Heavy episodic drinking trends in the Brazilian state capitals and Federal District, 2006-2018: an ecological time series analysis*

Zila van der Meer Sanchez[1] – ⓘ orcid.org/0000-0002-7427-7956
Thais Cláudia Roma de Oliveira Konstantyner[1] – ⓘ orcid.org/0000-0002-2289-1866
Gabriela Arantes Wagner[1] – ⓘ orcid.org/0000-0001-6070-7233
Maristela Goldnadel Monteiro[2] – ⓘ orcid.org/0000-0001-9527-0967
Camila Bertini Martins[1] – ⓘ orcid.org/0000-0002-8252-8815

[1]Universidade Federal de São Paulo, Departamento de Medicina Preventiva, São Paulo, SP, Brazil
[2]Pan American Health Organization, Washington, DC, USA

Abstract

Objective: To assess heavy episodic drinking trends in the 26 Brazilian state capitals and Federal District, overall and according to sex. **Methods:** This was an ecological time series study of heavy episodic drinking patterns among adults, from 2006 to 2018. The data were obtained from VIGITEL Survey time series. Prais-Winsten regression was used. **Results:** In the period studied a stationary heavy episodic drinking trend was found in 23 out of the 27 state capitals, with the exception of Macapá, where there was a decrease in this practice, and in São Paulo, Florianópolis and the Federal District, where an increase was found. There were important differences by sex in relation to heavy episodic drinking, with a tendency to increased consumption among women in seven state capitals. **Conclusion:** There was no reduction in heavy episodic drinking in most capitals, showing the urgency of implementing interventions to reduce alcohol consumption among the Brazilian population.

Keywords: Binge Drinking; Alcoholic Beverages; Brazil; Risk Factors; Telephone Survey; Time Series Studies.

Correspondence:
Zila M. Sanchez – Universidade Federal de São Paulo, Departamento de Medicina Preventiva, Rua Botucatu, No. 740, 4° andar, Vila Clementino, São Paulo, SP, Brazil. Postcode: 04024-002
E-mail: zila.sanchez@unifesp.br

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Introduction

Alcohol use accounts for 2.2% and 7.1% of the global disease burden for males and females, respectively. This substance is the main risk factor for death and disability among the 15-49 year-old population. In 2016, some three million deaths worldwide were attributed to alcohol use.[1]

In Brazil were are still at an incipient stage in preparing an epidemiological surveillance system for alcohol that takes into account the overall consumption indicators suggested by the World Health Organization (WHO), such as liters of alcohol *per capita*.[2] At the moment, the only indicator of harmful alcohol use monitored annually by the federal government is the pattern known as 'heavy episodic drinking' (HED) or binge drinking. This pattern, characterized by consumption of five measures of alcoholic beverage by males and four measures by females on a single occasion, is associated with diverse individual and social risk behaviors.[3]

> **The only indicator of harmful alcohol use monitored annually by the federal government is the pattern known as 'heavy episodic drinking' or binge drinking.**

In the general population, HED has been identified as a consumption pattern associated with increased odds of accidents, even when only practiced on a single occasion. This pattern can result in consequences directly related to the state of intoxication, such as hangovers, passing out, memory loss, nausea and vomiting, apart from increased likelihood of sexual abuse, suicide attempts and unprotected sex.[4] However, this pattern does not indicate regular consumption, as it only indicates the quantity consumed per occasion.[5]

In August 2019, the mass media highlighted information that alcohol consumption had increased among Brazilians,[6,7] taking as their reference the results of the Non-Communicable Disease Risk and Protective Factors Surveillance Telephone Survey (VIGITEL).[8]

However, the Health Ministry report did not present results regarding consumption trends in the cities covered by the survey, making it impossible to gain understanding of the distribution of this event in different regions of the national territory, nor to identify any distinct patterns in the Brazilian population.

The purpose of this article was to assess HED trends in the Brazilian state capitals and Federal District in the last 30 days, by sex, based on the VIGITEL Survey time series for the period 2006-2018.

Methods

This is an ecological time series study of heavy episodic drinking patterns among adults conducted in the 26 Brazilian state capitals and Federal District between 2006 and 2018.

The data were retrieved from the VIGITEL Survey[8] reports available on the Ministry of Health website (http://www.saude.gov.br/saude-de-a-z/vigitel#resultados). With effect from 2006, the VIGITEL Survey has collected information on people resident in the 26 Brazilian state capitals and Federal District aged 18 years old or over, selected by means of probabilistic sampling conducted in two stages: random selection of landline telephones; and random selection of a resident in each household to be interviewed. The system establishes a sample size of approximately 2,000 individuals per municipality for each year data is collected. This enables the frequency of any risk factors in the adult population to be estimated with a maximum error of two percentage points, with a 95% confidence coefficient, enabling stratification by sex.

Each year similar sample sizes with around 2,000 respondents per state capital, totaling some 54,000 individuals, are included in the study, following the same sampling structure. However, it should be noted that in 2012 there was a change in the sample weighting calculation, although this did not impact the trends observed.[9] Following the change in the post-stratification weighting calculation methodology in 2012, rake weighting was calculated for all the VIGITEL databases. This post-stratification weighting corrects possible flaws due to low residential telephone coverage in some cities.[9] However, the Survey only provides representation of the cities involved and not of Brazil as a whole.

The response variable was excessive alcohol consumption, obtained by means of the following questions:

In the last 30 days, have you drunk four or more drinks of alcoholic beverage on a single occasion?

(four measures of alcoholic beverage would be four cans of beer, four glasses of wine or four measures of sugar

cane rum, whisky or other distilled alcoholic beverage, in this question asked only of females)

In the last 30 days, have you drunk five or more measures of alcoholic beverage on a single occasion?

(five measures of alcoholic beverage would be four cans of beer, four glasses of wine or four measures of sugar cane rum, whisky or other distilled alcoholic beverage, in this question asked only of males)

There were two answer options for both questions: yes; no. In the case of the VIGITEL Survey, 'abusive consumption of alcohol' is taken to be intake of five or more measures (males) or four or more measures (females) on a single occasion, at least once in the 30 days prior to the interview.[8]

For the analysis performed in this study, we built time series based on the weighted percentage of adults reporting HED in the last month between 2006 and 2018, for the 26 state capitals and the Federal District, stratified by sex. The base-10 logarithm transformation of percentage HED was taken to be the dependent variable (log[y]) and the centralized year was taken to be the independent variable (x). The Prais-Winsten model[10] was used for trend analysis. As such, we estimated annual percent change (APC) and respective 95% confidence intervals. Trend was considered to be present when zero did not fall within the APC 95%CI, where (i) trend was 'rising' when APC was positive and (ii) trend was 'falling' when APC was negative. When zero fell within the APC 95%CI, trend was considered to be 'stationary'. R version 3.6.1 was used to perform all the analyses.

The VIGITEL Survey was approved by the National Research Ethics Committee (CONEP)/National Health Council, for each year the survey was conducted. In relation to 2018, the Certificate of Submission for Ethical Appraisal to CONEP was recorded under number 65610017.1.0000.0008

Results

There was no fall in HED in the absolute majority of the Brazilian state capitals (23/27 = 85%), and the overall trend was stationary. However, a reduction of -1.51% (95%CI -2.61%;-0.40%) in the annual percentage of this practice was found in the city of Macapá. In São Paulo, Florianópolis and the Federal District, average annual percent change increased by 2.36% (95%CI

1.48%;325%), 1.84% (95%CI 1.27%;2.42%) and 2.62% (95%CI 0.62%;4.67%), respectively (Table 1).

When stratifying by sex, an increase in HED among males in the Federal District and Florianópolis was found. There was a reduction in HED among males in seven state capitals: Macapá, Manaus, João Pessoas, São Luís, Teresina, Belo Horizonte and Porto Alegre.

No falling HED trends were found for females in any of the state capitals, while there was a rising trend among females in seven of them: Aracaju, Cuiabá, Goiânia, Belo Horizonte, São Paulo, Curitiba and Florianópolis.

Discussion

The results show important differences in HED trend among the Brazilian population, according to state capital of residence and sex of the interviewees, in a sample of residents who owned landline telephones.

It stands out that there was no reduction in alcoholic beverage consumption in the majority of the state capitals. As such, Brazil has not reacted adequately in relation to the United Nations Organization proposal for the Millennium Development Goals.[11] However, it should be highlighted that the VIGITEL Survey results do not provide a representative sample of the Brazilian population as a whole, but rather enable inferences only for adults living in the Brazilian state capitals and Federal District in households that have landline telephones.[12]

It is consensus in the international literature that the best way of reducing social harm associated with alcohol consumption consists of implementing public policies to restrict access, such as pricing policies and reduced advertising.[2] At the time this study was concluded, Brazil had not brought itself in line with the policies proposed by WHO in this field of environmental prevention, and generally speaking its federal policies had remained unaltered, with the exception of drink driving legislation.[13]

As a federative republic, Brazil confers autonomy on its states to propose and put into force public policies that aim to reduce risk factors to which their populations are subject. In the case of alcohol, the states and municipalities are competent to legislate on all policies on control of access to alcoholic beverages, as long as such policies do not contradict Federal Legislation on the subject. However, it is known that the states only tend to adhere to federal laws, and these have demonstrated low effectiveness in reducing the costs arising from alcohol

Table 1 – Trend and annual percent change in prevalence of adult abusive alcohol consumption,[a] Brazilian state capitals and Federal District, 2006-2018

Capitals and Federal District	Total			Male			Female		
	%[b]	APC[c]	95%CI[d]	%[b]	APC[c]	95%CI[d]	%[b]	APC[c]	95%CI[d]
North									
Belém	18.48	-1.31	(-3.62;1.05)	29.10	-1.55	(-3.87;0.84)	9.45	-0.87	(-4.46;2.87)
Boa Vista	17.48	-0.44	(-3.27;2.47)	26.15	-1.23	(-3.77;1.38)	8.94	2.39	(-2.85;7.90)
Macapá	18.75	**-1.51**	**(-2.61;-0.40)↓**	29.67	**-2.10**	**(-3.23;-0.96)↓**	8.52	0.77	(-0.75;2.32)
Manaus	15.22	-2.56	(-5.30;0.26)	24.75	**-3.51**	**(-6.06;-0.89)↓**	6.51	0.49	(-5.50;6.85)
Rio Branco	14.51	-0.68	(-2.72;1.39)	21.79	-1.13	(-2.34;0.09)	7.81	0.67	(-3.93;5.50)
Palmas	20.46	0.51	(-1.33;2.39)	30.32	0.51	(-1.41;2.47)	10.93	1.45	(-0.60;3.54)
Porto Velho	18.25	-0.18	(-1.47;1.13)	26.78	-0.49	(-1.99;1.03)	9.44	-0.06	(-3.34;3.34)
Northeast									
Aracaju	19.42	0.31	(-1.52;2.17)	29.87	-1.12	(-3.21;1.01)	10.49	**3.57**	**(1.41;5.77)↑**
Fortaleza	16.61	-1.65	(-3.83;0.58)	26.76	-2.34	(-4.70;0.07)	8.16	-0.16	(-2.87;2.62)
Maceió	18.04	-0.90	(-3.11;1.37)	28.26	-0.87	(-3.00;1.32)	9.61	-0.79	(-4.51;3.07)
Natal	17.39	-0.63	(-2.29;1.05)	28.57	-1.32	(-3.49;0.90)	8.07	1.33	(-0.33;3.03)
João Pessoa	16.84	-1.48	(-3.92;1.02)	28.04	**-2.05**	**(-3.84;-0.22)↓**	7.63	-0.71	(-5.48;4.31)
Salvador	23.32	-0.04	(-1.44;1.37)	32.31	-0.98	(-2.08;0.13)	15.51	1.03	(-1.89;4.03)
São Luís	19.45	-1.48	(-2.93;0.00)	31.39	**-2.21**	**(-2.95;-1.47)↓**	9.61	1.13	(-3.29;5.74)
Recife	19.75	-0.72	(-2.69;1.30)	29.47	-1.51	(-3.13;0.13)	12.03	0.89	(-1.89;3.76)
Teresina	20.41	-1.09	(-2.27;0.10)	32.59	**-2.02**	**(-3.24;-0.77)↓**	10.42	1.23	(-0.46;2.95)
Midwest									
Distrito Federal	19.76	**2.62**	**(0.62;4.67)↑**	28.32	**2.45**	**(0.19;4.76)↑**	12.26	3.09	(-0.29;6.59)
Cuiabá	20.66	1.17	(-0.16;2.52)	30.63	-0.16	(-1.83;1.53)	11.49	**4.57**	**(3.05;6.11)↑**
Campo Grande	17.36	0.61	(-1.49;2.76)	26.01	0.79	(-1.38;3.01)	9.54	0.17	(-2.38;2.80)
Goiânia	17.82	1.63	(-0.10;3.39)	26.37	0.84	(-1.05;2.77)	10.40	**3.80**	**(1.19;6.48)↑**
Southeast									
Belo Horizonte	20.74	0.37	(-0.17;0.92)	29.17	**-0.91**	**(-1.62;-0.19)↑**	13.62	**2.76**	**(1.36;4.18)↑**
Rio de Janeiro	19.13	0.68	(-0.81;2.19)	26.57	0.67	(-0.49;1.85)	12.66	1.19	(-0.81;3.23)
São Paulo	14.62	**2.36**	**(1.48;3.25)↑**	22.27	1.21	(-0.14;2.58)	7.99	**5.43**	**(3.09;7.82)↑**
Vitória	19.70	0.93	(-0.60;2.48)	27.92	0.04	(-1.16;1.25)	14.28	2.92	(-0.64;6.62)
South									
Curitiba	13.66	1.88	(-0.38;4.19)	22.02	0.89	(-0.74;2.55)	6.42	**5.03**	**(0.34;9.94)↑**
Florianópolis	19.61	**1.84**	**(1.27;2.42)↑**	29.50	**1.41**	**(0.46;2.37)↑**	10.68	**3.15**	**(1.39;4.93)↑**
Porto Alegre	15.32	-0.37	(-1.05;0.31)	22.22	**-1.46**	**(-2.56;-0.35)↓**	9.65	1.28	(-0.07;2.64)

a) Abusive alcohol consumption: five or more measures for males and four or more measures for females on a single occasion, at least once in the last 30 days.

b) Average percentage consumption in the period analyzed.

c) APC: annual percent change.

d) 95%CI: 95% confidence interval.

Notes:

↑Significant rising trend.

↓Significant falling trend.

consumption. These costs are not limited to expenditure on health, but also include lost productivity and several other forms of social harm, especially environmental and domestic violence.[14]

If Brazil intends to make progress with social protection against the effects resulting from abusive alcohol use and leave behind the average profile of stagnation identified in this study, then it must urgently start discussing policies on restricted access to alcohol which have been proven to be essential for reducing intake of alcoholic beverages worldwide and, consequently, reducing their impact on the global burden of the disease.[15]

Apart from this, a national alcohol surveillance system needs to be put in place, based on international indicators.[16] Within alcohol surveillance, the measurement used for HED does not appear to be the most adequate, since it does not include frequency of consumption nor the real amount of ethanol consumed, classifying as cases both adults with a single episode of binge drinking per month, such as drinking five cans of beer

on a single occasion, and also adults who consume this amount or more every day. HED pattern as an indicator of harmful alcohol use has low sensitivity to changes in total consumption by drinkers, and the choice of its use in Brazil will limit evaluation of the effect of future legislation aimed at restricting access to alcohol.

Finally, standing out in the analysis stratified by sex is the increase in alcohol consumption following the HED pattern, above all among females, in seven state capitals, whilst among males this increase was only found in two state capitals. The rising trend in HED among females has been the subject of debate in Brazil since 2010, following evidence found among adolescents.[17] This finding is not uncommon and has also been described recently in relation to the United States population. According to McKetta & Keys,[18] despite the prevalence of women practicing binge drinking being lower than that of men, women showed a greater trend of increased consumption between 2006 and 2018, coinciding with the period covered by our study. A variety of hypotheses regarding this phenomenon can be discussed. One of them relates to alcohol industry marketing focusing on the female target population, using products that are more attractive to them.[19] Another hypothesis relates to changes in women's social roles and excessive workload, which may lead, incorrectly, to them using alcohol as a form of self-medication to cope with anxiety and stress.[20]

The VIGITEL Survey has some important limitations, already mentioned above, such as not being representative of regions outside of the state capitals nor of people who do not have landline telephones; as well as the fact of it not containing questions about general alcohol consumption among the population, so that it is impossible to infer whether there is an increase in the number of drinkers in Brazil or in the amount they consume.[8]

When evaluating the general population, this study demonstrates stagnation in alcohol consumption according to the HED pattern between 2006 and 2018. Stratification by sex reveals a scenario of concern, highlighting the increase in excessive drinking episodes by women in seven of the 27 Brazilian state capitals. Alcohol policies seek to reduce consumption and, consequently, to reduce alcohol morbidity and mortality, so that both the stagnation and the increase in consumption found by the VIGITEL Survey reflect the insufficiency of these policies. We suggest that an alcohol surveillance system be implemented, including annual *per capita* consumption, measurements of consumption patterns (quantity and frequency, prevalence of abstainers and former-drinkers), data on alcohol-associated morbidity and mortality, as well as a system for evaluating federal and state-level public alcohol policies, consistent with the WHO Global Strategy to Reduce the Harmful Use of Alcohol,[16] aimed at achieving a measurable and substantial reduction in harmful alcohol use in Brazil.

Authors' contributions

Sanchez ZM was responsible for the concept of the manuscript and drafting it. Wagner GA and Monteiro MG reviewed and corrected the final version of the manuscript and contributed to the discussion on the study's results and limitations. Martins CB and Konstantyner TCRO were responsible for analyzing and interpreting the results. Konstantyner TCRO structured the database, planned and performed the first version of the analyses. Martins CB repeated the analyses for the purposes of verification and drafted the results. All the authors critically reviewed the manuscript, approved its final version and are responsible for the contents presented.

References

1. World Health Organization - WHO. Global status report on alcohol and health 2018 [Internet]. Geneva: World Health Organization; 2018 [cited 2019 Aug 19]. 450 p. Available from: https://apps.who.int/iris/bitstream/handle/10665/274603/9789241565639-eng.pdf?ua=1

2. Monteiro MG. Políticas públicas para a prevenção dos danos relacionados ao consumo de álcool. Epidemiol Serv Saúde [Internet]. 2016 jan-mar [citado 2020 jun 30];25(1):171-4. Disponível em: http://dx.doi.org/10.5123/S1679-49742016000100017

3. Sanchez ZM. A prática de *binge drinking* entre jovens e o papel das promoções de bebidas alcoólicas: uma questão de saúde pública. Epidemiol Serv Saúde [Internet]. 2017 jan-mar [citado 2020 jun 30];26(1):195-8. Disponível em: http://dx.doi.org/10.5123/s1679-49742017000100020

4. Kuntsche E, Kuntsche S, Thrul J, Gmel G. Binge drinking: health impact, prevalence, correlates and interventions. Psychol Health [Internet]. 2017 Aug [cited 2020 Jun 3-];32(8):976-1017. Available from: https://doi.org/10.1080/08870446.2017.1325889

5. Norström T, Ramstedt M. Mortality and population drinking: a review of the literature. Drug Alcohol Rev [Internet]. 2005 Nov [cited 2020 Jun 30];24(6):537-47. Available from: https://doi.org/10.1080/09595230500293845

6. Pinheiro C. Consumo abusivo de álcool cresceu quase 40% entre as mulheres. Veja Saúde [Internet]. 2019 ago [citado 2020 jun 29]. Disponível em: https://saude.abril.com.br/alimentacao/consumo-abusivo-de-alcool-cresceu-quase-40-entre-as-mulheres/

7. Ministério da Saúde (BR). Consumo abusivo de álcool aumenta 42,9% entre as mulheres [Internet]. Brasília: Ministério da Saúde; 2019 [citado 2020 jun 29]. Disponível em: https://saude.gov.br/noticias/agencia-saude/45613-consumo-abusivo-de-alcool-aumenta-42-9-entre-as-mulheres

8. Ministério da Saúde (BR). Secretaria de Vigilância em Saúde. Vigitel: o que é, como funciona, quando utilizar e resultados [Internet]. Brasília: Ministério da Saúde; 2019 [citado 2019 ago 19]. Disponível em: http://www.saude.gov.br/saude-de-a-z/vigitel#resultados

9. Bernal RTI, Iser BPM, Malta DC, Claro RM. Sistema de vigilância de fatores de risco e proteção para doenças crônicas por inquérito telefônico (Vigitel): mudança na metodologia de ponderação. Epidemiol Serv Saúde [Internet]. 2017 out-dez [citado 2020 jun 30];26(4):701-12. Disponível em: https://doi.org/10.5123/s1679-49742017000400003

10. Antunes JLF, Cardoso MRA. Uso da análise de séries temporais em estudos epidemiológicos. Epidemiol Serv Saúde [Internet]. 2015 jul-set [citado 2020 jun 30];24(3):565-76. Disponível em: https://doi.org/10.5123/S1679-49742015000300024

11. United Nations. Sustainable development goals – about the sustainable development goals [Internet]. [S.l]: United Nations; 2020 [cited 2020 May 20. Available from: http://www.un.org/sustainabledevelopment/sustainable-development-goals/

12. Munhoz TN, Santos IS, Nunes BP, Mola CL, Silva ICMD, Matijasevich A. Trends in alcohol abuse in Brazilian state capitals from 2006 to 2013: an analysis of data from the Vigitel survey. Cad Saúde Pública [Internet]. 2017 [cited 2020 Jun 30];33(7):e00104516. Available from: https://doi.org/10.1590/0102-311x00104516

13. Nakaguma MY, Restrepo BJ. Restricting access to alcohol and public health: Evidence from electoral dry laws in Brazil. Health Econ [Internet]. 2018 Jan [cited 2020 Jun 30];27(1):141-56. Available from: https://doi.org/10.1002/hec.3519

14. Shield KD, Probst C, Rehm J. A "buck a beer," but at what cost to public health? Can J Public Health [Internet]. 2019 Aug [cited 2020 Jun 30];110(4):512-5. Available from: https://doi.org/10.17269/s41997-019-00184-6

15. Madureira-Lima J, Galea S. Alcohol control policies and alcohol consumption: an international comparison of 167 countries. J Epidemiol Community Health [Internet]. 2018 Oct [cited 2020 Jun 30];72(1):54-60. Available from: http://dx.doi.org/10.1136/jech-2017-209350

16. World Health Organization - WHO. Global strategy to reduce the harmful use of alcohol [Internet]. Geneva: World Health Organization, 2010 [cited 2020 Feb 2]. 33 p. Available from: https://www.who.int/substance_abuse/publications/global_strategy_reduce_harmful_use_alcohol/en/

17. Carlini E, Noto A, Sanchez Z, Carlini C, Locatelli D, Abeid L, et al. (2010). VI Levantamento nacional sobre o consumo de drogas psicotrópicas entre estudantes do ensino fundamental e médio das redes pública e privada de ensino nas 27 capitais brasileiras 2010 [Internet]. Brasília: SENAD; 2010 [citado 2020 maio 8]. 503 p. Disponível em: https://www.cebrid.com.br/wp-content/uploads/2012/10/VI-Levantamento-Nacional-sobre-o-Consumo-de-Drogas-Psicotrópicas-entre-Estudantes-do-Ensino-Fundamental-e-Médio-das-Redes-Pública-e-Privada-de-Ensino-nas-27-Capitais-Brasileiras.pdf

18. McKetta S, Keyes KM. Heavy and binge alcohol drinking and parenting status in the United States from 2006 to 2018: an analysis of nationally representative cross-sectional surveys. PLoS Med [Internet]. 2019 Nov [cited 2020 Jun 30];16(11):e1002954. Available from: https://doi.org/10.1371/journal.pmed.1002954

19. Gonzalez I. 10 Gross examples of gendered alcohol marketing. Temper [Internet]. 2019 Jan [cited 2020 Jun 29]. Available from: https://www.thetemper.com/10-gross-examples-of-gendered-alcohol-marketing/

20. Haighton C, Kidd J, O'Donnell A, Wilson G, McCabe K, Ling J. 'I take my tablets with the whiskey': a qualitative study of alcohol and medication use in mid to later life. PLoS One [Internet]. 2018 Oct [cited 2020 Jun 30];13(10):e0205956. Available from: https://doi.org/10.1371/journal.pone.0205956