Original article

Association between socio-demographic factors and cardiovascular health risk behaviors of Brazilian adolescents aged 13 to 17 years: data from the 2015 National School-Based Health Survey

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Abstract

Objective: to analyze association between sociodemographic factors and cardiovascular health risk behaviors of Brazilian adolescents aged 13-17 years. **Methods:** we used data on 10,926 adolescents from the 2015 National School-Based Health Survey (PeNSE) to verify associations between socio-demographic variables and consumption of unhealthy foods, insufficient physical activity, and experimentation with alcoholic beverages and cigarettes, using Poisson regression. **Results:** associations were found between consumption of candies, insufficient physical activity and experimentation with alcoholic beverages and the female sex ([PRa=1.37 – 95%CI 1.25;1.50], [PRa=1.32 – 95%CI 1.26;1.38] and [PRa=1.05 – 95%CI 1.00;1.10]); soda consumption with the male sex (PRa=1.17 – 95%CI 1.03;1.31) and higher maternal schooling (PRa=1.14 – 95%CI 1.01;1.31); cigarette experimentation with the male sex (PRa=1.12 – 95%CI 1.00;1.25), being 16-17 years old (PRa=1.51 – 95%CI 1.33;1.72), not living with father (PRa=1.36 – 95%CI 1.20;1.53) or mother (PRa=1.25 – 95%CI 1.13;1.37). **Conclusion:** cardiovascular health risk behaviors influenced by sociodemographic characteristics should be taken into consideration in Brazilian adolescent health promotion.

Keywords: Risk-Taking; Cardiovascular Diseases; Adolescent; Health Surveys.

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Introduction

Cardiovascular diseases are one of the leading causes of death worldwide. They accounted for 17.9 million deaths in 2016. In that year, diseases affecting the heart or blood vessels corresponded to 28% of deaths from non-communicable diseases in Brazil.[1] Studies in Brazil[2,3] and abroad[4,5] point to an increase in the occurrence of risk factors in children and adolescents. This increase is associated with the early development of burdensome chronic diseases, such as coronary disease, heart failure, diabetes and chronic kidney disease.[1,6]

> *Studies like PeNSE allow child and adolescent health risk behaviors to be monitored and enable early identification of exposure to factors that can negatively influence their health status and consequently their quality of life.*

In 2008, preliminary results of a cohort study carried out with Brazilian children and adolescents already pointed to an increase in the prevalence of sedentary behavior, obesity, overweight and low levels of high density lipoprotein cholesterol (HDL-c).[7] Associations between modifiable lifestyle behaviors and cardiometabolic risk factors in children and adolescents are described in many studies.[8] Despite the evidence, not all children and adolescents adopt recommended levels of positive health behaviors and harmful behaviors can be seen; for example, low or no participation in physical leisure time activities, more time dedicated to sedentary behaviors, associated with more time using a screen – TV/computer/cell phone – and high consumption of ultra-processed foods.[8,9] More than 80% of United States adolescents aged 12 to 19 do not meet ideal recommendations for a healthy diet.[9] International data have also revealed insufficient levels of daily physical activities in more than 80% of adolescents aged 13 to 15 years old.[10]

Data from the 2013/2014 Health Behavior in School-Aged Children study sponsored by the World Health Organization (WHO) on the health of 219,810 young people from 42 European countries and North America, showed that not only behavior patterns, but also aspects related to socioeconomic context, such as family income, educational level, interaction with family and peers at school, living with parents, besides gender and age, may influence the extent to which adolescents are healthy. The WHO study pointed out that unfavorable social circumstances and increasing age are generally factors associated with riskier health behavior, including inadequate dietary habits, less practice of recommended physical activity, cigarette smoking and alcoholic beverage consumption. These behaviors differ according to sex: girls are more likely to practice less physical activity, while boys have a greater tendency to acquire unhealthy eating habits, excessive screen use, cigarette smoking and alcoholic beverage consumption. The study's authors also draw attention to the lack of research of this kind and highlight the importance of investigating socioeconomic health determinants in different contexts.[11]

In Brazil, in accordance with WHO recommendations, the Ministry of Health together with the Ministry of Education and the Brazilian Institute of Geography and Statistics (IBGE) Foundation developed the Brazilian National School-Based Health Survey (PeNSE) aiming at evaluating and monitoring aspects of Brazilian students' health, besides providing information to health service managers and health workers for designing specific health policies for these adolescents. This triennial survey started in 2009 and its most recent edition took place in 2015.[12]

Studies like PeNSE allow child and adolescent health risk behaviors to be monitored and enable early identification of exposure to factors that can negatively influence their health status and consequently their quality of life. However, Brazil lacks studies providing detailed analysis of the relationship between sociodemographic aspects and cardiovascular health risk behavior of Brazilian adolescents that could enable recommendation of more effective strategic measures to promote the health of this population.

The objective of this study was to analyze sociodemographic factors associated with cardiovascular health risk behavior of Brazilian adolescents aged 13-17 years.

Methods

This was a cross-sectional analytical study, using data from the PeNSE third edition, conducted in 2015 by IBGE together with the Ministry of Health. The 2015 PeNSE survey had two different samples: Sample 1, comprised

of students in the 9th grade of elementary education; and Sample 2, comprised of 13-17 year-old students ranging from the 6th grade of elementary education up to the 3rd third year of high school. Both samples only included students attending regular public and private schools in urban and rural areas all over Brazil.[12,13] In this article, we used data from Sample 2.

We used cluster sampling in two stages based on 2015 Student Census records. In order to estimate indicators for 13 to 17 year-old students, we compared the distribution of this population by age in each geographic stratum in which each adolescent was enrolled. Calibration weighting was done by age and Brazilian macro-regions, thus building a representative sample of the five Brazilian macro-regions – North, Northeast, South, Southeast and Midwest –; the 26 state capital cities and the Federal District; and some municipalities selected from among the rest. The sample calculations estimated an approximate maximum error of 3 percentage points, as an absolute value, with a 95% confidence level, considering prevalence (proportion) of 0.5 (or 50%).[2,13]

Data were collected between April and September 2015, by means of an electronic questionnaire answered by the students in the classroom, using smartphones for automatic recording of the information. We also measured their weight and height in order to calculate body mass index (BMI).[12,13]

What follows is a description of the dependent variables studied (risk behaviors), their indicators and respective questions:

a) Consumption of unhealthy food

- Regular consumption of candies: consumption of candies for five days or more, in the seven days prior to the interview.

Answer to the question: "How many days in the last seven days did you eat candies (sweets, drops, chocolate, bubble gum, bonbons or lollipops)?"

- Regular consumption of fried savory snacks: consumption of fried savory snacks for five days or more in the seven days prior to the interview.

Answer to the question: "How many days in the last seven days did you eat fried savory snacks? Example: French fries or fried savories such as chicken croquettes, fried kibbeh, fried pasty, 'acarajé' etc."

- Regular consumption of soda: consumption of soda for five days or more in the seven days prior to the interview.

Answer to the question: "How many days in the last seven days did you drink soda?"

- Regular consumption of industrialized/ultra-processed foods: consumption of industrialized/ultra-processed foods for five days or more in the seven days prior to the interview.

Answer to the question: "How many days in the last seven days did you eat industrialized/ultra-processed foods such as hamburger, ham, mortadella, salami, sausages, instant noodles, potato crisps, salted crackers?"

- Regular consumption of fast-food: consumption of fast-food for five days or more in the seven days prior to the interview.

Answer to the question: "How many days in the last seven days did you eat in fast-food restaurants, such as snack bars, hot dog stands, pizzerias etc.?"

b) Inactivity or low physical activity level: doing physical activities for at least 60 minutes a day in no more than five days (up to 299 minutes) in the last seven days prior to the interview, according to International Physical Activity Questionnaire (IPAQ) classification.[14]

Answer to the question: "How many days in the last seven days did you do physical activity for at least 60 minutes (1 hour) a day? (Add together all the time you spent doing any type of physical activity each day)."

c) Consumption of alcoholic beverage: experimentation with alcoholic beverage.

Answer to the question: "Have you ever drunk a unit of alcohol? (A unit is equivalent to a can of beer or a glass of wine or one shot of cachaça or whisky etc.)."

d) Cigarette use: experimentation with cigarettes.

Answer to the question: "Have you ever smoked cigarettes, even one or two puffs?"

The independent variables (sociodemographic aspects) were:

a) Sex (male; female);
b) Age (in years: 13-15; 16-17);
c) Mother's education level (up to incomplete elementary education – less than eight years of schooling, including illiterate mothers; complete elementary education – eight years or more of schooling);
d) Number of people living in the household (up to 3; 4 or more);
e) Living with father (yes; no); and
f) Living with mother (yes; no).

The collected data was analyzed in the Stata version 14.0 survey module which is appropriate for complex sample data analysis. Characterization of the students

included sociodemographic aspects and health risk behavior, expressed as prevalence (%) and respective 95% confidence intervals (95%CI).

Outcomes of the presence of cardiovascular health risk behavior were taken to be: (i) regular consumption of unhealthy food; (ii) inactivity or low physical activity level; (iii) experimentation with cigarettes; and (iv) experimentation with alcoholic beverages. Initially, we carried out bivariate analysis aimed at identifying association between each of the outcomes (cardiovascular health risk behavior) and each sociodemographic aspect, using the Pearson chi-square test with 5% statistical significance. Subsequently, we carried out multivariate analysis which was used to develop a model for each outcome. Each model was comprised of a cardiovascular health risk behavior (outcome) and all the independent variables (sociodemographic aspects). Adjustments were made by including all sociodemographic aspects (sex; age; mother's education level; living with father; living with mother; number of people in the household), regardless of the p-value in the bivariate analysis. Following this, variables with p-value greater than 0.05 were removed, one by one, from the model built for each risk behavior, and only those with a p-value <0.05 were kept in the models. We used Poisson regression to calculate crude prevalence ratios (PR) and adjusted prevalence ratios (PRa), and their respective 95%CI.

The 2015 PeNSE survey was submitted to and approved by the National Research Ethics Committee (CONEP)/National Health Council (CNS), as per Report No. 1,006,467, dated March 30, 2015. All student and school information was confidential and with no identification of them.[12]

Results

Sample 2 of the 2015 PeNSE survey was comprised of 16,608 students aged 11 to 19. However, with the aim of comparison with international population indicators, data from this study comprehended only information provided by students aged 13-17 years, totaling 10,926 adolescents. Refusals and questionnaires considered to be invalid because of information on sex and age accounted for 52 cases.

Most of the adolescents were boys (50.3% – 95%CI 48.7;51.9), aged 13-15 years (61.9% – 95%CI 58.1;65.6), lived with their mothers (61.6% – 95%CI 60.2;63.1) and/or fathers (88.4% – 95%CI 87.5;89.3) and lived with four people or more (73.2% – 95%CI 72.0;74.5). The sample distribution according to the mother's education level indicated that 67.3% (95%CI 64.9;69.7) of the students reported that their mothers had higher levels of schooling (complete elementary education and above: eight years or more of schooling), although 23.6% (95%CI 21.9;25.4) of the students were unable to answer this variable (Table 1).

When we analyzed cardiovascular health risk behaviors, we found that a considerable number consumed candies (40.6% – 95%CI 39.3;41.8), industrialized/ultra-processed foods (31.7% – 95%CI 30.5;32.8) and soda (27.2% – 95%CI 26.1;28.4) five or more days a week. The majority (68.4% – 95%CI 67.2;69.5) reported doing physical activity for up to 299 minutes a week and experimenting with alcoholic beverages (59.2% – 95%CI 58.0;60.4), while a smaller proportion had experimented with cigarettes (22.9% – 95%CI 21.8;23.9) at least once in their lifetime (Table 1).

In the crude analysis we found that regular consumption of candies was more prevalent in girls (PR=1.32 – 95%CI 1.22;1.43); regular consumption of soda was more prevalent in boys (PR=1.15 – 95%CI 1.04;1.28) and among adolescents whose mothers had 8 or more years of schooling (PR=1,15 – 95%CI 1.02;1.29); regular consumption of industrialized/ultra-processed foods predominated among adolescents whose mothers had 8 or more years of schooling (PR=1,24 – 95%CI 1.11;1.38); and regular consumption of fast-food was more prevalent among those who did not live with their fathers (PR=1.34 – 95%CI 1.00;1.79). We did not find associations between regular consumption of fried savory snacks and the study's independent variables (Tables 2 and 3).

Associations were kept in the multivariate model and showed that regular consumption of candies was more prevalent in girls (PRa=1.37 – 95%CI 1.25;1.50) and in the 13-15 age group (PRa=1.11 – 95%CI 1.00;1.22); consumption of soda was more prevalent among boys and adolescents (PRa=1.17 – 95%CI 1.03;1.31) whose mothers had 8 years or more of schooling (PRa=1.14 – 95%CI 1.01;1.31); consumption of industrialized/ultra-processed foods predominated among adolescents whose mothers had 8 years or more of schooling (PRa=1.24 – 95%CI 1.11;1.38); and consumption of fast-food predominated among those who did not live with their fathers (PRa=1.34 – 95%CI 1.00;1.79) (Tables 2 and 3).

Table 1 – Characterization of adolescent students according to sociodemographic characteristics and cardiovascular risk behaviors, PeNSE,[a] Brazil, 2015

Characterization of adolescent students	%[b]	95% CI[c]
Sociodemographic characteristics		
Sex (n=10,926)		
Male	50.3	48.7;51.9
Female	49.7	48.1;51.3
Age in years (n=10,926)		
13-15	61.9	58.1;65.6
16-17	38.1	34.4;41.9
Living with father (n=10,919)		
Yes	88.4	87.5;89.3
No	11.6	10.7;12.5
Living with mother (n=10,918)		
Yes	61.6	60.2;63.1
No	38.4	36.9;39.8
Number of people in the household		
Up to 3	26.8	25.5;28.0
4 or more	73.2	72.0;74.5
Mother's schooling, in years of study (n=10,907)		
<8	32.7	30.3;35.1
≥8	67.3	64.9;69.7
Cardiovascular health risk behavior		
Consumption of fried savory snacks in the last 7 days (n=10,900)		
None	31.0	29.8;32.1
1 to 4 days	55.2	53.9;56.4
5 days or more	13.9	13.0;14.8
Consumption of candies in the last 7 days (n=10,902)		
None	10.9	10.2;11.7
1 to 4 days	48.5	47.3;49.8
5 days or more	40.6	39.3;41.8
Consumption of soda in the last 7 days (n=10,908)		
None	17.6	16.7;18.6
1 to 4 days	55.2	53.9;56.4
5 days or more	27.2	26.1;28.4
Consumption of industrialized food in the last 7 days (n=10,894)		
None	14.6	13.7;15.5
1 to 4 days	53.7	52.5;55.0
5 days or more	31.7	30.5;32.8

a) PeNSE: National School-Based Health Survey.
b) Estimate corrected for sample weighing and design effect.
c) 95%CI: 95% confidence interval.
d) Total time spent in minutes by adolescents doing physical activities, in the seven days prior to the survey, considering the following domains: going to and from school; physical education classes; other out-of-school activities.

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Table 1 – Characterization of adolescent students according to sociodemographic characteristics and cardiovascular risk behaviors, PeNSE,[a] Brazil, 2015

Characterization of adolescent students	%[b]	95% CI[c]
Consumption of fast-food in the last 7 days (n=10,903)		
None	52.9	51.6;54.1
1 to 4 days	41.6	40.3;42.8
5 days or more	5.6	5.0;6.2
Total time spent doing physical activity in the last 7 days d (n=10,913)		
Up to 299 minutes	68.4	67.2;69.5
300 minutes or more	31.6	30.5;32.8
Cigarette experimentation (n=10.910)		
Yes	22.9	21.8;23.9
No	77.1	76.1;78.2
Alcoholic beverage experimentation (n=10.903)		
Yes	59.2	58.0;60.4
No	40.8	39.6;42.0

a) PeNSE: National School-Based Health Survey.
b) Estimate corrected for sample weighing and design effect.
c) 95%CI: 95% confidence interval.
d) Total time spent in minutes by adolescents doing physical activities, in the seven days prior to the survey, considering the following domains: going to and from school; physical education classes; other out-of-school activities.

In the crude analysis we found more prevalence of inactivity or low level of physical activity in girls (PR=1.32 – 95%CI 1.26;1.38) and among adolescents whose mothers had 8 years or more of schooling (PR=1.05 – 95%CI 1.00;1.10), whereby only the association with the female sex was kept in the adjusted analysis (PRa=1.32 – 95%CI 1.26;1.38). In relation to cigarette experimentation, in the crude analysis we identified greater prevalence among male students (PR=1.09 – 95%CI 0.98;1.23), among those aged 16-17 (PR=1.53 – 95%CI 1.43;1.74), who did not live with their fathers (PR=1.45 – 95%CI 1.28;1.64), who did not live with their mothers (PR=1.30 – 95%CI 1.18;1.44), and who lived with up to three people in their household (PR=1.16 – 95%CI 1.02;1.32). When submitted to adjusted analysis, living with up to three people did not remain statistically significant and therefore was not kept in the multivariate model (Table 4).

In relation to experimentation with alcoholic beverages, prevalence was higher in the female sex (PRa=1.05 – 95%CI 1.00;1.31), among students at aged 16-17 (PRa=1.38 – 95%CI 1.29;1.47), who did not live with their fathers (PRa=1.07 – 95%CI 1.01;1.14), who did not live with their mothers (PRa=1.07 – 95%CI 1.02;1.12), and who lived with up to three people in their household (PR=1.05 – 95%CI 1.01;1.11). These aspects were associated in both the crude and the multivariate analysis (Table 4).

Discussion

The behavior of Brazilian adolescents aged 13 to 17 years was inadequate for them to have good cardiovascular health: experimentation with cigarettes and alcoholic beverages; regular consumption of unhealthy food, which included candies, sodas and industrialized/ultra-processed foods; and insufficient weekly physical activity. We also found that higher prevalence of these behaviors was associated with aspects relating to the sociodemographic context, in particular: the female sex, associated with regular consumption of candies, insufficient physical activity and experimentation with alcoholic beverages; the male sex, associated with regular consumption of soda and experimentation with cigarettes; mother having more years of schooling, associated with regular consumption of soda and industrialized food; not living with their father, associated with regular consumption of fast-food; being 13 to 15 years old, associated with regular consumption of candies; being 16 to 17 years

Table 2 – Prevalence of regular consumption (in ≥5 days/week) of candies, fried savory snacks and soda and its association with sociodemographic variables among adolescent students, PeNSE,[a] Brazil, 2015

Variables	Unhealthy eating habits				
	%[b]	PR[c] (95%CI[d])	p[e]	PRa[f] (95%CI[d])	p[e]
Candies					
Sex		<0.001			<0.001
Female	45.3	1.32 (1.22;1.43)		1.37 (1.25;1.50)	
Male	33.5	1.00		1.00	
Age (in years)			0.932		0.030
13-15	39.1	1.00		1.11 (1.00;1.22)	
16-17	39.9	1.00 (0.92;1.09)		1.00	
Mother's education level (in years of study)			0.051		
<8	36.6	1.09 (0.99;1.21)		–	
≥8	40.0	1.00		–	
Living with father			0.182		
No	42.2	1.06 (0.97;1.17)		–	
Yes	39.0	1.00		–	
Living with mother			0.489		
No	40.9	1.02 (0.95;1.10)		–	
Yes	38.4	1.00		–	
Number of people in the household			0.605		
4 or more	39.2	1.02 (0.94;1.11)		–	
Up to 3	39.9	1.00		–	
Soda					
Sex		0.007			0.001
Female	25.1	1.00		1.00	
Male	28.3	1.15 (1.04;1.28)		1.17 (1.03;1.31)	
Age (in years)			0.741		
13-15	27.1	1.00		–	
16-17	26.1	1.01 (0.90;1.14)		–	
Mother's education level (in years of study)			0.019		0.025
<8	25.0	1.00		1.00	
≥8	26.5	1.15 (1.02;1.29)		1.14 (1.01;1.31)	
Living with father			0.899		
No	28.7	1.00		–	
Yes	26.5	1.00 (0.87;1.16)		–	
Living with mother			0.071		
No	28.1	1.08 (0.99;1.17)		–	
Yes	25.9	1.00		–	
Number of people in the household		0.676			
4 or more	26.5	1.02 (0.92;1.12)		–	
Up to 3	27.4	1.00		–	

a) PeNSE: National School-Based Health Survey.
b) Estimate corrected for sample weighing and design effect.
c) PR: crude prevalence ratio.
d) 95% CI: 95% confidence interval.
e) Pearson's chi-square test.
f) PRa: prevalence ratio adjusted for sociodemographic aspects (sex; age; mother's education level; living with father; living with mother; number of people in the household).

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Table 2 – Prevalence of regular consumption (in ≥5 days/week) of candies, fried savory snacks and soda and its association with sociodemographic variables among adolescent students, PeNSE,[a] Brazil, 2015

Variables	Unhealthy eating habits				
	%[b]	PR[c] (95%CI[d])	p[e]	PRa[f] (95%CI[d])	p[e]
	Fried savory snacks				
Sex			0.468		
Female	13.6	1.05 (0.91;1.22)		–	
Male	13.5	1.00		–	
Age (in years)			0.890		
13-15	13.6	1.00 (0.88;1.15)		–	
16-17	13.5	1.00		–	
Mother's education level (in years of study)			0.224		
<8	13.7	1.00		–	
≥8	13.4	1.24 (1.11;1.38)		–	
Living with father			0.572		
No	14.4	1.05 (0.88;1.25)		–	
Yes	13.5	1.00		–	
Living with mother			0.074		
No	14.2	1.13 (0.98;1.30)		–	
Yes	13.2	1.00		–	
Number of people in the household		0.878			
4 or more	13.5	1.00		–	
Up to 3	13.9	1.01 (0.86;1.17)		–	

a) PeNSE: National School-Based Health Survey.
b) Estimate corrected for sample weighing and design effect.
c) PR: crude prevalence ratio.
d) 95% CI: 95% confidence interval.
e) Pearson's chi-square test.
f) PRa: prevalence ratio adjusted for sociodemographic aspects (sex; age; mother's education level; living with father; living with mother; number of people in the household).

old, associated with experimentation with cigarettes and alcoholic beverages; living in the household with none of their parents, associated with experimentation with cigarettes and alcoholic beverages; as well as living with up to three people in their household, which was associated with experimentation with alcoholic beverages.

Research into the diet and lifestyle of adolescents shows that healthy eating habits and physical activities have contributed to reducing cardiovascular comorbidities in this population. Unhealthy eating habits and lack of physical activities have been associated with a less favorable cardiometabolic profile with increased cardiovascular risk.[15] This evidence points to the need to create health promotion strategies emphasizing reduction of cardiovascular health risk behavior in childhood and adolescence, given that over the years there has been a decrease in ideal health behaviors in this population, as pointed out by studies with European and North American students.[9,15]

In Brazil, the transition in eating habits identified since the 1980s, with traditionally consumed healthy food (beans, rice, fruit, vegetables and meat) being replaced by ready-to-eat food, such as industrialized food,[16] makes adolescents vulnerable to having a less healthy diet. In many countries, food most consumed by adolescents includes desserts, candies and sugar-rich beverages.[11] This behavior can also be found in Brazilian adolescents: around two fifths of the adolescents in our study regularly consumed candies, and around one third regularly consumed soda. Moreover, ever since the 2012 PeNSE survey,[17] regular consumption of candies has remained higher in females, while regular consumption of soda has been more prevalent in males.

It is still not clear how gender can influence consumption of sugar-rich food and preference for specific types of this food among adolescents. It is also not clear why results of studies carried out in different countries, including

Table 3 – Prevalence of regular consumption (in ≥5 days/week) of industrialized/ultra-processed food and fast-food and its association with sociodemographic variables among adolescent students, PeNSE,[a] Brazil, 2015

Variables	Unhealthy eating habits				
	%[b]	PR[c] (95%CI[d])	p[e]	PRa[f] (95%CI[d])	p[e]
	Industrialized/ultra-processed				
Sex			0.063		
Female	66.7	1.09 (0.99;1.19)		–	
Male	69.5	1.00		–	
Age (in years)			0.072		
13-15	69.0	1.00		–	
16-17	66.6	1.10 (0.99;1.23)		–	
Mother's education level (in years of study)			<0.001		<0.001
<8	71.5	1.00		1.00	
≥8	65.6	1.24 (1.11;1.38)		1.24 (1.11;1.38)	
Living with father			0.380		
No	68.3	1.00		–	
Yes	68.1	1.06 (0.92;1.21)		–	
Living with mother			0.326		
No	68.6	1.00		–	
Yes	67.9	1.04 (0.95;1.13)		–	
Number of people in the household			0.813		
4 or more	68.6	1.00		–	
Up to 3	67.0	1.01 (0.91;1.11)		–	
	Fast-food				
Sex			0.151		
Female	5.4	1.00		–	
Male	6.0	1.20 (0.93;1.55)		–	
Age (in years)			0.212		
13-15	5.5	1.00		–	
16-17	6.2	1.21 (0.89;1.63)		–	
Mother's education level (in years of study)			0.326		
<8	5.3	1.00		–	
≥8	6.0	1.17 (0.85;1.61)		–	
Living with father			0.049		0.049
No	8.0	1.34 (1.00;1.79)		1.34 (1.00;1.79)	
Yes	5.4	1.00		1.00	
Living with mother			0.417		
No	5.6	1.00		–	
Yes	5.8	1.10 (0.86;1.42)		–	
Number of people in the household			0.848		
4 or more	5.5	1.00		–	
Up to 3	6.3	1.02 (0.81;1.29)		–	

a) PeNSE: National School-Based Health Survey.
b) Estimate corrected for sample weighing and design effect.
c) PR: crude prevalence ratio.
d) 95% CI: 95% confidence interval.
e) Pearson's chi-square test.
f) PRa: prevalence ratio adjusted for sociodemographic aspects (sex; age; mother's education level; living with father; living with mother; number of people in the household).

Table 4 – Prevalence of inactivity or low physical activity level, experimentation with cigarettes and alcoholic beverages and their association with sociodemographic variables among adolescent students, PeNSE,[a] Brazil, 2015

Variables	Cardiovascular health risk behavior				
	%[b]	PR[c] (95%CI[d])	p[e]	PRa[f] (95%CI[d])	p[e]
	Inactivity or low physical activity level				
Sex			<0.001		<0.001
Female	76.6	1.32 (1.26;1.38)		1.32 (1.26;1.38)	
Male	58.8	1.00		1.00	
Age (in years)			0.189		
13-15	67.3	1.00		–	
16-17	68.2	1.03 (0.98;1.08)		–	
Mother's education level (in years of study)			0.036		
<8	69.0	1.00		–	
≥8	66.9	1.05 (1.00;1.10)		–	
Living with father			0.069		
No	67.7	1.05 (0.99;1.11)		–	
Yes	67.5	1.00		–	
Living with mother			0.050		
No	69.0	1.00		–	
Yes	66.8	1.04 (0.99;1.08)		–	
Number of people in the household			0.991		
4 or more	67.4	1.00		–	
Up to 3	68.3	1.00 (0.95;1.04)		–	
	Cigarettes				
Sex			0.099		0.042
Female	21.4	1.00		1.00	
Male	23.1	1.09 (0.98;1.23)		1.12 (1.00;1.25)	
Age (in years)			<0.001		<0.001
13-15	18.2	1.00		1.00	
16-17	29.9	1.53 (1.43;1.74)		1.51 (1.33;1.72)	
Mother's education level (in years of study)			0.997		
<8	24.3	1.00		–	
≥8	22.4	1.00 (0.87;1.14)		–	
Living with father			<0.001		<0.001
No	30.9	1.45 (1.28;1.64)		1.36 (1.20;1.53)	
Yes	21.2	1.00		1.00	
Living with mother			<0.001		<0.001
No	26.6	1.30 (1.18;1.44)		1.25 (1.13;1.37)	
Yes	19.6	1.00		1.00	
Number of people in the household			0.018		
4 or more	21.4	1.00		–	
Up to 3	24.6	1.16 (1.02;1.32)		–	

a) PeNSE: National School-Based Health Survey.
b) Estimate corrected for sample weighing and design effect.
c) PR: crude prevalence ratio.
d) 95% CI: 95% confidence interval.
e) Pearson's chi-square test.
f) PRa: prevalence ratio adjusted for sociodemographic aspects (sex; age; mother's education level; living with father; living with mother; number of people in the household).

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Table 4 – Prevalence of inactivity or low physical activity level, experimentation with cigarettes and alcoholic beverages and their association with sociodemographic variables among adolescent students, PeNSE,[a] Brazil, 2015

Variables	Cardiovascular health risk behavior				
	%[b]	PR[c] (95%CI[d])	p[e]	PRa[f] (95%CI[d])	p[e]
	Alcoholic beverages				
Sex			0.012		0.040
Female	60.1	1.06 (1.01;1.11)		1.05 (1.00;1.10)	
Male	56.5	1.00		1.00	
Age (in years)			<0.001		<0.001
13-15	49.1	1.00		1.00	
16-17	27.9	1.39 (1.30;1.48)		1.38 (1.29;1.47)	
Mother's education level (in years of study)			0.324		
<8	59.6	1.00		–	
≥8	60.8	1.03 (0.96;1.10)		–	
Living with father			<0.001		0.012
No	66.6	1.12 (1.05;1.18)		1.07 (1.01;1.14)	
Yes	57.2	1.00		1.00	
Living with mother			<0.001		0.018
No	62.5	1.10 (1.05;1.16)		1.07 (1.02;1.12)	
Yes	55.7	1.00		1.00	
Number of people in the household			<0.001		<0.001
4 or more	56.5	1.00		1.00	
Up to 3	62.9	1.10 (1.05;1.16)		1.05 (1.01;1.11)	

a) PeNSE: National School-Based Health Survey.
b) Estimate corrected for sample weighing and design effect.
c) PR: crude prevalence ratio.
d) 95% CI: 95% confidence interval.
e) Pearson's chi-square test.
f) PRa: prevalence ratio adjusted for sociodemographic aspects (sex; age; mother's education level; living with father; living with mother; number of people in the household).

Brazil, are contradictory.[8,11,18,19] Lack of strong evidence to explain this influence may derive from the diverse contexts in which the studied populations are located. A variety of aspects have been associated with this population's food consumption, including family socioeconomic status, emotional aspects, influence of the media, family and peer interaction, availability of products at home and at school, time spent in sedentary behaviors, besides a series of other factors.[8,11]

The influence of aspects related to family contexts on adolescent health behavior, diet and nutrition has been widely recognized. Studies affirm that higher parental education level and greater family interaction and support are predictors of positive health outcomes.[20] However, in relation to eating habits, the results of our study suggest that mothers having more years of schooling has a negative influence: soda and industrialized food consumption among adolescents whose mothers had a higher level of schooling was more prevalent. Added to this finding are the findings of other researchers,[17,18] which suggest that women with higher schooling levels are more likely to have jobs and this hinders preparing food at home and monitoring food eaten by their children, so that there is an increase in their consumption of unhealthy food.[18] We highlight that more than 50% of the adolescents investigated had mothers with a better education level, and this increases the probability of their working away from home.

The significant percentage of inactivity and low level of physical activity in girls coincides with international population-based studies with Chinese,[21] North American[19] and European[11] adolescents. The lower level of physical activity in girls seems to involve aspects related to sociocultural, biological and body perception disparities, in addition to gender issues. It is common that during childhood, besides having less freedom to

play outside, girls are encouraged to perform activities that demand less physical effort, while in adolescence they often do housework-related activties.[22]

In our analysis of experimenting with alcoholic beverages and cigarettes, we found that exposure to alcohol consumption was higher than exposure to cigarettes. Experimenting with cigarettes was associated with the male sex, while experimenting with alcoholic beverages was associated with the female sex and with living with up to three people at home. Older adolescents (16 to 17 years old) and those who did not live with their father were factors associated with both behaviors. Adolescent involvement with alcohol and cigarettes has been portrayed in many studies, representing a considerable problem worldwide with many health consequences.[23,24] Increased risk of smoking and consuming alcoholic beverages has been found by studies examining just one such lifetime experimentation, suggesting that early experimentation increases risk of possible dependence.[25,26]

It is noteworthy that in our study experimenting with alcoholic beverages was more prevalent among girls, differently to international research.[19,11] Studies that attempt to explain aspects related to gender differences with regard to alcohol consumption are still inconclusive. It is known that during adolescence consumption of these substances is strongly influenced by genetic factors and by the family example, and that potential consumption is influenced by affective, biological and social factors that interfere differently with each gender.[27] Moreover, other aspects of the familiar context, such as parental divorce and good family relations, appear to influence excessive use of alcohol and cigarettes in this period.[28] Girls are more susceptible to situations of family conflict, stress, depression and other internalizing behaviors. These problems are growing in contemporary society and this makes girls vulnerable, increasing their risk of early consumption especially of alcohol.[27]

Experimenting with alcohol and cigarettes among adolescents who do not live with their parents seems to suggest that the absence of this interaction influences such behavior. Good communication with parents has been indicated as one of the main means of protection against behaviors that make adolescents' health vulnerable, preparing them to face stressful situations and safeguarding them from the negative influence of messages received via the media or from their friends.[29] In 2007, a study with Argentinean adolescents highlighted that interaction with parents contributed to adopting healthy habits and reducing experimentation with alcoholic beverages and cigarettes, while interaction with friends or companions who smoked influenced experimentation with these substances.[29]

The existence of bias in the results of this study cannot be ruled out, given that its data was obtained by means of self-reported information that only involved adolescents enrolled at education institutions. They corresponded to 85% of the Brazilian adolescents in 2015.[30] In this case, our measurements of risk behavior prevalence may have been underestimated, in the event of adolescents not attending school being more likely to be in a worse socioeconomic context and, consequently, in riskier health situations.

Surveys like the PeNSE survey are fundamental. The information it provides enables strategies and public health policies aimed at students to be defined. We suggest that future studies should be conducted, given the need to periodically monitor cardiovascular health risk behavior among adolescents, with the aim of reducing the impact of these conditions in adult life.

The results of this study allow us to conclude that 13 to 17 year-old Brazilian adolescents have cardiovascular health risk behavior, such as inadequate eating habits, insufficient levels of physical activity, and use of alcoholic beverages and cigarettes. The Brazilian scenario is similar to that described by studies in high-income countries with similar populations.[11,19] These are behaviors influenced by sociodemographic aspects – gender, maternal schooling, living or not with parents and age group – and should be taken into consideration when preparing more effective strategies aimed at promoting this population's cardiovascular health.

Authors' contributions

Leal MABF took part in the conception and design of the study, data analysis and interpretation and writing the manuscript. Lima CEB, Mascarenhas MDM and Rodrigues MTP collaborated with the conception, critical review and approval of the final version of the manuscript. Paiva SSC and Veloso VR contributed to data analysis and interpretation. Sousa CRO collaborated with the design of the study and writing the manuscript. All the authors have approved the final version and declared themselves to be responsible for all aspects of the study, ensuring its accuracy and integrity.

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