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Prevalence of alcohol and tobacco use among Brazilian adolescents: a systematic review

Prevalência de consumo de álcool e tabaco entre adolescentes brasileiros: revisão sistemática

ABSTRACT

OBJECTIVE: To analyze alcohol and tobacco use among Brazilian adolescents and identify higher-risk subgroups.

METHODS: A systematic review of the literature was conducted. Searches were performed using four databases (LILACS, MEDLINE /PubMed, Web of Science, and Google Scholar), specialized websites and the references cited in retrieved articles. The search was done in English and Portuguese and there was no limit on the year of publication (up to June 2011). From the search, 59 studies met all the inclusion criteria: to involve Brazilian adolescents aged 10-19 years; to assess the prevalence of alcohol and/or tobacco use; to use questionnaires or structured interviews to measure the variables of interest; and to be a school or population-based study that used methodological procedures to ensure representativeness of the target population (i.e. random sampling).

RESULTS: The prevalence of current alcohol use (at the time of the investigation or in the previous month) ranged from 23.0% to 67.7%. The mean prevalence was 34.9% (reflecting the central trend of the estimates found in the studies). The prevalence of current tobacco use ranged from 2.4% to 22.0%, and the mean prevalence was 9.3%. A large proportion of the studies estimated prevalences of frequent alcohol use (66.7%) and heavy alcohol use (36.8%) of more than 10%. However, most studies found prevalences of frequent and heavy tobacco use of less than 10%. The Brazilian literature has highlighted that environmental factors (religiosity, working conditions, and substance use among family and friends) and psychosocial factors (such as conflicts with parents and feelings of negativeness and loneliness) are associated with the tobacco and alcohol use among adolescents.

CONCLUSIONS: The results suggest that consumption of alcohol and tobacco among adolescents has reached alarming prevalences in various localities in Brazil. Since unhealthy behavior tends to continue from adolescence into adulthood, public policies aimed towards reducing alcohol and tobacco use among Brazilians over the medium and long terms may direct young people and the subgroups at higher risk towards such behavior.

DESCRIPTORS: Adolescent. Adolescent Behavior. Smoking, epidemiology. Alcohol Drinking, epidemiology. Review. Brazil.

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RESUMO

OBJETIVO: Analisar o uso de álcool e tabaco em adolescentes brasileiros e identificar os subgrupos de maior risco.

MÉTODOS: Foi realizada revisão sistemática da literatura. A busca dos artigos foi feita em quatro bases de dados (LILACS, MEDLINE/PubMed, Web of Science e Google Scholar), websites especializados e referências dos artigos selecionados. Foram selecionadas referências em inglês e português, sem limites para ano de publicação (até junho de 2011), das quais foram incluídos 59 artigos que atenderam aos critérios de inclusão: envolver adolescentes brasileiros de dez a 19 anos de idade; avaliar a prevalência do uso de álcool e/ou de tabaco; usar questionários ou entrevistas estruturadas para mensurar as variáveis de interesse; ser um estudo populacional ou de base escolar que adotou procedimentos metodológicos para garantir a representatividade da população alvo (isto é, amostra aleatória).

RESULTADOS: A prevalência de uso atual de álcool (uso na época da pesquisa ou no mês anterior) variou de 23,0% a 67,7%. A prevalência média (refletindo uma tendência central das estimativas encontradas nos estudos) de uso atual de álcool foi de 34,9%. A prevalência de uso atual de tabaco variou de 2,4% a 22,0%, com uma prevalência média de 9,3%. Grande parte dos estudos estimou prevalências superiores a 10% para o uso frequente (66,7%) e pesado (36,8%) de álcool; a maioria deles estimou prevalências menores de 10% para o uso frequente e pesado de tabaco. A literatura nacional tem destacado a associação de fatores ambientais (religiosidade, condição de trabalho e uso de substâncias entre os amigos e parentes) e psicossociais (como conflitos com pais e sentimentos negativos e de solidão) com o uso de álcool e tabaco entre os adolescentes.

CONCLUSÕES: Os resultados sugerem que o consumo de álcool e tabaco entre adolescentes tem atingido alarmantes prevalências em várias localidades do Brasil. Como hábitos não saudáveis tendem a continuar da adolescência até a vida adulta, políticas públicas que visam à redução do uso de álcool e de tabaco na população brasileira a médio e longo prazos podem direcionar a população jovem e os subgrupos de maior risco a esses comportamentos.

DESCRIPTORS: Adolescente. Comportamento do Adolescente. Tabagismo, epidemiologia. Consumo de Bebidas Alcoólicas, epidemiologia. Revisão. Brasil.

INTRODUCTION

Tobacco use is an important modifiable risk factor for the development of non-communicable diseases (NCD). Globally, 60% of deaths are caused by NCD, which is the leading cause of mortality. Tobacco use is responsible for 5.1 million deaths per year, second only to high blood pressure, which kills 7.5 million people per year.⁶⁵ If serious action is not taken, annual tobacco-related deaths are projected to increase to 8 million by 2030 (10% of all deaths).⁶⁷

Use of alcohol is responsible for 2.3 million deaths per year (4% of all deaths). Alcohol use is associated with more than 60 types of disease and injury. It can also decrease the risk of coronary heart disease, stroke and

diabetes.⁶⁵ Harmful use of alcohol is a major risk factor for premature death and disability worldwide.²⁶

Alcohol and tobacco are used in different countries across all income groups.⁶⁵ Therefore, monitoring the exposure of individuals and populations to these substances can be considered to provide an important assessment of the health status of the world's population.⁶⁴ Since alcohol and tobacco use frequently begin in childhood and adolescence and continue into adult life, use of alcohol and tobacco among young people is a predictor of the future burden of alcohol- and tobacco-related diseases.^{21,45} Estimating the consumption of alcohol and tobacco among adolescents is an

important tool for monitoring the population's health status.⁶⁶

Studies have monitored the consumption of alcohol and tobacco among young people. The Youth Risk Behavior Survey (YRBS)¹⁷ has been conducted biennially in the United States since 1991. These surveys provide estimates and temporal trends of alcohol and tobacco use among American adolescents. The Global School-based Student Health Survey (GSHS) is an international survey that monitors several health-related risk factors among young people.^{21,46} The GSHS has contributed to knowledge of alcohol and tobacco use, especially among adolescents in developing countries. The first studies on alcohol and tobacco use among adolescents in Brazil were conducted in the mid-1980s.^{22,25} Since then, more comprehensive epidemiological studies on these habits among Brazilian youth have been conducted.^{24,32,36}

The present study aimed to systematically review the literature on the prevalence of alcohol and tobacco use among Brazilian adolescents, in order to identify high-risk subgroups and to contribute towards developing national policies focused on combating alcohol and tobacco use among adolescents. This review may contribute towards better awareness of the main cities and locations where the rates of alcohol and tobacco use are higher, especially among adolescents who are usually not evaluated in national studies (i.e. teenagers in small towns).

METHODS

The literature search was performed in June 2011 on the LILACS, MEDLINE/PubMed and Web of Science electronic databases and the Google Scholar portal. A combination of Medical Subject Headings (MeSH), *Descritores de Ciências da Saúde* (DeCS; for terms in Portuguese) and text words were used to generate the list of citations. The search process was constructed specifically for each database, and no limits were used in these searches. The key terms were used to search in MEDLINE/PubMed, LILACS and Google Scholar and by topic in the Web of Science. The search was conducted in English and Portuguese.

Our search strategy was based on a combination of three search parameters: risky behavior, sample type and nationality. The keywords for behavioral risk factors were stratified into three subgroups, featuring the behavioral outcomes included: (i) general terms for behavioral risk factors (adolescent behavior* OR adolescent health OR cardiovascular health OR cardiovascular diseases* OR health behavior* OR lifestyle OR risky behavior* OR risk factor*); (ii) alcohol use

(alcohol use OR illicit drugs OR alcohol drinking OR alcoholism OR alcoholic beverages); and (iii) tobacco use (smoking OR illicit drug OR tobacco use OR tobacco). Each subgroup of the behavioral risk factor descriptors was used in combination with keywords for sample type (youth OR teen* OR adolesc* OR child*) and nationality (Brazil*) to locate potentially relevant studies. The Boolean operator "AND" was used to combine the three groups in the search. The truncation symbols for each specific database (e.g., *, \$, or #) were used to capture all suffix variations of a root word.

Articles were selected in accordance with a systematic method. First the article titles and abstracts were read, then the inclusion criteria were applied to the analysis. All of the full-text articles were obtained and included if they met the inclusion criteria. The references for all selected papers were examined to identify other publications that should be reviewed. Searches were conducted on institutional websites to reach national survey data not published in scientific journals.^a The inclusion criteria for studies were as follows: (i) original research study; (ii) sample including Brazilian adolescents aged ten to 19 years (or with mean age within this range); (iii) observational study that assessed the prevalence of alcohol or tobacco use, regardless of whether the study considered this variable to be an exposure or an outcome; (iv) questionnaires or structured interviews to measure alcohol and tobacco use; and (v) school- or populational-based study that used methodological procedures to ensure representativeness of the target population (i.e., random sampling). Studies were not included if participants were selected based on a convenience sample or another non-probabilistic method, for example, if studies selected participants by evaluating adolescents from the largest school in town or a single class. Studies that included only adolescents from specific areas within a city (for example, slums or poor neighborhoods) were not included. These criteria were selected in order to increase comparability between the studies.

Articles were excluded if they averaged the measurements of smoking or alcohol consumption (for example, average number of cigarettes or alcoholic beverages per day), because these measurements would not assess the prevalence of the behavior in the target population. Studies that evaluated only lifetime alcohol and/or tobacco use and that did not measure the prevalence of alcohol or tobacco use in adolescents were also excluded. Theses, dissertations and monographs were not included, as it would be impractical to perform a systematic search of these papers. Likewise, case reports and reviews were not included. In the case of duplication, the most recent or the most complete publication was used, and the other publications were excluded.

^a The following institutional websites were accessed: Brazilian Department for Alcohol and Other Drugs Policies (www.obid.senad.gov.br); Brazilian Center for Information on Psychotropic Drugs (www.cebrid.epm.br); National Institute of Cancer (www2.inca.gov.br), Health Ministry (portalsaude.saude.gov.br); and the Brazilian Institute for Geography and Statistics (www.ibge.gov.br).

The following data were extracted: location and year of survey, sample size, age of participants and definition of alcohol and/or tobacco use. The prevalence of current alcohol and tobacco use and the respective 95% confidence intervals (95%CI) are presented for the total sample sizes. Prevalence rates and 95%CI are presented for the total sample and stratified according to gender for frequent and heavy use of alcohol and tobacco. The 95%CI were obtained directly from original articles whenever possible,^{1,5,7,11,20,23,28,32,33,36,39,40,51-53,55,56,59,68} or were calculated using the statistics program Stata 10.0 (Stata Corp., College Station, United States) the 'cii' command (95%CI exact for binomial distribution).

Overall mean prevalences were calculated to demonstrate the central trend for current use of alcohol and tobacco in Brazilian studies. These (weighted) mean prevalence rates were calculated by summing the numbers of cases in all the studies considered, dividing by the sum of the number of participants in all the studies considered, and multiplying by 100. The studies were organized according to the criteria used to identify the behavior of interest (i.e. current, frequent or heavy use of alcohol or tobacco). The studies were further organized according to geographical region of Brazil, in alphabetical order by study site and in chronological order by survey year.

RESULTS

The literature search yielded 3,195 potentially relevant articles. After reading the titles, 647 articles were selected on the basis of the inclusion criteria. The 647 abstracts were reviewed and 160 articles were selected for full text review. Of these, 65.4% were excluded for the following reasons: 32 used a non-probabilistic method for selecting participants, 28 studies did not present the variables of interest, 39 were duplicated studies and five did not include adolescents. Thus, 56 studies met our inclusion criteria. One additional study was obtained from the reference search, and two national surveys^{b,c} were obtained from the website search. Therefore, 59 studies were reviewed (Figure 1).

Of the 59 studies included, 62.7% presented estimates of the prevalence of alcohol and tobacco use among adolescents; 28.8% contained estimates of the prevalence of tobacco use only,^{2,9,13,16,28,32,33,35,38-40,42,51,53,57,68} and the prevalence of alcohol use only was assessed in 10.2%.^{3,24,37,43,47,52}

Most surveys were conducted between 2000 and 2004 (45.8%),^{1-3,6,8,11,14-16,18,20,24,28,30,32,35,37-39,41,43,49,55-57,62,68} or between 2005 and 2009 (28.8%);^{5,7,12,19,27,31,36,42,47,48,50,54,59,61,63,b,c} 1.7% were conducted in the 1980s,²⁵ 15.2%

in the 1990s;^{4,9,10,23,30,33,44,58,60} 3.4% were performed in other decades;^{22,40} and 6.8% did not include the survey year.^{13,51-53}

The southern region of Brazil was the study location for 49.0% of the studies;^{5,13,16,18,20,28-31,33,35,38-40,42,43,50,53,56,59,60,63,68} the southeastern region was the study location for 30.5%;^{1,3,4,6,8-12,23,37,41,44,51,52,55,61,62} 11.9% were conducted in the northeast,^{7,14,15,19,27,54,57} and 6.8% were conducted in the central-western region of Brazil;^{25,48,49,58} 13.6% were conducted in two or more regions of Brazil.^{2,22,24,32,36,47,b,c}

The study sample sizes ranged from 281⁵⁴ to 60,973³⁶ participants; 11.7% had samples of fewer than 500 adolescents,^{15,23,31,54,61,68,b} and 28.1% included 1,000 to 2,000 adolescents.^{3,11,15,18,25,27,33,43,44,48,53,55,57,59,62,63} However, most studies (40.7%) had sample sizes greater than 2,000 adolescents.^{2,4,6,7,12,19,20,22,24,28,32,35,36,38-41,49,51,52,56,58,60,c} Most of the articles described school-based surveys of adolescents from public schools only (43.4%).^{6,7,9-12,14,15,18,20,27,28,31,35,37,41,43,50,54-56,58,61,63,68} Fourteen additional school-based studies (23.7%) included adolescents from public and private schools.^{2,4,5,13,19,36,42,44,48,49,53,57,60,62} Only 5.1% included only adolescents from private schools;^{25,51,52} 1.7% included adolescents from public and private universities,^b and 27.1% selected participants using population-based sampling.^{1,3,8,16,22-24,29,30,32,33,38-40,47,59,c}

Current alcohol use was evaluated in 28 studies (Figure 2). The prevalence of current alcohol use ranged from 23.0%⁵⁹ to 67.7%.⁵⁶ The mean prevalence (which reflects the central trend of the studies included in this review) of current alcohol use was 34.9%. Of the 28 studies evaluating current alcohol use among adolescents, 21.4% had prevalence of less than 30%,^{15,36,44,47,59,61} and 28.6% had prevalence rates of 50% or higher.^{12,29,31,44,54,56,60,61}

The prevalence of current tobacco use was evaluated in 30 studies (Figure 3). The prevalence rates ranged from 2.4%⁵⁷ to 22.0%,⁴¹ and the mean prevalence of current tobacco use was 9.3%. Most studies measured a prevalence of approximately 10%, but 20.0% found prevalence rates higher than 15%.^{28,30,41,44,60,68}

The definition of frequent and heavy alcohol consumption has several defining criteria; thus, we chose not to present these data in chart form. Twelve studies provided estimates of frequent alcohol consumption among adolescents; 58.3% of these defined frequent alcohol use as weekly consumption,^{14,15,19,25,37,47,48} whereas 33.3% of the studies defined frequent alcohol consumption as

^b Secretaria Nacional de Políticas sobre Drogas. I levantamento nacional sobre o uso de álcool, tabaco e outras drogas entre universitários das 27 capitais brasileiras. Brasília (DF); 2010 [cited 2012 Apr 1]. Available from: http://www.obid.senad.gov.br/portais/OBID/biblioteca/documentos/Dados_Estatisticos/Estudantes

^c Instituto Brasileiro de Geografia e Estatística. Pesquisa nacional de amostra por domicílios – Tabagismo 2008. Rio de Janeiro; 2009 [cited 2012 Apr 1]. Available from: www1.inca.gov.br/inca/Arquivos/publicacoes/tabagismo.pdf

consuming six or more drinks per month.^{22,55,60,61} The prevalence of frequent alcohol use among Brazilian adolescents ranged from 5.0%²⁵ to 29.1%.¹⁴ Most studies found a prevalence of more than 10% (66.7%).^{6,14,15,19,22,37,55,60,61} Three studies stratified prevalence rates by gender^{14,19,60} and found higher prevalence among male adolescents. However, there was no overlap of the 95%CI between male and female adolescents (Table 1).

Twenty studies assessed heavy alcohol use among Brazilian adolescents. Experiencing an episode of heavy alcohol consumption (five or more doses per drinking occasion)^{10,18,47,51,62} or “drunkenness”^{10,24,43,61} were the most common definitions of heavy alcohol use in the studies that we reviewed. High frequent alcohol use (usually 20 or more times per month) was also used to define heavy alcohol use.^{55,60,61} The prevalence of heavy alcohol use ranged from 0.8%²⁵ to 34.5%;³⁷ 40%

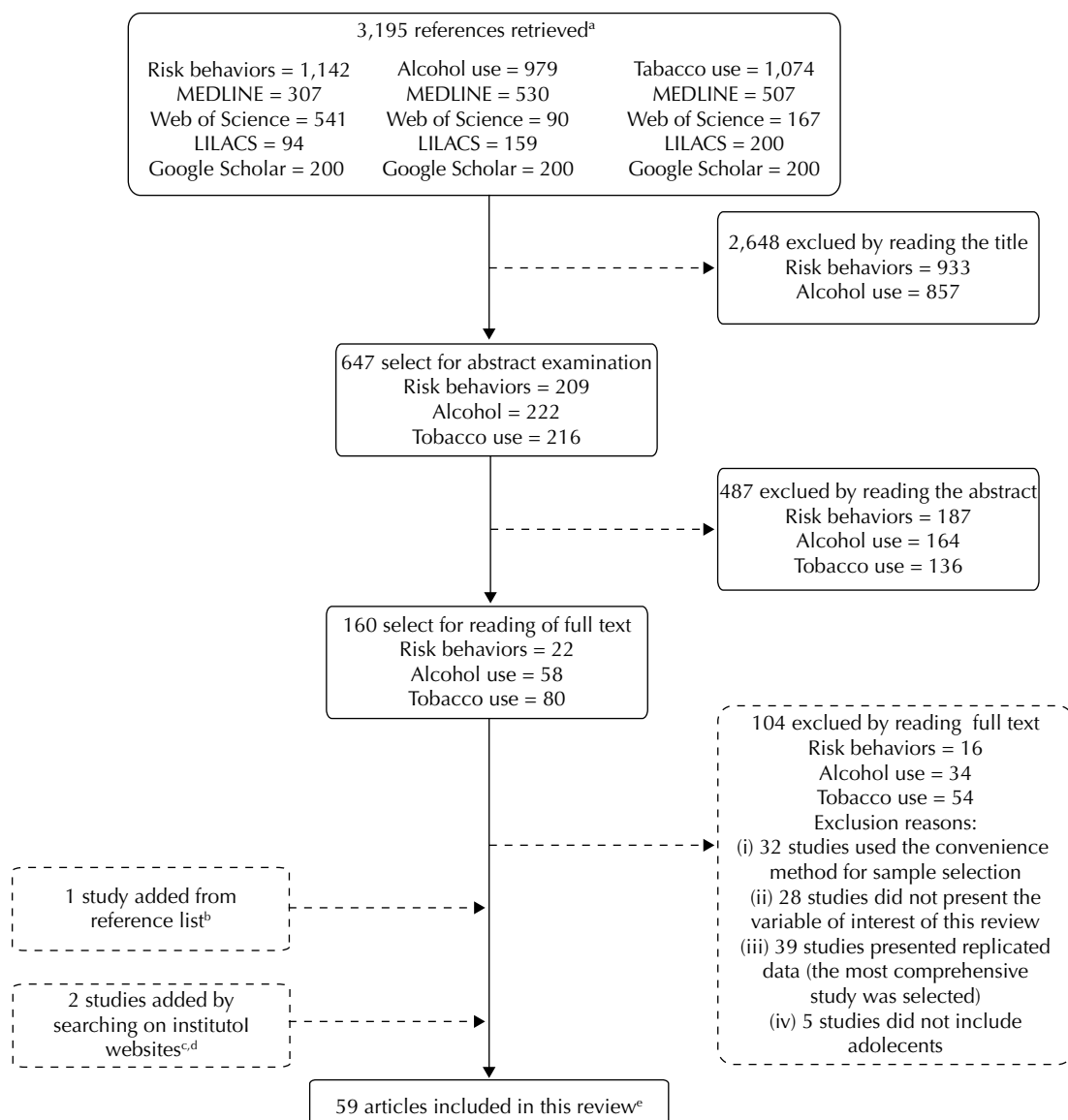


Figure 1. Flow chart of the study selection process.

^a Some references may have overlapped but they were excluded in the subsequent steps.

^b Teixeira et al⁶⁰

^c Secretaria Nacional de Políticas sobre Drogas. I levantamento nacional sobre o uso de álcool, tabaco e outras drogas e tre universitários das 27 capitais brasileiras. Brasília (DF); 2010 [cited 2012 Apr 1]. Available from: http://www.obid.senad.gov.br/portais/OBID/biblioteca/documentos/Dados_Estatisticos/Estudantes

^d Instituto Brasileiro de Geografia e Estatística. Pesquisa nacional de amostra por domicílios – Tabagismo 2008. Rio de Janeiro; 2009 [cited 2012 Apr 1]. Available from: www1.inca.gov.br/inca/Arquivos/publicacoes/tabagismo.pdf

^e References of studies included. 1-16,18-20,22-25,27-33,35-43,46-62,68,c,d

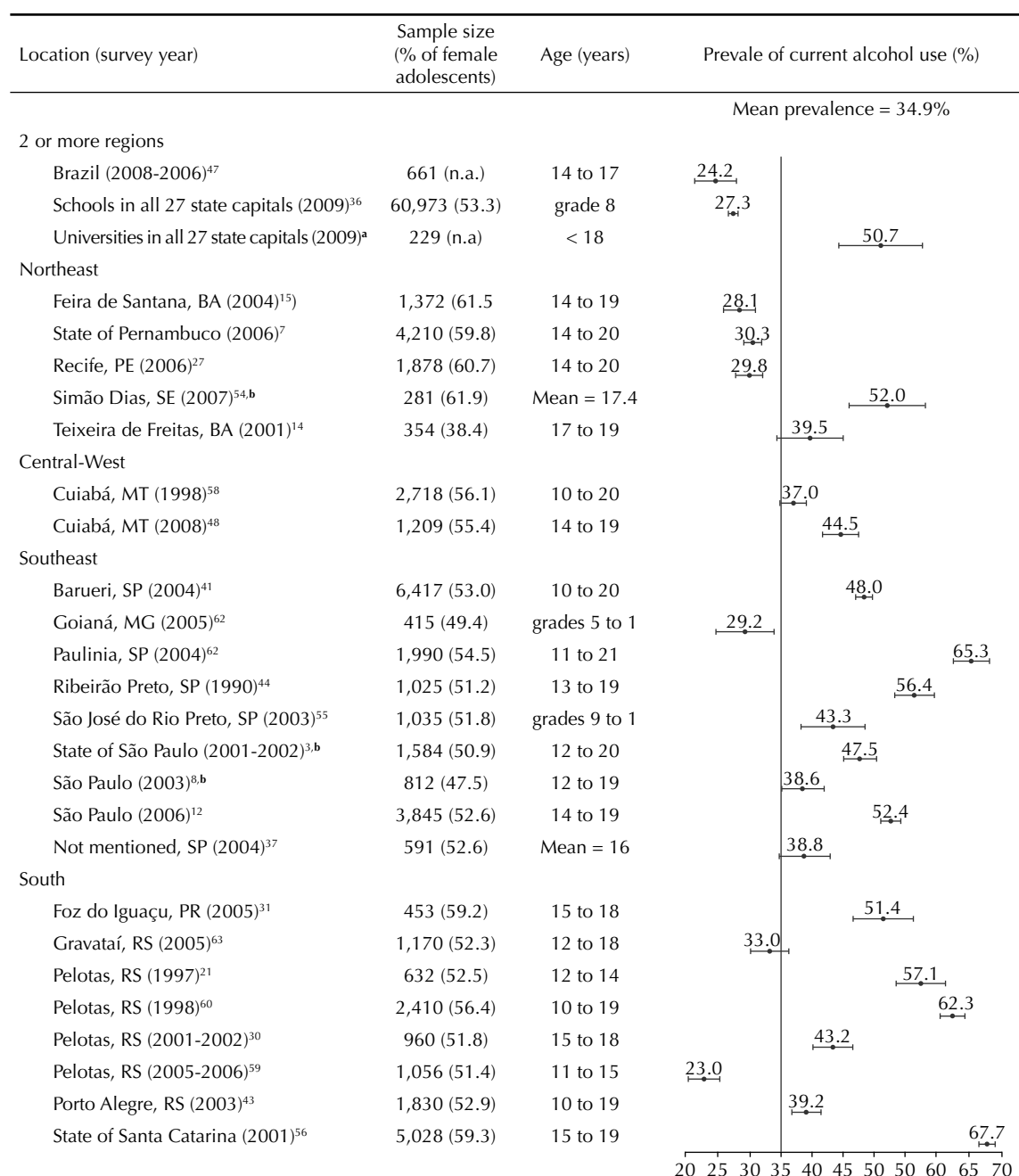


Figure 2. Prevalence of current alcohol use among Brazilian adolescents according to region, year of survey, sample size and participants's ages.

^a Secretaria Nacional de Políticas sobre Drogas. I levantamento nacional sobre o uso de álcool, tabaco e outras drogas entre universitários das 27 capitais brasileiras. Brasília (DF); 2010 [cited 2012 Apr 1]. Available from: http://www.obid.senad.gov.br/portais/OBID/biblioteca/documentos/Dados_Estatisticos/Estudantes

^b Current alcohol use was defined as drinking any alcoholic beverage at the time of the research. Other studies defined current alcohol use as the use of alcohol in the previous month or in a typical month.

States of Brazil: BA: Bahia; MG: Minas Gerais; MT: Mato Grosso; PE: Pernambuco; PR: Paraná; RS: Rio Grande do Sul; SE: Sergipe; SP: São Paulo.

estimated the prevalence of heavy alcohol use to be higher than 10%.^{10,18,20,43,51,58,62,b} Ten studies stratified the prevalence rates by gender, showing higher prevalence among male adolescents, with no overlap of the 95%CI between male and female adolescents (Table 1).^{10,18,20,23,43,51,58,60,62}

Seventeen studies measured frequent use of tobacco among adolescents: 68.7% defined frequent tobacco use as weekly consumption,^{12,18-20,24,29-31,40,42,53} and 25.0% defined frequent tobacco use as smoking six or more cigarettes per month.^{22,55,60,61} The prevalence of frequent

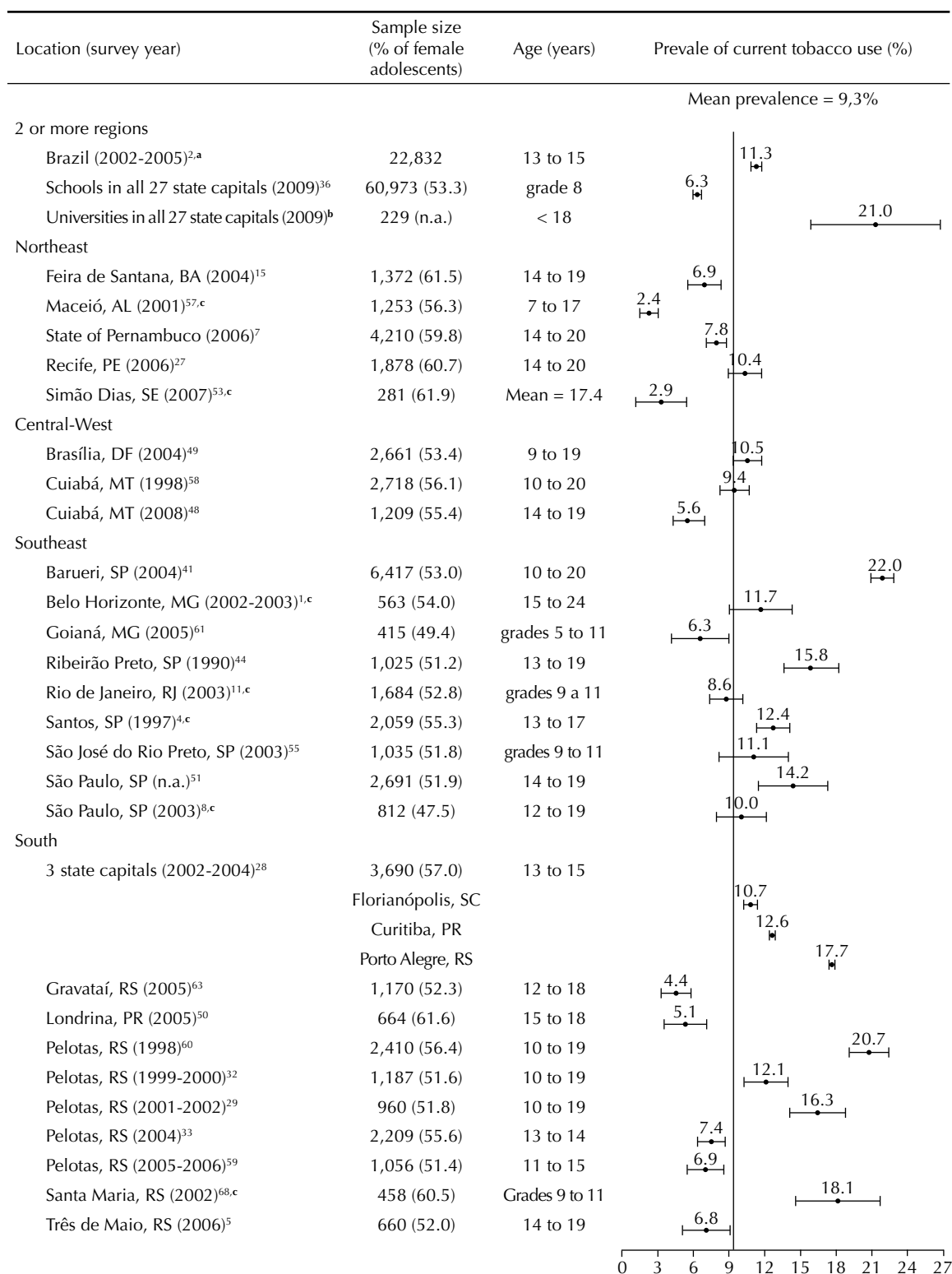


Figure 3. Prevalence of current tobacco use among Brazilian adolescents according to region, year of survey, sample size and participants' ages.

tobacco use ranged from 0.5%¹³ to 35.6%.¹² Most studies (68.7%) found a prevalence of frequent tobacco use of less than 10%;^{6,13,18-20,22,25,31,42,55,61} however, in 18.7%,

the estimated prevalence was higher than 15%.^{12,30,40} Ten studies stratified the prevalence rates according to gender.^{12,18-20,29-31,40,53,60} In two of those studies, the

Table 1. Prevalence of alcohol and tobacco use among Brazilian adolescents in studies included in this review, by gender, according to region, survey site, year, sample, participant's ages, and definition of alcohol or tobacco use.

Location (survey year) ^a	Sample (% of female adolescents)	Age (years)	Definition	Prevalence (%) (95%CI)		
				All	Male adolescents	Female adolescents
Alcohol use - Frequent or weekly alcohol use						
Two or more regions of Brazil						
Brazil (2005-2006) ⁴⁷	661 (n.a.)	14 to 17	1 + times/usual week	9.1 (7.0;11.5)	n.a.	n.a.
Brazil's 10 largest state capitals (1987, 1989, 1993, and 1997) ^{22,b}	1987: 16,149 (n.a.)	10 to 18	6+ times/ previous month	13.2 (12.7;13.7)	n.a.	n.a.
	1989: 19,183 (n.a.)			14.4 (13.9;14.9)	n.a.	n.a.
	1993: 24,634 (n.a.)			17.5 (17.0;18.0)	n.a.	n.a.
	1997: 15,501 (n.a.)			15.0 (14.4;15.6)	n.a.	n.a.
Northeast						
Feira de Santana, BA (2004) ¹⁵	1,372 (61.5)	14 to 19	1 + times/previous week	10.5 (8.9;12.3)	n.a.	n.a.
João Pessoa, PB (2005) ¹⁹	2,768 (55.9)	14 to 18	1 + times/usual week	21.8 (20.3;23.4)	29.7 (27.1;32.3)	15.6 (13.8;17.5)
Teixeira de Freitas, BA (2001) ¹⁴	354 (38.4)	17 to 19	1 + times/previous week	29.1 (24.4;34.1)	34.4 (28.1;41.1)	20.6 (14.1;28.4)
Central-West						
Cuiabá, MT (2008) ⁴⁸	1,209 (55.4)	14 to 19	1 + times/previous week	7.5 (6.1;9.2)	n.a.	n.a.
Federal District (1988) ²⁵	1,441 (52.7)	Mean = 15.5	1 + times/usual week	5.0 (3.9;6.3)	n.a.	n.a.
Southeast						
Goianá, MG (2005) ⁶¹	415 (49.4)	grades 5 to 11	6 + times/previous month	12.8 (9.7;16.4)	n.a.	n.a.
State of Minas Gerais (2000) ⁶	5,981 (59.6)	10 to 19	Alcohol use sometimes or always	28.1 (27.9;29.3)	n.a.	n.a.
São José do Rio Preto, SP (2003) ⁵⁵	1,035 (51.8)	grades 9 to 11	6 + times/previous month	15.1 (11.9;18.3)	n.a.	n.a.
Not mentioned, SP (2004) ³⁷	591 (52.6)	Mean = 16	1 + times/previous week	11.7 (9.2;14.5)	n.a.	n.a.
South						
Pelotas, RS (1998) ⁶⁰	2,410 (56.4)	10 to 19	6 + times/previous month	16.8 (15.3;18.4)	22.1 (19.6;24.8)	13.5 (11.7;15.5)
Alcohol use - heavy or daily						
Two or more regions of Brazil						
Brazil (2005-2006) ⁴⁷	661 (n.a.)	14 to 17	Male adolescents: 5 + doses/same occasion; Female adolescents: 4+ doses/same occasion – previous month	6.0 (4.4;8.2)	n.a.	n.a.
Schools in all 27 state capitals (2004) ³⁴	48,155 (50.8)	10 to 18	20 + days or 6 + "drunkenness" episodes/previous month	8.9 (8.6;9.2)	n.a.	n.a.
Universities in all 27 state capitals (2009) ^c	229 (n.a.)	< 18	Male adolescents: 5 + doses/same occasion; Female adolescents: 4 + doses/same occasion – previous month	29.0 (23.4;35.6)	n.a.	n.a.
Continues						

Continues

Table 1. Continuation

Location (survey year) ^a	Sample (% of female adolescents)	Age (years)	Definition	Prevalence (%) (95%CI)		
				All	Male adolescents	Female adolescents
Northeast						
João Pessoa, PB (2005) ¹⁹	2,768 (55.9)	14 to 18	1 + times/ usual week	2.6 (2.0;3.2)	3.8 (2.8;5.1)	1.7 (1.1;2.5)
Central-West						
Federal District (1988) ²⁵	1,441 (52.7)	Mean = 15.5	1 + times/usual week	3.5 (2.6;4.6)	n.a.	n.a.
Southeast						
Goianá, MG (2005) ⁶¹	415 (49.4)	grades 5 to 11	6 + times/previous month	2.1 (1.0;4.1)	n.a.	n.a.
State of Minas Gerais (2000) ⁶	5,981 (59.6)	10 to 19	Tobacco use sometimes or always	7.0 (6.4;7.8)	n.a.	n.a.
São José do Rio Preto, SP (2003) ³⁵	1,035 (51.8)	grades 9 to 11	6 + times/previous month	4.9 (3.3;6.5)	n.a.	n.a.
São Paulo, SP (2006) ¹²	3,845 (52.6)	14 to 19	1 + times/usual week	35.6 (34.1;37.1)	37.5 (35.3;39.8)	32.5 (30.5;34.6)
South						
Bento Gonçalves, RS (n.a.) ¹³	590 (58.5)	9 to 18	Active smoking	0.5 (0.1;1.5)	n.a.	n.a.
Florianópolis, SC (2001) ¹⁸	1,107 (52.1)	15 to 18	1 + times/usual week	8.9 (7.3;10.7)	6.8 (4.8;9.3)	10.8 (8.4;13.6)
Foz do Iguaçu, PR (2005) ³¹	453 (59.2)	15 to 18	1 + times/usual week	9.9 (7.3;13.1)	9.7 (5.9;15.0)	10.1 (6.7;14.3)
Maringá, PR (2007) ⁴²	991 (54.5)	14 to 18	1 + times/usual week	5.8 (4.4;7.4)	n.a.	n.a.
Pelotas, RS (1997) ²⁹	632 (52.5)	12 to 18	1 + times/previous week	11.1 (8.7;13.8)	12.0 (8.6;16.2)	10.4 (7.2;14.0)
Pelotas, RS (1997 and 2000-2001) ⁴⁰	1997: 1,076 (47.9) 2000-2001: 2,718 (17.4)	14 to 15 17 to 19	1 + times/previous week	7.5 (6.0;9.3) 21.5 (20.0;23.1)	5.9 (4.0;7.8) 20.2 (18.5;21.9)	9.3 (6.8;11.8) 27.5 (24.6;30.4)
Pelotas, RS (1998) ⁶⁰	2,410 (56.4)	10 to 19	6 + times/previous month	11.6 (10.3;12.9)	10.5 (8.7;12.6)	12.8 (11.1;14.7)
Pelotas, RS (2001-2002) ³⁰	960 (51.8)	15 to 18	1 + times/previous week	16.3 (14.1;18.8)	13.0 (10.0;16.4)	19.5 (16.1;23.3)
State of Santa Catarina (2001) ²⁰	5,028 (59.3)	15 to 19	1 + times/usual week	6.8 (6.1;7.5)	7.2 (6.1;8.4)	6.5 (5.6;7.4)
Santa Maria, RS (n.a.) ³³	1,019 (53.2)	10 to 19	1 + times/usual week	10.3 (8.5;12.3)	9.1 (6.7;12.1)	11.1 (8.7;14.2)
Tobacco use - heavy or daily						
Two or more regions of Brazil						
107 largest cities in Brazil (2001) ^{32,d}	1,031 (n.a.)	12 to 17	1 + times/usual day	3.7 (2.1;5.4)	4.5 (2.7;6.3)	3.0 (1.5;4.5)
Brazil (2008) ^e	7,539 (n.a.)	15 to 24	1 + times/habitual day	8.4 (7.7;9.0)	11.5 (10.8;12.2)	5.1 (4.6;5.6)
Universities in all 27 state capitals (2009) ^e	229 (n.a.)	< 18	5 + points estimated using Fargerston test (2000) on nicotine dependence	0.0	n.a.	n.a.
Northeast						
Feira de Santana, BA (2004) ¹⁵	1,372 (61.5)	14 to 19	1 + times/usual day	2.5 (1.7;3.5)	n.a.	n.a.
Continues						

Table 1. Continuation

Location (survey year) ^a	Sample (% of female adolescents)	Age (years)	Definition	Prevalence (%) (95%CI)		
				All	Male adolescents	Female adolescents
Central-West						
Federal District (1988) ²⁵	1,441 (52.7)	Mean = 15.5	1 + times/usual day	3.3 (2.5;4.4)	n.a.	n.a.
Southeast						
Barueri, SP (2001) ⁴¹	6,417 (53.0)	10 to 20	20 + times/previous month	10.0 (9.3;10.8)	n.a.	n.a.
Goianá, MG (2005) ⁶¹	415 (49.4)	grades 5 to 11	20 + times/previous month	1.4 (0.5;3.1)	n.a.	n.a.
Ribeirão Preto, SP (1990) ⁴⁴	1,025 (51.2)	13 to 19	1 + times/usual day	4.1 (3.0;5.5)	n.a.	n.a.
São José do Rio Preto, SP (2003) ⁵⁵	1,035 (51.8)	grades 9 to 11	20 + times/previous month	4.3 (2.8;5.7)	n.a.	n.a.
São Paulo, SP (1998) ¹⁰	871 (52.6)	12 to 18	20 + times/month or 6 + cigarettes/same occasion	5.1 (3.7;6.7)	5.7 (3.6;8.4)	4.6 (2.9;6.9)
São Paulo, SP (n.a.) ⁵¹	2,691 (51.9)	14 to 19	20 + times/previous month	3.8 (2.6;5.5)	3.4 (1.7;6.4)	4.1 (2.6;6.5)
State of São Paulo (1999) ²³	311 (51.8)	12 to 17	2 + positive answers about heavy tobacco use	3.5 (0.6;6.5)	3.3 (0.5;6.2)	3.7 (0.8;6.7)
South						
Gravataí, RS (2005) ⁶³	1,170 (52.3)	12 to 18	1 + times/usual day	3.2 (2.2;4.3)	n.a.	n.a.
Pelotas, RS (1998) ⁶⁰	2,410 (56.4)	10 to 19	20 + times/previous month	8.5 (7.4;9.7)	8.1 (6.6;10.0)	9.3 (7.8;11.0)
Pelotas, RS (2000-2001) ³⁹	2,718 (17.4)	17 to 19	1 + times/usual day	15.7 (14.4;17.2)	15.8 (14.3;17.3)	15.4 (12.1;18.7)
Pelotas, RS (2003) ¹⁶	810 (49.7)	10 to 19	1 + times/usual day	8.0 (6.3;10.1)	6.6 (4.4;9.5)	9.4 (6.8;12.7)
Pelotas, RS (2004) ³⁵	2,209 (55.6)	13 to 14	1 + times/usual day	0.9 (0.5;1.4)	n.a.	n.a.
Pelotas, RS (2004-2005) ³⁴	4,452 (49.2)	10 to 12	1 + times/usual day	1.7 (1.3;2.1)	n.a.	n.a.
Sapiranga, RS (1991) ⁹	864 (48.6)	11 to 30	1 + times/usual day	3.2 (2.2;4.7)	4.8 (3.0;7.3)	1.7 (0.7;3.4)

^a Some studies appear more than once in the table because they used different definitions for alcohol and tobacco use.

^b Galduróz et al²² (2004) included adolescents from 10 cities: Belém, Belo Horizonte, Brasília, Curitiba, Porto Alegre, Recife, Rio de Janeiro, Salvador and São Paulo.

^c Secretaria Nacional de Políticas sobre Drogas. I levantamento nacional sobre o uso de álcool, tabaco e outras drogas entre universitários das 27 capitais brasileiras. Brasília (DF); 2010 [cited 2012 Apr 1]. Available from: http://www.obid.senad.gov.br/portais/OBID/biblioteca/documentos/Dados_Estatisticos/Estudantes

^d Leitão Filho et al³² (2009) included individuals from the 107 largest cities (over 200,000 inhabitants) in Brazil, which represented 27.7% of the Brazilian population.

^e Instituto Brasileiro de Geografia e Estatística. Pesquisa nacional de amostra por domicílios – Tabagismo 2008. Rio de Janeiro; 2009 [cited 2012 Apr 1]. Available from: www1.inca.gov.br/inca/Arquivos/publicacoes/tabagismo.pdf

States of Brazil: BA: Bahia; MG: Minas Gerais; MT: Mato Grosso; PB: Paraíba; PR: Paraná; RS: Rio Grande do Sul; SC: Santa Catarina; SP: São Paulo.

AUDIT: The Alcohol Use Disorders Identification Test; n.a.: not available.

prevalence of frequent tobacco use was higher among male adolescents,^{12,18} and the estimate was higher for female adolescents in one study (Table 1).⁴⁰

Nineteen studies estimated the prevalence of heavy tobacco use among adolescents. Heavy tobacco use was usually defined as smoking one or more cigarettes per day,^{9,15,16,25,32,35,38,39,44,63} or smoking 20 or more cigarettes per month.^{10,41,55,60,61} The prevalence of heavy tobacco use ranged from 0.9%³⁵ to 15.7%.³⁹ Most studies found a prevalence of less than 5%; however, two studies indicated heavy tobacco use estimates higher than 10%.^{32,41} Eight studies stratified the prevalence rates by gender, and in all of these studies the prevalence rates were similar for male and female adolescents (Table 1).^{9,10,16,23,32,39,51,60}

DISCUSSION

The Brazilian literature includes a large number of studies on alcohol and tobacco use during adolescence. Alcohol and tobacco use among adolescents has been treated fairly in the national literature, through development of several comprehensive high-quality epidemiological studies.^{2,22,24,32,36,47} The high number of Brazilian studies indexed in international databases (e.g. MEDLINE/PubMed and Web of Science; Figure 1), indicate increasing interest in alcohol and tobacco-related research relating to young Brazilians and the impact of risky behavior on the individual's health.

However, there are some gaps in the national literature on alcohol and tobacco use among young Brazilians. There was a high concentration of studies focusing on the southern and southeastern regions of Brazil, whereas few of the studies included were conducted in the northern, northeastern and central-western regions. The development of scientific research relating to these risky behaviors in Brazil has yet to cover all regions of the country. Efforts have been made by regional and national institutions to conduct surveys involving adolescents in all regions of Brazil. These institutions have invested financially and academically in this research area, and have developed policies for diagnosing and preventing behavioral risk factors among young people in different regions of Brazil.

Although the sale of alcoholic beverages to children under 18 years has been prohibited in Brazil,^d many Brazilian adolescents have consumed alcohol. Several studies observed prevalence rates of current alcohol use of more than 50%.^{12,29,31,44,54,56,60,62} The most worrisome findings, however, were the high prevalence rates (above 10%) of frequent^{6,14,15,19,22,37,55,60,61} and heavy^{10,18,20,43,52,58,62} alcohol use in several studies. The

prevalence rates of tobacco among Brazilian adolescents were also high, with several studies finding rates of more than 15%.^{28,30,41,44,60,68} Although the rates of frequent and heavy tobacco use were well below the rates observed for frequent and heavy alcohol use, some studies at different sites found estimates higher than 10%.^{12,30,39-41} These behaviors are exhibited by large portions of the young Brazilian population at several sites and are contributing negatively to the health status of these adolescents.

Several studies included in this review sought to identify risk factors associated with current, frequent and heavy use of alcohol and tobacco among young Brazilians (Table 2). A large number of studies highlighted a positive association between age and consumption of these substances, which may explain the different prevalence estimates, since these studies examined different age groups.

Some of the highest estimates for current alcohol^{12,31,56} and tobacco^{30,51,68} use were obtained in studies with older adolescents (14 years or older). However, studies that included young adolescents (those younger than 14 years) also revealed high prevalence rates. For example, the *Pesquisa Nacional de Saúde do Escolar* (National Adolescent School-based Health Survey),³⁶ a national survey among eighth-grader students (over 90% were 13-15 years) in all 27 Brazilian state capitals, found high prevalences of current alcohol (27.3%) and tobacco (6.3%) use. Another study, which evaluated young adolescents (13-15 years) in three state capitals in Southern Brazil, found high estimates for current tobacco use (10.7%, 12.6%, and 17.7% in Florianópolis, Curitiba, and Porto Alegre, respectively).²⁸ One study on adolescents from a birth cohort study in Pelotas, Southern Brazil, demonstrated the early onset of smoking among the participants.⁴⁰ Of these, 7.5% consumed cigarettes on a weekly basis at 14-15 years of age, and this prevalence nearly tripled in late adolescence to 21.5% at 17-19 years of age.⁴⁰ Cross-sectional data from this cohort also indicate that more than half the adolescents with any lifetime tobacco use smoked their first cigarette before reaching ten years of age.³⁸ These data suggest that the prevalence of alcohol and tobacco use is already high in early adolescence and that these estimates tend to increase with age.

Gender was frequently analyzed in studies to identify subgroups at higher risk of alcohol and tobacco use. However, the direction of association between gender and alcohol and tobacco use has important variations according to the particular behavior presenting risk. Male adolescents are more likely to drink alcohol, and this result was obtained for current, frequent and heavy alcohol use (Table 2). However, for tobacco use, some

^d The sale of alcoholic beverages to persons under 18 years of age was established as an infraction under article 243 of the *Estatuto da Criança e do Adolescente* (Statute for Minors; Federal law 8.069/90) and the *Lei de Contravenções Penais* (Law on Criminal Contraventions, article 63).

Table 2. Summary of risk factors associated with alcohol and tobacco use among Brazilian adolescents (the numbers are the study reference number).

Risk factors	Consumption pattern		
	Current	Frequent	Heavy
Alcohol use			
Employment	58	-	24,41
Increasing age	10,27,41,43,59	18,25,42	18,41,43,47,52
Male gender	10,14,27,30,60	61	20,37,41,47,52,60
Feelings of sadness, loneliness, insomnia and suicidal ideation	63	-	-
Religion concerns (not following, adopting or being faithful to religion)	7	-	23,37,47,52
Parents who drink alcohol	-	-	37
Poor relationship with parents	-	-	23
Tobacco use			
Employment	1,28,29,33,40,41,58	-	-
Increasing age	5,10,51,68	18,20,25,41	9,41
Alcohol use	1,19,29,49	-	-
Brother who smokes	1,34	53	9
Exposure to secondhand tobacco smoke at home	28,51,63	-	-
Feelings of sadness, loneliness, insomnia and suicidal ideation	63	-	-
Friends who smoke	1,28,33,68	-	-
Female gender	11,28,30	18,53	-
Illicit drug use	4,49	-	-
Religion concerns (not following, adopting or being faithful to religion)	7,51	-	-
Parents who smoke	1,4,28	-	-
Poor relationship with parents	28	-	-
Separated parents	29	39	39

studies showed that female adolescents had higher rates of smoking habits (Table 2), while some studies indicated that male adolescents were at higher risk of smoking. These conflicts may be related to historical and social conditions or concepts of male and female identity.³⁰ However, the current trend indicates that the consumption of alcohol and tobacco may be increasing among female adolescents, thus indicating an at-risk population in future generations.

The Brazilian literature has also indicated that socio-cultural and environmental factors (such as religiosity, working condition and substance use among family and friends) are associated with tobacco and alcohol use during adolescence. Adolescents who are not religious are more likely to use alcohol and tobacco (Table 2), a finding that may be related to the doctrines followed by some religious denominations, which prohibit unhealthy behavior.⁷ Some studies have suggested that secondary exposure to smoking and alcohol consumption by parents, older brothers and friends may be an important risk factor for developing these behaviors (Table 2). Data from a study conducted in three state capitals in Southern Brazil indicated that adolescents with friends who smoke are nine

times more likely to smoke than adolescents without friends who smoke.²⁸

Psychosocial factors (such as conflict with parents and negative feelings such as sadness and loneliness) also contributed towards alcohol and tobacco use among Brazilian adolescents. One study on adolescents in all 27 state capitals found that those in poor relationships with their parents were 50% more likely to be heavy alcohol drinkers.²⁴ Another study on students in Gravataí, Southern Brazil, showed that adolescents who experienced feelings of sadness over the previous 12 months were 2.6 and 1.7 times more likely to report current tobacco and alcohol use, respectively.⁶³ The national literature has indicated the importance of environmental and psychosocial factors on alcohol and tobacco consumption among adolescents. Reducing alcohol and tobacco use in adolescents may involve reducing exposure to these risk factors.

The national literature has highlighted the association between alcohol consumption and smoking during adolescence.^{1,19,29,49} Students in João Pessoa, Northeastern Brazil, who drank alcohol on a weekly basis were 20 times more likely to consume tobacco on a weekly basis.¹⁹ In Brasília, in Central-Western

Brazil, nearly eight in ten adolescent smokers also drank alcohol.⁴⁹ These two behaviors are associated, but the association does not necessarily imply causality. However, interventions aiming to reduce alcohol consumption among adolescents could also reduce tobacco use, and vice-versa.

Some studies have examined temporal trends in the consumption of alcohol and tobacco consumption among adolescents. Data from a series of surveys conducted between 1987 and 1997 by the *Centro Brasileiro de Informações sobre Drogas* (Brazilian Center for Information on Psychotropic Drugs – *CEBRID*) have shown important estimates for temporal trends in these behaviors among adolescents in ten Brazilian state capitals.²² The prevalence of frequent alcohol use (six or more drinks per month) increased in six of the cities studied. However, the prevalences of frequent alcohol use (13.2% in 1987 and 15.0% in 1997) and frequent tobacco use (7.0% in 1987 and 6.2% in 1997) were generally stable.²² Another study from *CEBRID* presented estimates for tobacco use in 2004, which were compared with data from 1997.³⁵ With the exception of Recife and Rio de Janeiro, there was a significant decrease in heavy use of tobacco (defined as 20 or more cigarettes in the previous month). The decrease in tobacco use was related to changes in public policy in Brazil during the interval between the surveys (cigarette advertising was banned from the Brazilian media in 2000).³⁵

Public policy can be effective in reducing unhealthy behavior. Given the high prevalence of current, frequent and heavy alcohol use among Brazilian adolescents (Figure 2 and Table 1), there is an urgent need for policies that are effective for reducing alcohol use among adolescents.

Some limitations of this review should be highlighted. The first limitation is the variability between the studies reviewed. Although several studies have used questionnaires based on instruments from the GSHS,^{21,46} there are important variations in the definitions of alcohol and tobacco use patterns, recall periods and sample selection methods. These inter-study methodological differences may be related to the objectives established for each study. Future studies should aim to minimize

these variations. Local and regional studies with a standardized methodological procedure (i.e. instruments, cutoff points, etc.) would be required to contribute towards diagnosing and monitoring alcohol and tobacco use among Brazilian adolescents.

The second limitation relates not only to this review but also to most studies included in it: the use of questionnaires to estimate alcohol and tobacco use among adolescents. Many studies did not test the validity of the questionnaires, and when they were tested, they found that adolescents tended to underestimate their consumption.³⁵ Thus, the real prevalence rates may be greater than those found in these studies.³⁴

The last limitation is that some important studies may not have been included in this review. A large number of studies on alcohol and tobacco use in Brazilian adolescents are theses and dissertations that have not been published in journals. However, most of the main research concerning alcohol and tobacco use among Brazilian adolescents is presented in this review.

CONCLUSIONS

There are important inter-study variations in the prevalence rates of current, frequent and heavy alcohol and tobacco use among Brazilian adolescents. However, a large proportion of the studies included reached worrying prevalence rates of alcohol and tobacco consumption.

This review pointed out the relationship between some environmental factors (e.g. religiosity, working condition and substance use among family and friends) and psychosocial factors (e.g. conflict with parents and negative feelings such as sadness and loneliness) and alcohol and tobacco use among young Brazilians. However, we recommended that further studies should be conducted to identify risk factors, especially in relation to alcohol use, because the national literature does not comprehensively assess these variables. Since unhealthy behaviors continue through adolescence and adulthood, medium and long-term public policies created to reduce the use of alcohol and tobacco among Brazilians should focus on interventions among young people and subgroups that are at higher risk, so as to promote adoption of healthier behaviors.

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