Original Research

Alcohol-induced risk behaviors among Brazilian nightclub patrons: a latent class analysis

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ABSTRACT

Objective: The aim of this study is to identify risk behavior profiles associated with alcohol consumption among patrons during or just after departure from nightclubs in São Paulo, Brazil.

Study design: Cross-sectional survey.

Methods: The study used a two-stage cluster sampling survey design. Data were collected on a probabilistic sample of nightclub patrons. Overall, 2422 patrons were interviewed at the entrance of 31 nightclubs. Latent class analysis (LCA) was used to identify risk behavior profiles with an emphasis on risky driving, fights, alcoholic blackouts, and harm and unsafe sex.

Results: A 3-class LCA model was selected, with classes consisting of low (43%), medium (33%), and high (24%) risk patrons. Compared to patrons in the low-risk class, patrons in the medium- and high-risk classes were more likely to be men (odds ratio [OR] = 2.2, 95% confidence interval {CI} [1.2—4.0] and OR = 3.2, 95% CI [1.8—5.8], respectively), to have engaged in binge drinking during the last year (OR = 15.0, 95% CI [7.2—31.3] and OR = 14.3, 95% CI [9.4—21.8]), to be in the highest socioeconomic stratum (OR = 2.6, 95% CI [1.3—5.1] and OR = 2.0, 95% CI [1.2—3.5]) and to have been interviewed at a hip-hop music nightclub (OR = 2.8, 95% CI [1.1—6.8] and OR = 3.7, 95% CI [1.5—9.1]).

Conclusions: Risk behaviors were not equally distributed among nightclubs. Individual- and environmental-level characteristics are associated with higher risk. Alcohol harm reduction, such as the implementation of a responsible drinking service, should be implemented in São Paulo nightclubs.

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Introduction

Alcohol use affects brain chemistry by altering the levels of the neurotransmitters that control behaviors and emotional processes.[1] After using alcohol, cognitive and physical functioning are affected, reducing self-control and the ability to process information, increasing impulsiveness, making people more likely to engage in risk behaviors.[2] Several studies have found an association of alcohol use or alcohol intoxication with physical and sexual violence, increasing the likelihood of sexual risk behavior, traffic accidents, unintentional injuries, and periods of amnesia, also known as alcohol-induced blackouts.[3–9]

However, the severity of the consequences of alcohol use depends on the frequency and amount consumed.[10] A risky consumption behavior that has aroused interest in recent years is called 'binge drinking' (BD)[11] or 'heavy episodic drinking',[12] which is defined as the consumption of four or more and five or more servings of alcoholic beverages on one occasion for women and for men, respectively.[13] These episodes of acute alcohol abuse not only have an influence on overall mortality but also contribute to an increasing risk of all the acute consequences previously described.

The abuse of alcohol has been reported to be directly associated with the recreational context of the nightclub setting,[14] thereby contributing to increased risk behaviors in regular nightclub patrons.[15] Nightclubs are places frequented mainly by youths and young adults, who seek different forms of entertainment in these locations, with the use of alcohol acting as an important mediator.[16] According to population data, in Brazil, nightclubs are the places of choice for binge drinking,[17,18] which increases concerns regarding the risks to which patrons of these venues are exposing themselves. Moreover, compared to other highly populous countries, Brazil is ranked as having the second highest rate of major complications resulting from alcohol consumption, according to disability-adjusted life years lost.[19]

Given the aforementioned considerations, the objectives of this article were to evaluate how alcohol-induced risk behaviors are grouped among nightclub patrons by the use of latent class analysis (LCA) and to explore how these different patterns of risk behaviors are associated with sociodemographic factors, binge drinking, and music style of the venue at which the patrons were interviewed.

Methods

Sampling

Nightclubs were defined as establishments that have controlled entry and exit of patrons, sell alcoholic beverages, and have a dance floor. A cross-sectional survey was conducted in nightclubs in the city of São Paulo during the first half of 2013. Cluster sampling was performed in two stages; the selection of nightclubs (first stage) constituted identifying a probabilistic sample of nightclubs, each with an inclusion probability proportional to the maximum capacity of the club. The second stage involved a systematic sampling of every third person in the selected nightclub's entrance queue.[20]

To guarantee that we would have at least 30 nightclubs participate in the survey, we contacted the original 40 selected nightclubs and seven replacements, resulting in an acceptance rate of 66% (31/47). A target sample size of 1600 nightclub patrons was calculated considering an absolute precision of 5%, a 95% confidence interval (CI), the use of two-stage cluster sampling, and a design effect of two.[21] Taking into account a possible refusal rate of 30% and a maximum loss at follow-up from entrance to exit of 40%,[22] it was calculated that 2912 nightclub patrons should initially be approached.

Sampling weights for nightclubs and patrons were calculated to correct for losses, and details of this process are presented in a supplementary file of the study conducted by Carlini et al.[23] Details regarding the sampling procedure have been presented by Santos et al.[24]

Instruments and data collection

Patrons participated in entrance and exit interviews based on a questionnaire and received a bracelet with a unique numeric code to identify them at the nightclub exit. Initial interviews at the nightclub entrances investigated sociodemographic variables, patterns of alcohol and drug use, and risk behaviors in nightclubs during the year preceding the survey. For the present study, only entrance interview data were used. Data were registered in a tablet device.

Variables

The following aspects were evaluated as explanatory variables: sociodemographic characteristics (gender, age, education, marital status, and socioeconomic status [SES]), history of BD during the past year (five servings of alcohol for men and four servings of alcohol for women consumed over period of 2 h—a serving was defined as a 5-oz glass of wine, a 12-oz can of beer, or a 1.5-oz shot of liquor, and examples of equivalence were presented to the interviewee in a figure), and the type of nightclub where the interview occurred, classified by musical style.

Each respondent was asked about his or her history of risk behaviors practiced inside or shortly after leaving the nightclub. A binary response to each of the questions served as the basis for generating the latent classes. Questions, presented in the Supplementary File, numbered one to three were grouped and named 'Risky Driving'. Questions number four and five were named 'Fights' and 'Blackouts', respectively. The questions numbered six and seven were grouped under the name 'Physical Harm'. The questions numbered eight to ten were grouped together and called 'Risky Sex'. The eleventh question was named 'Sexual Intercourse Under the Influence of Alcohol'.

SES was evaluated using a standardized index known as the 'Brazilian Economic Classification' (ABEP).[25] This scale was used to classify participants into subgroups 'A' to 'E' (where A corresponded to the highest SES). C/D/E SES groups showed low frequencies, then they were combined.

Musical styles were categorized into eclectic (plays several musical styles on the same night), country, funk, electronic, dance-pop, rock, hip-hop, and forró according to the type of music played in the nightclubs and recorded by field staff during data collection.

Statistical analysis

To address the first question about the possible existence of distinct groups of risk behaviors during the past year among nightclub patrons in São Paulo, a weighted LCA[26] was performed using venues as clusters.

LCA is a statistical modeling technique based on the premise that associations between a set of observed categorical variables (i.e. risk behaviors) may be explained by a finite number of mutually exclusive latent classes. Based on recorded responses, individuals received a probability of membership in each level or class of latent variables.[26] Fig. 1 depicts the conceptual relationships between the indicator variables (the different risk behaviors), the latent classes, and the covariate predictors for the latent class model constructed during these analyses.

Following the advice of Nylund et al. (2007),[27] an iterative modeling process was used to produce one to six class models using Mplus v7.[28] The significance of covariates as predictors of latent class membership was tested using multinomial logistic regression analysis after an LCA model was fit using a 3-step procedure that took into account the uncertainty associated with assigning latent class membership to individuals.[29] The results are presented as weighted percentages (wt%), adjusted odds ratios (aOR), 95% CI and P-values.

Results

A total of 3063 individuals were approached at the 31 nightclubs that participated in the study, and 2422 interviews (79.1% acceptance rate at the time of entrance) were performed. There was no significant gender difference between those who consented and did not consent to participate in the interview at nightclub entry (P = 0.945).

Four interviews had data missing for all of the variables used for the construction of latent classes; therefore, the sample size used was 2418 interviews.

Table 1 presents the sociodemographic characteristics of the nightclub patrons, which showed that most of the patrons were male (60.8%), approximately 88% were younger than 33 years-old, 53.7% belonged to the middle SES, approximately 90% were single, and 68% had engaged in BD in the past year; additionally, patrons were more frequently interviewed in electronic music nightclubs (28.2%).

Latent classes were created based on the risk behavior indicator variables reported as occurring during the preceding year. A total of six latent class models were examined (Table 2). The Vuong Lo Mendell Rubin (VLMR) test P-value of the 2-class model was significant, but the 4-class model demonstrated a lower Bayesian Information Criterion (BIC) value. The lowest sample size adjusted BIC (ssaBIC) value and highest entropy value were demonstrated by the 5-class model. Overall, Akaike Information Criterion (AIC) values decreased as the number of classes increased. When the BIC value was considered as the most reliable measure,[27] selection of the 4-class model was favored. However, given the study setting, the 3-class model was selected because it showed similar characteristics to those presented by the models with two and four classes but demonstrated one difference: this model had greater interpretability within the context of the evaluated event.

Table 3 shows the weighted probabilities of risk behavior occurrence during the previous year for each latent class of the selected 3-class model. The classes were defined as 'low risk', corresponding to 43% of the patrons (95% CI [36.0–50.1%]); 'medium risk' (33%, 95% CI [28.5–37.3%]); and 'high risk' (24%, 95% CI [20.7–28.7%]). Patrons in the 'low-risk' class had an average likelihood of risky driving (35.2%), low probabilities of blackouts and sexual intercourse while under
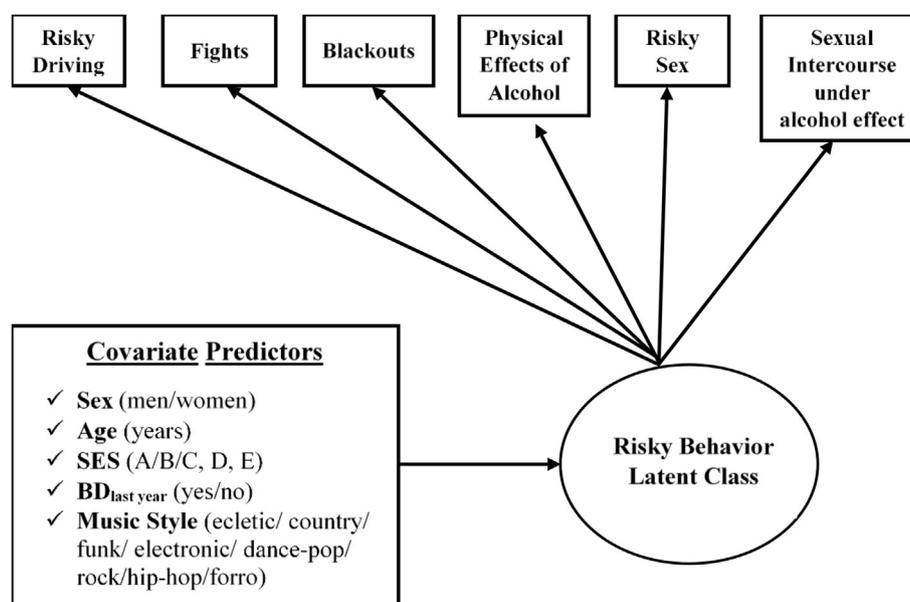
Fig. 1 – **Latent class model of risk behaviors associated with alcohol consumption among nightclub patrons of São Paulo with covariate predictors. BD, binge drinking; SES, socioeconomic status [standardized index known as the 'Brazilian Economic Classification'].**

Table 1 – Sociodemographic characteristics of nightclub patrons (N = 2418) in the city of São Paulo in 2013.

Variables	N	Wt%	95% CI
Sociodemographics			
Gender			
Male	1474	60.8	48.3–72.0
Female	944	39.2	28.0–51.7
Age group (years)			
18–25	1355	62.9	51.9–72.6
26–33	683	24.9	18.8–32.1
≥34	380	12.2	7.5–19.5
Education			
Up to elementary school	138	7.5	4.5–12.3
Secondary	1334	59.6	53.0–65.8
University/postgraduate	919	32.9	24.8–42.3
Marital status			
Married/cohabitating	182	6.8	3.8–11.7
Single	2122	90.3	84.2–94.2
Separated/widowed	99	2.9	1.8–4.6
Socioeconomic status			
A	638	25.8	19.0–63.8
B	1361	53.7	50.5–56.9
C/D/E	421	20.5	14.9–27.5
Binge drinking last year	1640	67.7	63.3–71.9
Nightclubs			
Music style			
Eclectic	536	25.1	10.8–48.1
Country	218	17.0	3.5–53.5
Funk	151	9.5	2.2–33.2
Electronic	663	28.2	11.3–54.7
Pop-dance	261	7.4	1.8–26.1
Rock	240	2.8	0.7–10.1
Hip-hop	164	5.0	0.8–24.8
Forró/Zouk	187	5.1	1.1–20.8

CI, confidence interval; Wt%, weighted percentage.

the influence of alcohol (8.1% and 7.7%, respectively), and negligible probabilities of engaging in the other risk behaviors (<5%). Patrons in the 'medium-risk' class had a high probability of risky driving (90.0%), moderate probabilities of blackouts (59.1%), and sexual intercourse while under the influence of alcohol (56.5%), a low probability of suffering from the physical harm (15.9%), and low probabilities of engaging in the other risk behaviors (<15%). Patrons in the 'high-risk' class were at increased risk of engaging in risky sex, sexual intercourse while under the influence of alcohol and risky driving (>80%) and had a moderate probability of blackouts (60.6%) and a low probability of suffering from the physical harm (14.7%). Fig. 2 shows the probabilities associated with each of the risk variables used to construct the latent classes.

As Table 4 shows, after covariate adjustment and using the 'low-risk' class as the reference category, those in the 'medium-risk' class were more likely to have engaged in BD in the past year (aOR = 15.0, 95% CI [7.2–31.3]), to be male (aOR = 2.2, 95% CI [1.2–4.0]), to be in the highest SES (aOR = 2.6, 95% CI [1.3–5.1]) and to have been interviewed at a hip-hop nightclub (aOR = 2.8, 95% CI [1.1–6.7]). Those who were interviewed at country music and forró/zouk nightclubs were 84% and 51% less likely to belong to the 'medium-risk' than the 'low-risk' class, respectively (P < 0.001). Those in the 'high-risk' class were more likely to have engaged in BD in the past year (aOR = 14.3, 95% CI [9.4–21.8]), to be male (aOR = 3.2, 95% CI [1.8–5.8]), to be in the highest SES (aOR = 2.0, 95% CI [1.2–3.5]), and to have been interviewed at an electronic music nightclub (aOR = 2.0, 95% CI [1.2–3.4]) or hip-hop nightclub (aOR = 3.7, 95% CI [1.5–9.1]). However, those who were interviewed at country music nightclubs were 39% less likely to belong to the 'high-risk' than the 'low-risk' class (P = 0.027).

Discussion

Three distinct classes of risk behaviors associated with alcohol consumption were identified among nightclub patrons in the city of São Paulo, and patrons were categorized into a 'low', 'medium', or 'high' risk class. Almost 55% of those interviewed were categorized into the 'medium-risk' and 'high-risk' classes. Individuals in these classes were more likely to be male, to be in the highest economic stratum, to have engaged in past year BD, and to be interviewed at a hip-hop music nightclub and less likely to be interviewed at a country music nightclub. Patrons who were interviewed at forró/zouk music nightclubs were less likely to belong to the 'medium-risk' class; on the other hand, patrons who were interviewed at electronic music nightclubs were more likely to belong to the 'high-risk' class. It was also of note that the category of behaviors that most differentiated between the 'medium-risk' and 'high-risk' classes was risky sexual behaviors, which was most prevalent in the 'high-risk' class.

This study was innovative in that it focused on the alcohol-induced risk behaviors reported by a probabilistic sample of nightclub patrons in the most populous city in the Southern Hemisphere. Moreover, in the extent of our literature search, it seems to be the first published article that have used LCA to group risk behaviors induced by alcohol among nightclub patrons. Concerning individual sociodemographic data, it has been reported that men tend to be more exposed to the

Table 2 – Latent class fit statistics for models with 1–6 classes.

Model	Goodness of fit statistics					Proportion of sample in each class					
	AIC	BIC	ssaBIC	p-VLMR	Entropy	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6
Class 1	15,670.325	15,705.069	15,686.005	–	–	1.00					
Class 2	14,417.742	14,493.021	14,451.717	<0.001	0.656	0.36	0.64				
Class 3	14,330.686	14,446.500	14,382.955	0.481	0.606	0.24	0.33	0.43			
Class 4	14,264.607	14,420.955	14,335.170	0.753	0.616	0.42	0.21	0.17	0.20		
Class 5	14,244.546	14,441,429	14,333.404	0.215	0.659	0.01	0.39	0.15	0.12	0.33	
Class 6	14,237.155	14,474.574	14,344.307	0.444	0.707	0.13	0.11	0.01	0.33	0.39	0.03

AIC, Akaike Information Criterion; BIC, Bayesian Information Criterion; ssaBIC, sample size adjusted Bayesian Information Criterion; p-VLMR, P-value associated with Vuong Lo Mendell Rubin test.

Table 3 – Conditional prevalence rates of risk behaviors associated with alcohol consumption reported as occurring during the previous year for each latent class among nightclub patrons in the city of São Paulo in 2013 (N = 2418).

Risk behavior[a]	Latent classes									Total (N = 2418)		
	Low risk (N = 1038)			Medium risk (N = 791)			High risk (N = 589)					
	N	Wt%	95% CI	N	Wt%	95% CI	N	Wt%	95% CI	N	Wt%	95% CI
Risky driving	380	35.2	30.6–40.2	701	90.0	86.9–92.5	558	86.2	81.2–90.1	1639	65.4	60.0–70.5
Fights	8	0.8	0.2–3.3	104	13.0	9.4–17.6	149	25.8	19.9–32.7	261	10.9	8.5–13.8
Blackout	73	8.1	5.9–11.0	446	59.1	53.2–64.6	385	60.6	55.4–65.6	904	37.6	32.2–43.3
Physical effects	7	0.7	0.2–1.9	117	15.9	11.6–21.4	82	14.7	10.7–19.8	206	9.1	7.1–11.4
Risky sex	21	2.3	1.6–3.2	90	13.4	9.3–18.9	589	100.0	–	746	29.7	26.0–33.8
Sexual intercourse under the influence of alcohol	76	7.7	5.6–10.5	481	56.5	48.2–64.4	589	100.0	–	1196	46.1	38.9–53.5

CI, confidence interval; Wt%, weighted percentage.
[a] Risk behavior associated with alcohol consumption during previous 12 months.

consequences of alcohol abuse in different settings,[31] which is corroborated by our results. However, our finding indicating that high SES is a potential risk factor for high-risk behaviors is in accordance with other Brazilian surveys among students and the general population,[32,33] but no consensus regarding this issue has yet been established in the literature.[34,35]

According to Huckle et al.,[30] increased number of visits to nightclubs was associated with patrons' alcohol-related disorderly behavior, symptoms of alcohol dependence, and physical effects the next day, even for a dose of one drink per occasion. The authors reported that the exposure to the nightclub environment was a stronger risk factor for alcohol negative consequences than the amount of alcohol consumed by the subjects, suggesting that bar and nightclub patrons were exposed to a higher risk of suffering alcohol-related negative effects than were members of the general population. On the other hand, our study increased the body of understanding regarding the alcohol-related negative effects associated with attending nightclubs, showing that different types of nightclubs can be potential predictors of a higher exposure to alcohol-related harms and consequences.

The type of music played at the nightclub at which interviews took place was more strongly associated with membership in a higher risk class than were individual factors, suggesting that the environment plays an important role in nightclub patron behavior. In this study, those who were interviewed at nightclubs playing electronic music demonstrated a higher probability of belonging to the high-risk class. These findings are in accordance with those of Calafat et al.,[36] who showed that variables related to recreational lifestyle factors were better predictors of establishing alcohol and drug-use patterns than were sociodemographic characteristics among students in nine European cities. They also found that those belonging to rock, rave, and house subcultures were exposed to the most notable risks associated with recreational habits. Moreover, according to Lozon and Bensimon,[37] partying at electronic music events has been found to have a negative influence on listeners and be associated with alcohol abuse, opposing authority, and violent behavior.

Regarding risk behaviors engaged in while under the influence of alcohol, our study showed that risky driving was the most prevalent of the investigated alcohol-induced risk behaviors. Similarly, the results of a Brazilian nationally representative household survey revealed that more than half of current drinkers reported BD, and equally alarmingly, nearly a quarter of current drinkers reported driving after drinking.[38]

It is important to note that Brazil has a severe drinking and driving law, known as the 'Dry Law', which was first implemented in 2008 (law 11.705) and then modified in 2012 (law 12.760) and in 2013 (Resolution #432, January 23th 2013). The Resolution 432 states that driver's breath alcohol concentration between 0.05 and 0.33 mg/l is a 'traffic offense', punished with expensive fines and ≥0.34 mg/l is considered 'traffic offense and crime', punished with prison. However, this legislation did not seem to intimidate nightclub patrons or the general population. In this sense, these findings suggest the need for increased law enforcement and more sobriety checkpoints in Brazilian cities.

Another behavior that was highly prevalent among patrons in the medium- and high-risk classes were alcohol-
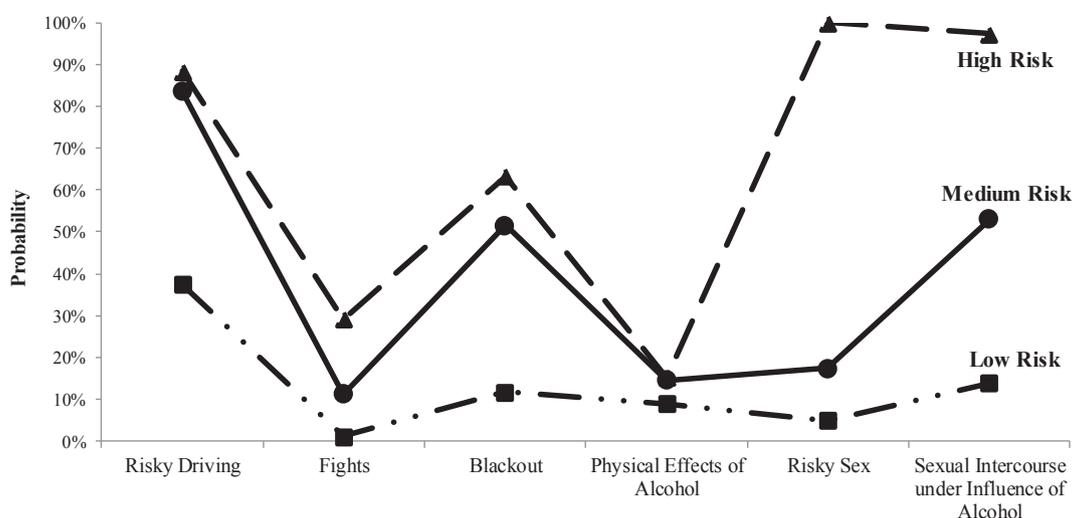
Fig. 2 — Weighted probability of engaging risk behaviors associated with alcohol consumption during the past 12 months given latent class membership among nightclub patrons (N = 2418) in the city of São Paulo, 2013.

Table 4 — Multinomial logistic regression model for the associations between musical style of venue, nightclub patron characteristics and risk behaviors, and alcohol consumption class membership.

Covariate	Medium risk vs low risk			High risk vs low risk		
	aOR	95% CI	P	aOR	95% CI	P
Gender						
Female	1			1		
Male	2.21	1.23—3.99	0.008	3.24	1.82—5.80	<0.001
Age (years)	0.99	0.95—1.04	0.718	1.00	0.97—1.02	0.686
SES						
A	2.59	1.32—5.06	0.005	2.01	1.16—3.49	0.013
B	1.45	0.55—3.87	0.455	1.05	0.52—2.11	0.889
C, D or E	1			1		
$BD_{last\ year}$						
No	1			1		
Yes	14.98	7.17—31.31	<0.001	14.32	9.40—21.83	<0.001
Music type						
Eclectic	1			1		
Country	0.14	0.06—0.31	<0.001	0.61	0.39—0.95	0.027
Funk	0.91	0.54—1.54	0.725	1.39	0.89—2.18	0.147
Electronic	1.21	0.55—2.66	0.628	2.00	1.17—3.41	0.011
Pop-dance	0.52	0.23—1.22	0.133	0.74	0.29—1.91	0.535
Rock	0.94	0.43—2.08	0.883	1.26	0.76—2.10	0.374
Hip-hop	2.78	1.14—6.76	0.025	3.72	1.52—9.09	0.004
Forró/zouk	0.49	0.32—0.76	0.002	0.64	0.39—1.07	0.088

Results based on 2405 interviews with complete data on all covariates.
aOR, adjusted odds ratio; CI, confidence interval.

induced blackouts, which was reported by approximately 60% of respondents in each of these risk classes. According to a systematic review of clinical research focused on alcoholic blackouts, the majority of publications examined BD and alcohol-related consequences in young adults and college students and reported prevalence rates of blackouts ranging from 20% to 55% in diverse populations and settings.[9] However, this review emphasized the difficulty associated with comparing studies because each study used a different time-frame measure for event occurrence, varying from a day to lifetime history of blackouts. Nevertheless, in the present study, it was noted that patrons belonging to the medium- and high-risk classes reported a greater prevalence of blackouts during the past year than was identified in previous studies.

It is also important to note that public policy may facilitate harm reduction related to alcohol-induced risk behaviors and has been considered the most effective way to reduce the harm caused by alcohol on individuals and societies.[39] Potential harm reduction policies within the present scenario would involve enforcement of drink and driving control, minimum unit pricing, and implementation of responsible drinking services.[39] Although law 11.705 (2008) regulates drinking and driving in Brazil, it has not been enforced in the city of São Paulo.[40] On the other hand, the country does not have laws regulating responsible selling and prices of alcoholic beverages.

The main limitation of this study lies in the fact that it used a timeframe of 12 months for the assessment of risk behaviors

associated alcohol consumption, and the information obtained from participants may have been underestimated due to a possible memory bias. Another limitation was the acceptance rate among the sampled nightclubs, which may have compromised the inclusion of certain types of clubs. Despite these limitations, the study has several strengths, including the participation rate among patrons at the nightclub entrances.

Conclusions

Our study showed that individual level factors and nightclub music style may be associated with engaging in different risk behaviors associated with alcohol consumption among patrons in São Paulo. Risk behaviors were not equally distributed among the venues because high-risk patrons were more likely to be interviewed at electronic music nightclubs. However, risky driving was a highly prevalent behavior among patrons, and alcohol harm reduction must be implemented in São Paulo nightclubs. Implementation of a responsible drinking service, drink and driving law enforcement, and minimum unit pricing constitute possible harm reduction interventions that may reduce alcoholic harm in the three classes of patrons.

Author statements

Competing interests

None declared.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.puhe.2017.11.019.