



Binge drinking among Brazilian students: A gradient of association with socioeconomic status in five geo-economic regions

Zila M. Sanchez^{a,*}, Danilo P. Locatelli^b, Ana R. Noto^b, Silvia S. Martins^c

^a Department of Preventive Medicine, Brazilian Center of Information of Psychotropic Drugs, Universidade Federal de Sao Paulo, 04038-034 Sao Paulo, Brazil

^b Department of Psychobiology, Universidade Federal de Sao Paulo, 04023-062 Sao Paulo, Brazil

^c Department of Epidemiology, Columbia University, NY 10032, USA

ARTICLE INFO

Article history:

Received 23 January 2012

Received in revised form 11 June 2012

Accepted 14 June 2012

Available online 6 July 2012

Keywords:

Binge drinking
Socioeconomic status
School survey
Adolescents

ABSTRACT

Background: Socioeconomic status (SES) may be directly associated with binge drinking (BD) and country inequality. The aims of this study were to describe the characteristics of BD among high school students in Brazil and the association of BD with students' socioeconomic status in the five different Brazilian macro-regions.

Methods: A national cross sectional survey was carried out using a multistage probabilistic sample of 17,297 high school students aged 14–18 years drawn from 789 public and private schools in each of the 27 Brazilian state capitals. Self-report data about BD behaviors and SES were analyzed via weighted logistic regressions and a funnel plot.

Results: Almost 32% of the students engaged in BD in the past-year. Being in the highest SES stratum doubled the risk of BD among students in all five Brazilian macro-regions. There was a gradient in the association between past-year BD and socioeconomic status: as SES increased; the chance of having recently engaged in BD also increased. In Brazilian capitals as a whole, being a boy versus being a girl (adjusted odds ratio – aOR=1.40 [95%CI 1.26; 1.58]), being older (aOR=1.47 [95%CI 1.40; 1.55]) and attending private versus public schools (aOR=1.39 [95%CI 1.18; 1.62]) were associated with greater risk for BD.

Conclusions: Contrary to what is observed in developed countries, students living in Brazilian capitals may be at an increased risk of BD when they belong to the highest socioeconomic status. There might be similar associations between high SES and BD among adolescents growing up in other emerging economies.

© 2012 Elsevier Ireland Ltd. All rights reserved.

1. Introduction

Most youth experiment with alcohol, but the patterns and frequency of alcohol use in adolescence, particularly binge drinking patterns (BD), are associated with health-related consequences. BD is defined as consuming at least four/five alcoholic drinks on one single occasion (Wechsler and Nelson, 2001) and this behavior is sometimes referred to as “heavy episodic drinking” (Kuntsche et al., 2004). The practice of BD by adolescents is a risk behavior, not only due to the physiological effects of alcohol intoxication and possible death (Gunja, 2011), but also for being associated with higher rates of sexual violence (Chersich et al., 2007), traffic accidents (Zhao et al., 2010), poor school performance, involvement with other risk

behaviors (Miller et al., 2007) and higher incidence of alcoholism in the future (Pitkänen et al., 2005).

In Brazil, a country in which laws prohibit the sale to and consumption of alcoholic beverages by adolescents under 18 years of age (Romano et al., 2007), almost 16% of adolescents aged 14–17 years-old engaged in BD according to a 2007 national household survey (Pinsky et al., 2010). In a representative sample of private school students in the country's largest city (São Paulo), the prevalence of past-month BD was 33% (Sanchez et al., 2011), particularly among wealthier adolescents. This puts Brazilian students in a higher range of risk related to BD than the ones in United States (US) (Nelson et al., 2008) and in several European countries (Hibell et al., 2009).

Brazil is facing a large economy growth and has recently achieved the position of 6th world economy (Inman, 2011). However, despite this fact, the country is still the 13th most unequal country in the world (CIA, 2011), with an average Gini index of 0.54 (and extreme regional differences of involvement in gross domestic product (GDP) (IBGE, 2010)). (The Gini index is a coefficient that measures the extent to which the distribution of income among

* Corresponding author at: Universidade Federal de São Paulo, Rua Borges Lagoa, 1341/1º andar, 04038-034 São Paulo, SP, Brazil.

E-mail addresses: zila.sanchez@unifesp.br, zila.sanchez@gmail.com (Z.M. Sanchez).

individuals within a population deviates from a perfectly equal distribution. A Gini index of 0 represents perfect equality while an index of 1 implies perfect inequality.) The country is divided into five geo-economic macro-regions which have very different GDPs per capita, defining five smaller Brazils. The GDPs in each region vary from US\$ 4679 (in the Northeast, the poorest region) to US\$ 13,238 (in the Midwest, the richest region), considering a parity of 1.6 Brazilian Reais to 1 US dollar (parity Reais \times dollar at the year of the survey) and data from the IBGE (*Instituto Brasileiro de Geografia e Estatística* – Brazilian Institute of Geography and Statistics; IBGE, 2010). According to several researchers, income inequality is as much a risk factor for alcohol harm as poverty is (Dietze et al., 2009; Elgar et al., 2005). The extreme social inequality and the high position among other world economies puts Brazil in a unique position for the investigation of social factors related to alcohol and drug use.

While most European and North American studies emphasize alcohol consumption as more prevalent among adolescents of lower socioeconomic status (SES; Baumann et al., 2007; Guilamo-Ramos et al., 2005; Helasoja et al., 2007); according to recent Brazilian epidemiological studies, high SES is associated with alcohol consumption among Brazilian adolescents (Galduroz and Caetano, 2004; Sanchez et al., 2011; Soldera et al., 2004). A review of the Brazilian literature on the topic pointed to a lack of information about binge drinking patterns in Brazil, in particular the patterns of underage binge drinking (Silveira et al., 2008). Similarly, there is a lack of information of adolescent binge drinking patterns in other emerging economies. In a systematic review of worldwide studies that investigated the relationship between socioeconomic status and health behaviors in adolescence (Hanson and Chen, 2007), the authors suggest that the existence of an association between socioeconomic status and alcohol use is not evident in the analyzed articles, but would require further analysis in different countries to improve the evidence.

The peculiarities of the economic and social conditions of Brazil raise the hypothesis that perhaps the association between SES and BD may be different from that found in richer countries. The principle of the social and emotional impact of being rich in a rich country may be different than that of being rich in an emerging economy and highly unequal society, and this relationship can vary according to regional patterns of income and inequality (Elgar et al., 2005).

Given the need for more studies to build consensus of scientific knowledge or deepening of scientific evidence about the influence of SES on alcohol consumption in emerging economies, this study aims to: (1) describe the characteristics of binge drinking among high school students in Brazil; (2) evaluate the association of the most dangerous pattern of Brazilian adolescent alcohol use – binge drinking – with adolescents' socioeconomic status, in different regions of Brazil.

2. Methods

2.1. Study design and sample selection

Data comes from a cross sectional survey of school-attending youths in all the 27 Brazilian state capitals, with classroom survey data collected in 2010 from a sample of the cities' private and public schools. The study's target population was designed as a representative sample of high school students (10th to 12th grade) in these schools, with a two steps random selection process. A total of 789 schools participated in this study, with a school response rate of 86%. The sample size considered a maximum relative error of 10% and a 95% confidence interval for a prevalence of 50%. The student response rate was 79.2% (20.5% were absence in the day of the survey and 0.3% refused to participate). Ninety-eight questionnaires were excluded from the analysis for having a positive answer for a fictitious drug. The present study was limited to high school students aged between 14 and 18 years-old ($N = 17,297$).

Some participants had missing or invalid responses to key study variables. For this reason, the effective sample size for the present investigation and the proportion of designated participants with useable data for logistic regressions is 14,714 and 85.1%, respectively.

2.2. Assessment plan

Anonymous standardized paper and pencil questionnaire data were gathered by a trained team of interviewers who worked in the classroom without the presence of a teacher. A questionnaire, with closed form questions adapted from standardized World Health Organization (WHO) items (Smart et al., 1980) and the European School Survey Project on Alcohol and Other Drugs (ESPAD) questionnaire (Hibell et al., 2009) was used. In average, it took one 40 min to the students to complete the questionnaire.

The protocol was reviewed and approved by the *Universidade Federal de São Paulo* (UNIFESP) Research Ethics Committee (Protocol #0348/08), with provisions for participants to participate anonymously, to decline to participate, to leave questions unanswered, and that they could interrupt their participation at any time.

2.3. Measures

2.3.1. Key response variable. The key response variable in this study described binge drinking (BD) in the past year, defined as at least one episode of consumption of five or more servings of alcoholic beverages on the same occasion, as used in the ESPAD survey (Hibell et al., 2009). 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 the equivalence examples were drawn on the questionnaire to facilitate students understand.

2.3.2. Covariates under study. The suspected covariate of central interest is social rank as indexed in relation to a highly standardized survey assessment of socioeconomic status (SES) known as the ABEP index (*Associação Brasileira de Empresas de Pesquisa* – Brazilian Association of Research Agencies). The ABEP index (ABEP, 2008) is based upon the educational level of the head of the household, possession of various types of household goods (e.g., television sets), and number of housekeepers. This scale was used to sort participants into standardized subgroups labeled from A to E (A1, A2, B1, B2, C1, C2, D, E; where A1 was the highest economic strata).

Due to the inequality of distribution of Brazilian income, we defined 5 ranks of SES: high SES (A1 + A2), medium-high SES (B1 + B2), medium-low SES (C1), and low SES (C2 + D + E). It was important to include the C2 stratum among the low SES group to have enough cases to run the regressions in all regions, otherwise it would be impossible to analyze data from Brazil's South region.

Differences according to Brazilian regions were analyzed considering the 5 geo-economic regions defined by the Brazilian federal government: South (3 states capitals), Southeast (4 states capitals), Midwest (3 states capitals and the Brazilian Capital, Brasilia) Northeast (9 states capitals) and North (7 states capitals) and that are widely used on the population census.

2.3.3. Descriptive measures. Besides past year binge drinking (BD) as the main outcome variable, we also describe prevalence of lifetime and past month binge drinking. Three questions about the patterns of the last binge drinking episode were also analyzed. The students were asked about where they were during the last episode and with whom they were and what type of alcoholic beverage they drunk on that occasion. The possible responses are presented in Table 1.

2.4. Statistical analysis

Analyses were conducted on data weighted to correct for unequal probabilities of selection into the sample. The complex survey design took into account the city and type of school, the school as primary sampling unit, the expansion weight and the final probability of drawing the student who answered the questionnaire. The outcome variable of interest was engagement in binge drinking in the past year. The independent variables included SES, type of school, age and sex. They were used to describe the characteristics of students reporting recent (past year) binge drinking and not reporting binge drinking. To estimate the association between SES and recent BD (outcome variable) we conducted three type of weighted logistic regression stratified by the five Brazilian macro-regions: (1) high SES \times all other together (see Table 3); (2) high SES \times each other in separate (high SES as the reference group versus: medium-high; medium-low; and low as described in Section 2.3.2), as presented in Tables 3 and 4, low SES \times each other in separate (low SES as the reference group versus: high; medium-high; and medium-low), as presented in Table 4. For all analyses the dependent variable was binge drinking (yes or no, were no was the reference) in the past year (12 month prior to the survey) and the main independent variable was SES rank controlled by age, sex and type of school. The first analysis (using SES as a binary variable – high SES \times all other together) derived a funnel plot that shows adjusted odds ratio in the 5 Brazilian regions.

Analyses were performed using Stata Version 11, with svyset procedures to address variance estimation under the complex sample design in these regressions. Results are presented via weighted proportions (wt%), crude Odds ratios (cORs), adjusted Odds Ratios (aORs) and 95% confidence interval (95%CI).

3. Results

BD was a very common behavior among high school students in Brazilian state capitals. Table 1 provides a description of this

Table 1
Description of patterns of binge drinking among public and private high school students in the 27 Brazilian State Capitals (N = 14,714).^a

	N	wt%	95%CI	
			Min	Max
Lifetime binge drinking	5129	34.9	33.1	36.7
Binge drinking in the past year	4579	31.6	29.8	33.4
Binge drinking in the past month	2913	20.9	19.4	22.4
Once	961	6.3	5.6	7.1
Twice	785	5.5	4.9	6.2
3–5 episodes	734	5.0	4.5	5.7
6–9 episodes	219	1.7	1.4	2.1
10+ episodes	214	1.8	1.5	2.2
Characterization of the last binge episode ^a				
Where did it occur?				
Bar, nighthouse, pub	2936	25.0	23.2	26.9
Friends' house	2591	21.5	20.0	23.0
Relatives' house	864	9.4	8.4	10.4
Own house	742	8.0	7.0	8.9
Another place ^b	753	8.2	7.1	9.4
With whom?				
Alone	189	2.3	1.8	2.8
Friends	4553	33.4	31.4	35.4
Parents or uncles	1049	11.0	10.0	12.1
Brothers or cousins	1790	16.9	15.5	18.3
Other ^c	248	2.7	2.2	3.2
What type of alcoholic beverage did you drink? ^d				
Beer	3545	28.5	26.7	30.2
Vodka	2630	21.8	20.1	23.7
Alcopop ^e	2902	24.9	23.2	26.7
Wine	1744	19.5	17.9	21.3
Cocktail	2024	19.9	18.1	21.8
Whisky	1295	12.2	11.1	13.5

^a Missing data for the binge measures (lifetime, year and month) varied from 1% to 3%.

^a Respondents could give more than one answer.

^b Mainly parties, birthday parties, parties in beaches.

^c Manily boyfriend/girlfriend, husband or wife.

^d Liquors with less than 10% of prevalence were not included on the table.

^e Pre-mixed flavored spirits.

behavior among the study sample. Almost 35% of the students engaged in BD at least one in their lifetime. This behavior was also common in the 30 days prior to the study (20.9%) and the frequency varied from one to five times (from 6.3% to 5.0%) in the past month. In general, the last episode of BD occurred in pubs and nightclubs (25.0%) or at friends' houses (25.0%), with friends and by drinking beer, alcopop (spirits mixed with soda or industrialized juice) and vodka.

Table 2 describes the study sample in relation to past-year BD and the covariates under study. Most of the respondents were girls (56.3% [95%CI 55.1–57.6%]), with an average age of 15.9 years (SD = 0.3), attending public schools (75.6% [95%CI 71.9–78.9%]) and living in the Southeast region of Brazil (42.7% [95%CI 38.5–46.9%]). According to the ABEP index, the majority of the students belonged to families with medium socioeconomic status (38.8% [95%CI 36.7–40.9%]) on the C stratum and 43.9% [95%CI 41.8–45.8%] on the B stratum). Only 50 cases were found on the lowest stratum ($E = 0.4%$ [95%CI 0.3–0.5%]). Being an older boy attending private school and belonging to the high socioeconomic SES were associated with past-year BD on the crude analysis.

In Brazil as a whole, being part of the most favored SES group increased by 84% (aOR = 1.84; 95%CI 1:52–2:24) the odds of a student having engaged in BD in the past year as compared to the pool of students of all other SES combined. Fig. 1 presents regional differences on the odds ratio estimates with covariate adjustment for sex, age and type of school. This association was significant across all regions, but was strongest in the poorest regions of the country (North: aOR = 2.29 [95%CI: 1.57–3.36] and the Northeast: aOR = 2.04 [95%CI: 1.64–2.54]). Table 3 presents the odds ratios for the control variables. Older age was the only significant covariate in the five

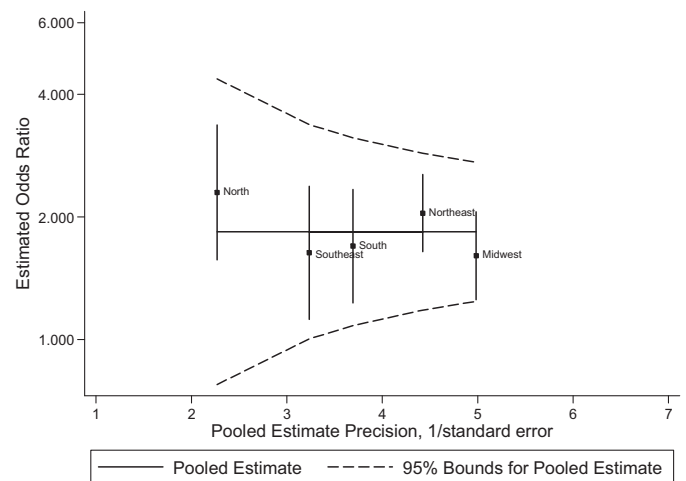


Fig. 1. Funnel-plot for the adjusted odds ratio of high SES and recent binge drinking (past-year) in five Brazilian regions.

regions, increasing from 40% to 54% the odds of belonging to the group who engaged in BD. Table 4 compares the different SES categories, using the higher SES as a reference for the first columns and lower SES as a reference in the last columns. In the analysis in which the reference encompasses the students of social class A (the richest class), there is a clear inverse gradient of odds ratio controlled for sex, age and type of school in Brazil as a whole and in the five geo-economic regions in separate. Despite all the gradients being well defined in all regions, showing that those who belong to the higher SES were at greater risk than those who belong to lower SES classes, the greatest difference between the adjusted odds among different strata is in the Midwest. In this region, the drop from one stratum to another decreased in 20% the odds of BD, while the poorest (low SES) were up to 70% (aOR = 0.34, 95%CI: 0.24–0.49) less likely to have engaged in binge in the past-year than the wealthiest (high SES).

The analysis using the poorest group as the reference group shows that there was not always a risk gradient between a lower class to the next higher classes, although this risk gradient always existed between the extremes SES (low and high). While the gradient is clear from the perspective of the risk level in Brazil as a whole (where the wealthier students were almost three times more likely than poor to have engaged in BD – aOR = 2.79, 95%CI: 2.18–3.58), when we examine the regions separately, we notice that in the Southeast region there was no difference between the two lower classes (medium-low SES and low SES) and in the North the only significant difference lies in the extremes (wealthiest versus poorest).

4. Discussion

4.1. Recap of main findings

Three substantive findings emerge from these analyses: (1) BD is a highly prevalent risk behavior among high school students in the 27 Brazilian state capitals, mainly among older boys, those studying in private versus public schools and those that belong to the highest SES (class A as categorized by ABEP index); (2) considering stratified analyses for each of the five Brazilian macro-regions these result persist. It is worth noting that the poorer the region the stronger the association between SES and wealth (regions as Northeast and North, with smaller PIBs, presented higher odds ratios of binge drinking in the highest socioeconomic classes); (3) there is a very clear and consistent inverse gradient of association between SES and BD in all regions, considering the highest SES as reference;

Table 2
Descriptive weighted analysis of factors associated with recent binge drinking (past-year) among students in Brazilian high schools (N = 14,518).^a

	Recent binge yes				Recent binge no				Total				Bivariate	
	N	wt%	95%CI		N	wt%	95%CI		N	wt%	95%CI		Crude OR	95%CI
Gender														
Female	2218	49.4	47.1	51.5	5878	59.6	58.1	61.5	8096	56.3	55.1	57.6	Ref	
Male	2352	50.6	48.4	52.8	4041	40.4	39.9	41.9	6393	43.7	42.4	44.9	1.51	1.35 1.68
Age group														
14–15	1203	25.5	21.7	29.7	4193	41.5	38.1	44.9	5396	36.4	33.3	39.6	Ref	
16–18	3376	74.5	70.3	78.2	5746	58.5	55.1	61.9	9122	63.6	60.4	66.7	2.06	1.71 2.49
Type of school														
Private	2297	29.4	24.9	34.9	4180	22.1	19.1	25.3	6477	24.4	21.1	28.0	1.47	1.26 1.71
Public	2282	70.6	65.6	75.1	5759	77.9	74.6	80.8	8041	75.6	71.9	78.9	Ref	
SES^a														
A	1231	18.4	14.7	22.8	1662	10.3	8.6	12.3	2893	12.9	10.6	15.6	Ref	
B	2010	45.1	41.9	48.3	4451	43.3	41.2	45.3	6461	43.9	41.8	45.8	0.58	0.49 0.70
C	1202	32.3	30.1	35.9	3368	41.5	39.4	43.7	4570	38.8	36.7	40.9	0.44	0.37 0.54
D	112	2.9	2.3	3.6	425	4.6	3.9	5.3	537	4.0	3.5	4.6	0.36	0.27 0.48
E	24	0.6	0.4	1.0	33	0.3	0.2	0.4	50	0.4	0.3	0.5	1.13	0.59 2.19
Brazilian region														
North region	798	7.7	6.3	9.5	2329	12.4	10.3	14.7	3127	10.9	9.1	12.9	Ref	
Notheast region	1593	23.7	20.7	26.9	3805	28.7	25.4	32.2	5398	27.0	24.2	30.2	1.32	1.12 1.55
Midwest region	790	12.0	9.7	14.6	1536	11.8	10.5	13.8	2326	11.9	10.1	13.3	1.87	1.52 2.29
Southeast region	801	47.4	42.6	52.1	1525	40.5	35.9	45.2	2326	42.7	38.5	46.9	2.24	1.85 2.71
South region	597	9.2	7.6	11.2	744	6.6	5.2	8.3	1341	7.5	6.1	9.1	1.62	1.33 1.97

^a Missing data for the outcome measure was 1.3%.

^a SES according to ABEP scale (described in Section 2).

however, this gradient is not so clear when using the lowest SES as reference.

4.2. Selected limitations and offsetting strengths

Before detailed discussion of these findings, a few limitations should be mentioned. Data is based upon self-report, thus, the questions were subject to interpretation by the participants and to a possible information bias. However, the anonymous nature of the survey and the absence of the teacher in the classroom during the survey administration should help promote response validity. Also the question about a fictitious drug allowed us to drop the questionnaires with proved bias information. Some degree of non-participation (especially because of absence on the day of the survey) and data missingness excluded some students from the analysis. However, the levels of participation were larger than those obtained in the US Monitoring the Future study (Johnston et al., 2009), considering that almost all the students that were invited to participated agreed on participating in the survey. Another possible limitation is the fact that we used the ESPAD questions on binge drinking and, unfortunately, these questions do not differentiate the number of drinks to define BD by sex (Hibell et al., 2009).

4.3. Research issues

It is important to note that as this study is based upon a cross sectional survey, association does not imply causation. However, as we are dealing with high SES adolescents and their socio-economic position in society is based upon parents' income and education, it is hard to believe that their current SES would significantly change during the five years that encompass this period of life (adolescence). One must consider that there may be exceptions, however, in general, SES is a stable variable for adolescents (Spijkerman et al., 2008) and would not be dependent on the practice of BD. In adult studies, about the examination of causality related to SES is much more complex, since the drug itself could be acting as a causal factor to the decline of social class, for example, and may not be the cause of the drug use.

Although causal inference always requires extreme caution, we suggest that the data in this paper allows us, cautiously; to suggest that belonging to the higher SES classes in the capitals of any Brazilian macro-region is associated with the practice of BD.

Table 3

Results of the adjusted logistic regression for recent binge drinking (past-year) associated with the highest SES among high school students in the 27 Brazilian capitals and in the five geo-economic regions (N = 14,489).

Binge drinking in the past year	aOR	95%CI		p value
Brazil				
High SES ^a	1.84	1.52	2.24	<0.001
Male	1.40	1.26	1.57	<0.001
Age	1.47	1.38	1.55	<0.001
Private school	1.39	1.18	1.62	<0.001
North region				
High SES ^a	2.29	1.57	3.36	<0.001
Male	1.57	1.09	2.26	0.017
Age	1.45	1.25	1.68	<0.001
Private school	1.02	0.80	1.30	0.894
Northeast region				
High SES ^a	2.04	1.64	2.54	<0.001
Male	1.40	1.19	1.64	<0.001
Age	1.49	1.40	1.58	<0.001
Private school	1.22	0.98	1.51	0.075
South region				
High SES ^a	1.70	1.23	2.33	0.002
Male	1.24	0.93	1.65	0.140
Age	1.40	1.19	1.63	<0.001
Private school	1.47	1.07	2.01	0.019
Southeast region				
High SES ^a	1.63	1.12	2.38	0.011
Male	1.44	1.18	1.76	<0.001
Age	1.54	1.38	1.72	<0.001
Private school	1.64	1.20	2.23	0.002
Midwest region				
High SES ^a	1.61	1.25	2.06	<0.001
Male	1.18	0.90	1.54	0.227
Age	1.37	1.24	1.51	<0.001
Private school	1.38	1.04	1.83	0.026

^a High SES = "A" group according to the ABEP scale. The reference group was all other social classes compared to class A.

Table 4

Results of the adjusted logistic regression for recent binge drinking (past-year) associated with four levels of SES among high school students in the 27 Brazilian State Capitals and according to the 5 Brazilian geo-economic region, considering the two extreme classes as reference ($N = 14,489$).

Binge drinking in the past year	aOR	95%CI		p value	aOR	95%CI		p value	N
Brazil									
High SES	Ref				2.79	2.18	3.58	<0.001	2934
Medium-high SES	0.59	0.48	0.71	<0.001	1.65	1.40	1.94	<0.001	6553
Medium-low SES	0.49	0.39	0.63	<0.001	1.39	1.17	1.65	<0.001	2920
Low SES	0.36	0.28	0.46	<0.001	Ref				2307
North region									
High SES	Ref				2.73	1.52	4.91	0.001	744
Medium-high SES	0.48	0.33	0.70	<0.001	1.31	0.80	2.15	0.279	1384
Medium-low SES	0.39	0.25	0.62	<0.001	1.07	0.77	1.50	0.684	637
Low SES	0.37	0.20	0.65	0.001	Ref				407
Northeast region									
High SES	Ref				2.84	2.15	3.75	<0.001	921
Medium-high SES	0.52	0.41	0.65	<0.001	1.47	1.18	1.82	0.001	2036
Medium-low SES	0.51	0.38	0.66	<0.001	1.44	1.14	1.83	0.003	1227
Low SES	0.35	0.27	0.46	<0.001	Ref				1291
Midwest region									
High SES	Ref				2.89	2.01	4.15	<0.001	474
Medium-high SES	0.70	0.54	0.90	0.006	2.02	1.42	2.86	<0.001	1207
Medium-low SES	0.50	0.36	0.70	<0.001	1.46	1.00	2.12	0.050	384
Low SES	0.34	0.24	0.49	<0.001	Ref				283
Southeast region									
High SES	Ref				2.34	1.39	3.94	0.002	422
Medium-high SES	0.64	0.44	0.94	0.022	1.50	1.06	2.13	0.022	1174
Medium-low SES	0.58	0.36	0.92	0.022	1.35	0.93	1.96	0.112	497
Low SES	0.42	0.25	0.71	0.002	Ref				260
South region									
High SES	Ref				2.08	0.97	4.46	0.059	373
Medium-high SES	0.60	0.43	0.82	0.002	1.25	0.63	2.48	0.511	752
Medium-low SES	0.55	0.33	0.91	0.023	1.16	0.57	2.38	0.679	175
Low SES	0.48	0.22	1.02	0.059	Ref				66

Analysis controlled for age, sex and type of school.

High SES was defined as the "A" at ABEP scale, medium-high SES as the "B" at ABEP scale, medium low SES as the "C1" at the ABEP scale and low SES as the C2, D and E at the ABEP scale.

This association is most evident in the poorest regions (North and Northeast, with GDP per capita of US\$ 6385 and US\$ 4679) than in the richest (Southeast and Midwest, whose GDP per capita is almost double: US\$ 12,732 and US\$ 13,238 respectively, considering a parity of 1.6 Reais to 1 US dollar and data from the IBGE, 2008, 2011). It is noteworthy here that all comparisons of macro-economic and SES should be taken with caution, due to inequality of income distribution by countries, as suggested by RITTER and CHALMERS (2011). These researchers have shown evidence of direct association of alcohol consumption and the state of country's economy, suggesting that the pattern of use and daily amount used by a population vary in waves according to macro-economic variations. Certainly, it is hard to define the process of causal relation (if it truly exists). However, we speculate that three main pathways may exist: (1) financial: the richest adolescents have more pocket money to spend in nightclubs, pubs and parties to purchase drinks and/or (2) socio-cultural: there could be family factors that distinguish parental monitoring and rules in families with higher income versus families with lower income levels, and/or (3) behavioral: the feeling of omnipotence against the risk of intoxication and feeling of superiority derived from the emotional weight of being rich in a mostly low to middle income country.

Regarding financial issues, what could explain the increased risk of BD among those with SES in the poorest regions would be the question of parity of purchasing power. In the poorest regions, a person in a high SES class has greater purchasing power than a person with the same income (and also classified as high SES) living in the richest region, for example, which indirectly makes them even richer compared to the rest of the population living in that

specific region. This is consistent with Bellis et al. (2007) findings, among British adolescents: adolescents with more spending money were more likely to drink frequently, binge drink and to drink in public, as well as in a study of Martin et al. (2009) in the US, that found that college students with lower levels of spending money had lower levels of drinking and getting drunk.

It is noticeable that the high SES group is the only one that always presents itself at a greater risk than any other SES group, suggesting that the increased pocket money is not the only thing behind this association (otherwise, when we take the lowest class as reference, the gradient should be kept in all regions of Brazil), but there should be other socio-cultural and behavioral aspects that are shared by the wealthy class such as weaker parental supervision or felling of omnipotence or intangibility.

In the same direction, two Finnish studies, have discussed the issue of pocket money and suggested that the availability of money is at least to some degree related to parent's affluence and have a clear relationship with drunkenness among adolescents (Kouvonen and Lintonen, 2002; Lintonen et al., 2000). However, the relationship between SES and drunkenness among adolescents is not so clear in 27 other countries analyzed by the Health Behavior in School-aged Children study (HBSC). In this comparative study, in less than 20% of European countries there was evidence of increased risk associated with the higher classes. According to the authors, the regional differences of the association between SES and alcohol drunkenness depend on the alcohol culture of each country (Richter et al., 2006), which points to the need for this analysis for each individual country and highlights the relevance of the present study. Goodman and Huang (2002) offer a provocative

hypothesis that a SES gradient in health behavior is well established, with higher SES linked to better health. To the extent that BD is a manifestation of unhealthy behavior, the evidence from Brazil seems to contradict this hypothesis and goes deeply against the assertion that the SES gradient and health behavior is very well established.

Similar to what was found in Brazil, in a cohort study of adolescents in the United Kingdom, alcohol drinking was more common in young people from higher-income households but less common when the adolescents had a mother with a higher level of education as compared to having a mother with lower level of education. According to the authors, on one hand higher family income might increase the availability of alcohol in the family, on the other hand mothers with higher educational attainment might encourage more healthy behaviors in their children, including reduced alcohol use (Melotti et al., 2011). This could not be tested in our study since we did not collect data on maternal education (only the educational level of the head of the household, who could be either the mother or the father, according to the perception of the adolescent).

Analysis of the “Behavioral Risk Factor Surveillance System” (BRFSS) survey for the general US population aged 18 and older showed that binge drinking is more common among young adults (18–24 years) than among older adults. Different from Brazil, in the US the highest frequency and intensity of binge drinking by household income was reported by those with households incomes <\$25,000 (5.0 episodes per month and 8.5 drinks on occasion, respectively; CDC, 2009). According to data from the Monitoring the Future Survey (MTF), the same is true for US high school students. Although the MTF study does not include questions about family income, the researchers estimate students’ SES by their parents’ education level. Results from the 2010 MTF show that 10th grade high school students that have parents with the lowest education levels were two times more likely to have engaged in binge drinking in the past 15 days than students that have parents with the highest education level (23% versus 13%; Johnston et al., 2011).

Nevertheless, the association of binge drinking with SES is still contradictory. For instance, in Sweden, there is some evidence that SES is not associated with binge drinking among women. Abstainers had lower levels of education but binge drinkers did not differ in terms of social situation, mental or physical health, compared with other drinkers (Rundberg et al., 2008).

The data presented in this article shows does not support the role of poverty as a risk factor for alcohol abuse and binge drinking among adolescents (Guilamo-Ramos et al., 2005; Helasoja et al., 2007). It is important to note that it could be that high levels of binge drinking are common amongst high SES adolescents due to greater availability of pocket money however high illegal substance use could be common amongst lower SES adolescents if the prices of certain illicit substances are equivalent or cheaper than that of alcohol. We believe there is a need of future studies that investigate the association between SES and other drug use in Brazil (e.g., in household populations, among young adults) as well as in other developing countries to look for possible differences according to the price and availability of drugs.

In this field of research that shows controversial results about association of higher SES or income inequality on adolescent drinking, the fact that this analysis fails to explain why this phenomenon occurs does not invalidate the inverse gradient found in the relationship between binge drinking and SES, but points to the need of more probing research, with a mixed methods approach combining quantitative survey analysis with qualitative interviewing and social network analysis can help clarify the dynamic processes that produce the observed SES gradient (Tashakkori and Teddlie, 2010).

4.4. Conclusions

In summary, we set out to discover whether there would be a gradient of association of SES and BD among high school students in Brazil. However, contrary to what has been observed in developed countries, students living in Brazilian capitals may be at an increased risk of BD when they belong to the highest socioeconomic status in all regions. This association is stronger in the poorest regions of the country and a clear inverse OR gradient was detected. Older boys in private schools are in more risk for this behavior. Aspects of the local alcohol culture and weight to be rich in a highly unequal country may be influencing this result. Adolescents in other emerging economies might have the same association between high SES and BD.

Role of funding source

Funding for this study was provided by the SENAD (National Secretariat for Drug Policies) of the Brazilian Federal Government and FAPESP (post doctoral fellowship for Dr. Sanchez). SENAD and FAPESP have no further role in study design, the collection, analysis and interpretation of data, the writing of the report or in the decision to submit the paper for publication. Dr. Martins receives research support from the US National Institutes of Health – NIDA grant DA023434 and NICHD grant HD060072.

Contributors

Zila M. Sanchez wrote the first draft of the manuscript and did all the statistical analyses. Danilo P. Locatelli managed the literature review and contributed to the introduction and discussion section. Ana R. Noto revised the manuscript to improve contents. Silvia S. Martins supervised the analyzes and all the writing process.

Conflict of interest

The authors declare that there are no conflicts of interest.

Acknowledgements

We thank the SENAD for funding the National Survey on Drug Use among middle and high school students and Dr. EA Carlini, director of CEBRID and the CEBRID team.

References

- ABEP, 2008. Critério de Classificação Econômica Brasil [Internet]. Associação Brasileira de Empresas de Pesquisa. Available from: www.abep.org/codigosguias/Criterio_Brasil_2008.pdf.
- Baumann, M., Spitz, E., Guillemin, F., Ravaud, J.F., Choquet, M., Falissard, B., Chau, N., 2007. Associations of social and material deprivation with tobacco, alcohol, and psychotropic drug use, and gender: a population-based study. *Int. J. Health Geogr.* 6, 50.
- Bellis, M.A., Hughes, K., Morleo, M., Tocque, K., Hughes, S., Allen, T., Harrison, D., Ferrer, E., 2007. Predictors of risky alcohol consumption in schoolchildren and their implications for preventing alcohol-related harm. *Subst. Abuse Treat. Prev. Policy* 2, 15.
- CDC, 2009. Sociodemographic differences in binge drinking among adults—14 States, 2004. *MMWR* 58, 301–304.
- Chersich, M.F., Luchters, S.M., Malonza, I.M., Mwarogo, P., King’ola, N., Temmerman, M., 2007. Heavy episodic drinking among Kenyan female sex workers is associated with unsafe sex, sexual violence and sexually transmitted infections. *Int. J. STD AIDS* 18, 764–769.
- CIA, 2011. The World Factbook 2011. Washington. <https://www.cia.gov/library/publications/the-world-factbook/rankorder/2172rank.html>.
- Dietze, P.M., Jolley, D.J., Chikritzhs, T.N., Clemens, S., Catalano, P., Stockwell, T., 2009. Income inequality and alcohol attributable harm in Australia. *BMC Public Health* 9, 70.
- Elgar, F.J., Roberts, C., Parry-Langdon, N., Boyce, W., 2005. Income inequality and alcohol use: a multilevel analysis of drinking and drunkenness in adolescents in 34 countries. *Eur. J. Public Health* 15, 245–250.

- Galduroz, J., Caetano, R., 2004. Epidemiology of alcohol use in Brazil. *Rev. Bras. Psiquiatr.* 26 (Suppl. 1), S3–S6.
- Goodman, E., Huang, B., 2002. Socioeconomic status, depressive symptoms, and adolescent substance use. *Arch. Pediatr. Adolesc. Med.* 156, 448–453.
- Guilamo-Ramos, V., Jaccard, J., Turrissi, R., Johansson, M., 2005. Parental and school correlates of binge drinking among middle school students. *Am. J. Public Health* 95, 894–899.
- Gunja, N., 2011. Teenage toxins: recreational poisoning in the adolescent. *J. Paediatr. Child Health* (Epub ahead of print).
- Hanson, M.D., Chen, E., 2007. Socioeconomic status and health behaviors in adolescence: a review of the literature. *J. Behav. Med.* 30, 263–285.
- Helasoja, V., Lahelma, E., Prattala, R., Petkeviciene, J., Pudule, I., Tekkel, M., 2007. The sociodemographic patterning of drinking and binge drinking in Estonia, Latvia, Lithuania and Finland, 1994–2002. *BMC Public Health* 7, 241.
- Hibell, S., Guttormsson, U., Ahlström, S., Balakireva, O., Bjarnason, T., Kokkevi, A., Kraus, L., 2009. The 2007 ESPAD Report – Substance Use Among Students in 35 European Countries. The Swedish Council for Information on Alcohol and Other Drugs (CAN), Stockholm, Sweden.
- IBGE, 2010. *Contas Regionais do Brasil: 2004–2008*. Rio de Janeiro, 116 p.
- Inman, P., 2011. Brazil Overtakes UK as Sixth-largest Economy. *The Guardian*. <http://www.guardian.co.uk/business/2011/dec/26/brazil-overtakes-uk-economy>.
- Johnston, L.D., O'Malley, P.M., Bachman, J.G., Schulenberg, J.E., 2009. Monitoring the Future National Survey Results on Drug Use, 1975–2008. Volume I: Secondary School Students. National Institute on Drug Abuse, Bethesda, MD.
- Johnston, L.D., O'Malley, P.M., Bachman, J.G., Schulenberg, J.E., 2011. Monitoring the Future National Survey Results on Drug Use, 1975–2010. Volume I: Secondary School Students. Institute for Social Research, The University of Michigan, Ann Arbor.
- Kouvonen, A., Lintonen, T., 2002. Adolescent part-time work and heavy drinking in Finland. *Addiction* 97, 311–318.
- Kuntsche, E., Rehm, J., Gmel, G., 2004. Characteristics of heavy episodic drinkers in Europe. *Soc. Sci. Med.* 59, 113–127.
- Lintonen, T., Rimpela, M., Vikat, A., Rimpela, A., 2000. The effect of societal changes on drunkenness trends in early adolescence. *Health Educ. Res.* 15, 261–269.
- Martin, B.A., McCoy, T.P., Champion, H., Parries, M.T., Durant, R.H., Mitra, A., Rhodes, S.D., 2009. The role of monthly spending money in college student drinking behaviors and their consequences. *J. Am. Coll. Health* 57, 587–596.
- Melotti, R., Heron, J., Hickman, M., Macleod, J., Araya, R., Lewis, G., 2011. Adolescent alcohol and tobacco use and early socioeconomic position: the ALSPAC birth cohort. *Pediatrics* 127, e948–e955.
- Miller, J.W., Naimi, T.S., Brewer, R.D., Jones, S.E., 2007. Binge drinking and associated health risk behaviors among high school students. *Pediatrics* 119, 76–85.
- Nelson, D.E., Mowery, P., Asman, K., Pederson, L.L., O'Malley, P.M., Malarcher, A., Maibach, E.W., Pechacek, T.F., 2008. Long-term trends in adolescent and young adult smoking in the United States: metapatterns and implications. *Am. J. Public Health* 98, 905–915.
- Pinsky, I., Sanches, M., Zaleski, M., Laranjeira, R., Caetano, R., 2010. Patterns of alcohol use among Brazilian adolescents. *Rev. Bras. Psiquiatr.* 32, 231–241.
- Pitkänen, T., Lyyra, A., Pulkkinen, L., 2005. Age of onset of drinking and the use of alcohol in adulthood: a follow-up study from age 8–42 for females and males. *Addiction* 100, 652–661.
- Richter, M., Leppin, A., Gabhainn, S., 2006. The relationship between parental socioeconomic status and episodes of drunkenness among adolescents: findings from a cross-national survey. *BMC Public Health* 6, 289.
- Ritter, A., Chalmers, J., 2011. The relationship between economic conditions and substance use and harm. *Drug Alcohol Rev.* 30, 1–3.
- Romano, M., Duailibi, S., Pinsky, I., Laranjeira, R., 2007. Alcohol purchase survey by adolescents in two cities of State of Sao Paulo, Southeastern Brazil. *Rev. Saude Publ.* 41, 495–501.
- Rundberg, J., Lidfeldt, J., Nerbrand, C., Samsioe, G., Romelsjö, A., Ojehagen, A., 2008. Abstinence, occasional drinking and binge drinking in middle-aged women. The Women's Health in Lund Area (WHILA) Study. *Nord. J. Psychiatry* 62, 186–191.
- Sanchez, Z.M., Martins, S.S., Opaleye, E.S., Moura, Y.G., Locatelli, D.P., Noto, A.R., 2011. Social factors associated to binge drinking: a cross-sectional survey among Brazilian students in private high schools. *BMC Public Health* 11, 201.
- Silveira, C., Silveira, C., Silva, J., Silveira, L., Andrade, A., Andrade, L., 2008. Epidemiologia do beber pesado e beber pesado episódico no Brasil: uma revisão sistemática da literatura. *Rev. Psiquiatr. Clín.* 35 (Suppl. 1), 31–38.
- Smart, R.G., Hughes, D.P.H., Johnston, L.D., 1980. *Methodology for Students Drug-use Surveys*. World Health Organization, Geneva.
- Soldera, M., Dalgalarrodo, P., Correa Filho, H.R., Silva, C.A., 2004. Use of psychotropics drugs among students: prevalence and associated social factors. *Rev. Saude Publ.* 38, 277–283.
- Spijkerman, R., van den Eijnden, R.J., Huiberts, A., 2008. Socioeconomic differences in alcohol-specific parenting practices and adolescents' drinking patterns. *Eur. Addict. Res.* 14, 26–37.
- Tashakkori, A., Teddlie, C., 2010. *SAGE Handbook of Mixed Methods in Social and Behavioral Research*. SAGE, Thousand Oaks.
- Wechsler, H., Nelson, T.F., 2001. Binge drinking and the American college student: what's five drinks? *Psychol. Addict. Behav.* 15, 287–291.
- Zhao, G., Wu, C., Houston, R.J., Creager, W., 2010. The effects of binge drinking and socio-economic status on sober driving behavior. *Traffic Inj. Prev.* 11, 342–352.