Juan, M., Bellis, M., Hughes, K., et al. (2009). Which young people accept a lift from a drunk or drugged driver? *Accident Analysis & Prevention*, 41(4), 703–709. <http://dx.doi.org/10.1016/j.aap.2009.03.009>.

Calafat, A., Blay, N. T., Hughes, K., Bellis, M., Juan, M., Duch, M., et al. (2011). Nightlife young risk behaviours in Mediterranean versus other European cities: Are stereotypes true? *European Journal of Public Health*, 21(3), 311–315. <http://dx.doi.org/10.1093/eurpub/ckq141>.

Carlini, C., Andreoni, S., Martins, S. S., Benjamin, M., Sanudo, A., & Sanchez, Z. M. (2014). Environmental characteristics associated with alcohol intoxication among patrons in Brazilian nightclubs. *Drug and Alcohol Review*, 33(4), 358–366. <http://dx.doi.org/10.1111/dar.12155>.

Clapp, J. D., Holmes, M. R., Reed, M. B., Shillington, A. M., Freisthler, B., & Lange, J. E. (2007). Measuring college students' alcohol consumption in natural drinking environments: Field methodologies for bars and parties. *Evaluation Review*, 31(5), 469–489. <http://dx.doi.org/10.1177/0193841X07303582>.

Curtis, A., Coomber, K., Hyder, S., Droste, N., Pennay, A., Jenkinson, R., et al. (2016). Prevalence and correlates of drink driving within patrons of Australian nighttime entertainment precincts. *Accident Analysis and Prevention*, 95(PtA), 187–191. <http://dx.doi.org/10.1016/j.aap.2016.07.018>.

Goss, C. W., Van Bramer, L. D., Gliner, J. A., Porter, T. R., Roberts, I. G., & Diguisepi, C. (2008). Increased police patrols for preventing alcohol-impaired driving. *The Cochrane Database of Systematic Reviews*, 8(4), D005242. <http://dx.doi.org/10.1002/14651858.CD005242>.

Graham, K., Miller, P., Chikritzhs, T., Bellis, M. A., Clapp, J. D., Hughes, K., et al. (2014). Reducing intoxication among bar patrons: Some lessons from prevention of drinking and driving. *Addiction*, 109(5), 693–698. <http://dx.doi.org/10.1111/add.12247>.

Gruenewald, P. J., Stockwell, T., Beel, A., & Dyskin, E. V. (1999). Beverage sales and drinking and driving: The role of on-premise drinking places. *Journal of Studies on Alcohol*, 60(1), 47–53.

Hingson, R., & Winter, M. (2003). Epidemiology and consequences of drinking and driving. *Alcohol Research & Health: The Journal of the National Institute on Alcohol Abuse and Alcoholism*, 27(1), 63–78.

Holmila, M., & Raitasalo, K. (2005). Gender differences in drinking: Why do they still exist? *Addiction*, 100(12), 1763–1769. <http://dx.doi.org/10.1111/j.1360-0443.2005.01249.x>.

Horwood, L. J., & Fergusson, D. M. (2000). Drink driving and traffic accidents in young people. *Accident Analysis and Prevention*, 32(6), 805–814.

Jones, L., Hughes, K., Atkinson, A. M., & Bellis, M. A. (2011). Reducing harm in drinking environments: A systematic review of effective approaches. *Health & Place*, 17(2), 508–518. <http://dx.doi.org/10.1016/j.healthplace.2010.12.006>.

Kuntsche, E., Rehm, J., & Gmel, G. (2004). Characteristics of heavy episodic drinkers in Europe. *Social Science and Medicine*, 59(1), 113–127. <http://dx.doi.org/10.1016/j.socscimed.2003.10.009>.

Lomba, L., Apostolo, J., & Mendes, F. (2009). Drugs and alcohol consumption and sexual behaviours in night recreational settings in Portugal. *Adicciones*, 21, 309–325.

Lwanga, S. K., & Lemeshow, S. (1991). *Sample size determination in health studies: A practical manual*. Geneva: World Health Organization.

Malta, D. C., Berna, R. T., Silva, M. M., Claro, R. M., Silva Júnior, J. B., & Reis, A. A. (2014). Consumption of alcoholic beverages, driving vehicles, a balance of dry law, Brazil 2007–2013. *Revista de Saude Publica*, 48(4), 692–966.

Martin, R. J., Chaney, B. H., & Cremeens-Matthews, J. (2015). Examination of breath alcohol concentration (BrAC) levels, alcohol use disorders identification test (AUDIT-C) classification, and intended plans for getting home among bar-attending college students. *The American Journal on Addictions*, 24(4), 285–288. <http://dx.doi.org/10.1111/ajad.12196>.

Martin, R. J., Chaney, B. H., Cremeens-Matthews, J., & Vail-Smith, K. (2016). Perceptions of Breath Alcohol Concentration (BrAC) levels among a sample of bar patrons with BrAC values of 0.08% or higher. *Psychology of Addictive Behaviors*, 30(6), 680–685. <http://dx.doi.org/10.1037/adb0000203>.

Pechansky, F., De Boni, R., Diemen, L. V., Bumaguin, D., Pinsky, I., Zaleski, M., et al. (2009). Highly reported prevalence of drinking and driving in Brazil: Data from the first representative household study. *Revista Brasileira de Psiquiatria*, 31(2), 125–130.

Perham, N., Moore, S. C., Shepherd, J., & Cusens, B. (2007). Identifying drunkenness in the night-time economy. *Addiction*, 102(3), 377–380. <http://dx.doi.org/10.1111/j.1360-0443.2006.01699.x>.

Ponce, J. C., Munoz, D. R., Andreuccetti, G., de Carvalho, D. G., & Leyton, V. (2011). Alcohol-related traffic accidents with fatal outcomes in the city of Sao Paulo. *Accident Analysis & Prevention*, 43(3), 782–787. <http://dx.doi.org/10.1016/j.aap.2010.10.025>.

Rammohan, V., Hahn, R. A., Elder, R., Brewer, R., Fielding, J., Naimi, T. S., Toomey, T. L., et al. (2014). Effects of dram shop liability and enhanced overservice law enforcement initiatives on excessive alcohol consumption and related harms: Two community guide systematic reviews. *American Journal of Preventive Medicine*, 41(3), 334–343. <http://dx.doi.org/10.1016/j.amepre.2011.06.027>.

Rao, J. N. K., & Scott, A. J. (1987). On simple adjustment to chi-square test with sample survey data. *The Annals of Statistics*, 15(1), 385–397.

Dispõe sobre os procedimentos a serem adotados pelas autoridades de trânsito e seus agentes na fiscalização do consumo de álcool ou de outra substância psicoativa que determine dependência, para aplicação do disposto nos arts. 165, 276, 277 e 306 da Lei nº 9.503, de 23 de setembro de 1997–Código de Trânsito Brasileiro (CTB).

Romano, E., Torres-Saavedra, P., Voas, R. B., & Lacey, J. H. (2014). Drugs and alcohol: Their relative crash risk. *Journal of Studies on Alcohol and Drugs*, 75(1), 56–64.

Sanchez, Z. M., Ribeiro, K. J., & Wagner, G. A. (2015). Binge drinking associations with patrons' risk behaviors and alcohol effects after leaving a nightclub: Sex differences in the Balada com Ciência portal survey study in Brazil. *PLoS One*, 10(8), e0133646. <http://dx.doi.org/10.1371/journal.pone.0133646>.

Santos, M. G., Paes, A. T., Sanudo, A., Andreoni, S., & Sanchez, Z. M. (2015). Gender differences in predrinking behavior among nightclub patrons. *Alcoholism, Clinical and Experimental Research*, 39(7), 1243–1252. <http://dx.doi.org/10.1111/acer.12756>.

Sañudo, A., Andreoni, S., & Sanchez, Z. M. (2015). Polydrug use among nightclub patrons in a megacity: A latent class analysis. *International Journal of Drug Policy*, 26(12), 1207–1214. <http://dx.doi.org/10.1016/j.drugpo.2015.07.012>.

Smith, G. W., Farrell, M., Bunting, B. P., Houston, J. E., & Shevlin, M. (2011). Patterns of polydrug use in Great Britain: Findings from a national household population survey. *Drug and Alcohol Dependence*, 113(2–3), 222–228. <http://dx.doi.org/10.1016/j.drugalcdep.2010.08.010>.

Taylor, B., Irving, H., Kanteres, F., Room, R., Borges, G., Cherpitel, C., et al. (2010). The more you drink the harder you fall: A systematic review and meta-analysis of how acute alcohol consumption and injury or collision risk increase together.

- Drug and Alcohol Dependence*, 110(1–2), 108–116. <http://dx.doi.org/10.1016/j.drugalcdep.2010.02.011>.
- WHO (Ed.), (2014). *Global status report on alcohol and health*. Geneva: World Health Organization.
- Wilsnack, R. W., Wilsnack, S. C., & Obot, I. S. (2005). Why study gender, alcohol and culture? In I. S. Obot, & R. Room (Eds.), *Alcohol, gender and drinking problems: Perspectives from low and middle income countries*, Geneva: World Health Organization.
- Xuan, Z., Blanchette, J. G., Nelson, T. F., Heeren, T. C., Nguyen, T. H., & Naimi, T. S. (2015). Alcohol policies and impaired driving in the United States: Effects of driving- vs. drinking-oriented policies. *The International Journal of Alcohol and Drug Research*, 4(2), 119–130. <http://dx.doi.org/10.7895/ijadr.v4i2.205>.