

## Skipping breakfast associated with socioeconomic and lifestyle factors in Brazilian adolescents

Omitir o café da manhã está associado a fatores socioeconômicos e de estilo de vida entre adolescentes brasileiros

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**Abstract** *The aim is to estimate the prevalence and evaluate the association of socioeconomic and lifestyle factors with skipping breakfast among Brazilian adolescent students. A cross-sectional study carried out with adolescent ninth-graders from Brazilian public and private schools participating in the 2015 National School Health Survey. The prevalence of skipping breakfast (less than five days/week) and its respective 95% confidence intervals were estimated and stratified by gender according to demographic, socioeconomic, and lifestyle factors, self-perceived body image, and attitudes towards weight. A three-block hierarchical Poisson regression, considering the complex sample design. The prevalence of skipping breakfast was 35.6%, higher among girls than boys. In both genders, skipping breakfast was positively associated with the highest socioeconomic level, morning school shift, paid work, regular consumption of alcoholic beverages, living only with the mother, the father or neither, the irregular consumption of school food and meals with parents, considering oneself too fat/fat and trying to lose weight. In general, skipping breakfast was associated with socioeconomic factors and lifestyle behaviors harmful to health among adolescent students.*

**Key words** *Breakfast, Adolescent, Skipping, Food consumption*

**Resumo** *O objetivo é estimar a prevalência e avaliar a associação dos fatores socioeconômicos e de estilo de vida com a omissão do café da manhã entre adolescentes escolares brasileiros. Um estudo transversal realizado com adolescentes do 9º ano de escolas públicas e privadas brasileiras participantes da Pesquisa Nacional de Saúde do Escolar de 2015. A prevalência de omissão do café da manhã (menos de cinco dias/semana) e seus respectivos intervalos de confiança de 95% foram estimados e estratificados por sexo de acordo com fatores demográficos, socioeconômicos, estilo de vida, autopercepção da imagem corporal e atitudes em relação ao peso. Uma regressão de Poisson hierárquica de três blocos, considerando o desenho amostral complexo. A prevalência de pular o café da manhã foi de 35,6%, maior entre as meninas do que entre os meninos. Em ambos os sexos, omitir o café da manhã associou-se positivamente com maior nível socioeconômico, turno escolar matutino, trabalho remunerado, consumo regular de bebidas alcoólicas, morar apenas com a mãe, pai ou nenhum dos dois, consumo irregular de alimentação escolar e refeições com os pais, considerar-se muito gordo/gordo e tentar perder peso. Em geral, a omissão do café da manhã foi associada a fatores socioeconômicos e comportamentos de estilo de vida prejudiciais à saúde entre estudantes adolescentes.*

**Palavras-chave** *Café da manhã, Adolescente, Omissão de refeições, Consumo alimentar*

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## Introduction

The Brazilian Population Food Guide recognizes breakfast as one of the main meals of the day, along with lunch and dinner<sup>1</sup>. The consumption of breakfast is a healthy eating behavior, as it provides energy to start daily activities and break with the long night fast<sup>2</sup>. Regular consumption of this meal is associated with greater adequacy of nutrient intake among children and adolescents<sup>3-5</sup>, along with other healthy habits and behaviors<sup>6,7</sup>.

Despite the importance of consuming breakfast, studies indicate a high prevalence of skipping this meal among adolescents<sup>5,6</sup>. A study involving children and adolescents from 33 countries showed that the prevalence of skipping breakfast ranged from 10% to 33%<sup>8</sup>. Another study with North American adolescents showed that about half of them (49.3%) consumed breakfast less than five days a week<sup>9</sup>.

In Brazil, data from the 2008-2009 National Food Survey showed that 21.5% of boys and 24.8% of girls aged 10-19 were occasional consumers or did not consume breakfast on either food assessment days<sup>10</sup>. According to data from the São Paulo Health Survey (ISA-Capital), 34% of boys and 41.8% of girls aged 12-18 skipped breakfast<sup>11</sup>.

The results of the Study on Cardiovascular Risks in Adolescents (ERICA) revealed that the profile of adolescents who do not consume breakfast evidenced in the Brazilian literature consists of female individuals, children of low-schooling mothers, and public school's students<sup>12</sup>.

Assessing the consumption of this meal in this period of life is essential, considering the beneficial effects of regular breakfast intake<sup>13</sup> and that the habits acquired in childhood and adolescence tend to last into adulthood<sup>14</sup>. However, few studies address the topic at the national level in Brazil. Thus, we aimed to estimate the prevalence and analyze the factors associated with skipping breakfast in Brazilian adolescent students.

## Methods

This study's sample consisted of 102,072 Brazilian students regularly attending ninth grade of the elementary school in public and private schools throughout Brazil, located in rural and urban areas, who participated in the 2015 National School Health Survey (PeNSE). This sample is nationally representative since it covers the 27 federative

units, including capitals and municipalities in the inland regions.

The 2015 PeNSE was held in partnership with the Brazilian Institute of Geography and Statistics (IBGE) and the Ministries of Health and Education. It was approved by the National Research Ethics Commission (CONEP) on March 30, 2015 (registration No. 1.006.467). The most detailed description of the methodology adopted for the sampling process is found in the survey publication<sup>15</sup>. Data were collected from April to September 2015 in schools through self-administered questionnaires in smartphone devices, divided into thematic modules. This study adopted questions about sociodemographic, food, school environment, lifestyle, body image, and attitudes towards weight features.

The outcome variable "skipping breakfast" was analyzed by the following question: "Do you usually have breakfast?", with the answer options: "Yes, every day", "Yes, 5 to 6 days a week", "Yes, 3 to 4 days a week", "Yes, 1 to 2 days a week", "Rarely" and "No"<sup>15</sup>. Skipping breakfast was considered when the student reported having this meal less than five days/week<sup>16</sup>. A total of 101,996 students were retained for this study, since 76 students had no information on this variable.

Among the independent variables, the socio-demographic characteristics studied were: gender (male/female); age group (14 years or less/15 years or more); ethnicity/skin color (white, black, yellow, brown, and indigenous), municipality of residence (capital/non-capital); school type (public/ private); study shift (morning, intermediate/full-time, afternoon, and night), paid work (yes/no), maternal schooling level (no study, incomplete elementary school, complete elementary school/incomplete high school, complete high school and higher education), living with parents (living with father and mother; only with mother; only with father; none of the parents) and socioeconomic level. The socioeconomic level was obtained from the report of owning the following items: computer, motorcycle, car, cell phone, bathroom, internet, landline, and a paid domestic worker at home at least three days a week. Each item received a weight equivalent to the inverse frequency of ownership or presence of the total sample. The sum of the respective items' weights originated from each adolescent's score, which was then distributed in tertiles<sup>17</sup>.

Since 24.9% (n=25,434) of the students did not know how to inform the maternal schooling level, the variable went through the Multiple Imputation by Chained Equations (MICE) meth-

od, which is the most suitable in this case<sup>18</sup>. The multiple imputation method fills in the missing values in the database, which allows using statistical methods directed to the processing of complete data<sup>19</sup>. The predictive variables considered for imputation were gender, family goods (car, landline, cell phone, number of household bathrooms), and services (housekeeper and home internet access), as previously performed by Azere-do *et al.*<sup>20</sup>.

The food-related variables were having lunch or dinner with parents, consuming school meals, and a canteen at school. The habit of eating meals with parents was categorized into regular ( $\geq 5$  days/week) and irregular ( $< 5$  days/week)<sup>21</sup>. The regular intake of school meals was when adolescents reported consuming school meals three or more times a week<sup>22</sup>. A school canteen was also assessed (yes/no) according to the report of the school principal or responsible.

The physical activity level was assessed from questions related to commuting to school, leisure activities, and physical education classes at school, considering duration and frequency. Through the answers, the adolescents were classified as active (those who performed physical activity for at least 300 minutes per week) insufficiently active (adolescents who performed up to 299 minutes of physical activity per week), and inactive (those who did not perform physical activity during the week)<sup>23,24</sup>.

Sedentary behaviors, in hours per day, were assessed by the question: "On a typical weekday, how long do you sit watching television, using a computer, playing video games, talking with friends, or doing other activities while sitting? (not counting Saturdays, Sundays, holidays, and school sitting time)". Despite the recommendation of the World Health Organization (WHO) that children and adolescents do not exceed two hours of daily sedentary activities, for analysis, in this study, adolescents who remained seated for more than four hours per day performing sedentary activities were classified as sedentary<sup>25</sup>. Regarding health risk behaviors, we considered regular use of cigarettes and alcohol consumption when reported by the adolescent at least one day in the 30 days before the survey. The WHO definitions were used for both variables<sup>26</sup>.

The perceived body image was investigated by the question "As for your body, do you consider yourself very thin, thin, normal, fat, or very fat?". Regarding the analyses, adolescents were classified as very thin/thin, normal, and very fat/fat<sup>27</sup>. Attitudes toward body weight were as-

essed by the following question "What are you doing regarding your weight?" with answers categorized as "nothing", "trying to lose weight", "attempting to gain weight", and "attempting to keep weight"<sup>28</sup>.

Prevalence, the respective 95% confidence intervals, and a 0.05 significance level were estimated for skipping breakfast according to the general population's independent variables and stratified by gender, using the Chi-square test with second-order Rao-Scott adjustment. The variables with a significant difference regarding the prevalence of skipping breakfast were considered in the Poisson regression model with robust variance and a 5% significance level. The model was defined in three levels: distal (sociodemographic variables), adjusted by same-level variables, intermediate level (lifestyle and school-related variables), adjusted by the variables of the previous level and this level, and proximal (variables referring to body image and attitudes towards weight), adjusted by the variables of the level itself and the previous ones, according to the backward selection model. The variables with a statistical significance at the 5% level ( $p$ -value  $< 0.05$ ) in the block belonging to and adjusted by the previous level block remained in the final model. The analyses were performed using the Stata version 12 statistical program.

## Results

The prevalence of skipping breakfast was 35.6% (95%CI: 34.7;36.5), and was higher among girls (42.5%; 95%CI: 41.5;43.6), compared to boys (28.3%; 95%CI: 27.4;29.3). Assessing the socio-demographic and economic characteristics, we found that the proportion of students in both genders who skipped breakfast was more frequent among those with mothers with higher schooling level, capital residents, engaged in paid work, belonging to the highest socioeconomic levels, studying in the morning shift, and not living with their parents.

We observed that skipping breakfast was more prevalent among white adolescents than among brown ones, with no difference for the other categories. Boys who studied in the private school network skipped breakfast the most, and no significant difference for this variable was observed among girls (Table 1).

When analyzing the behaviors of lifestyle and body image, we found that skipping breakfast was greater among sedentary boys and girls who

**Table 1.** Breakfast omission among Brazilian adolescents according to demographic and socioeconomic characteristics, stratified by sex. Brazil, 2015.

	N	General		Male		Female	
		%	95%IC	%	95%IC	%	95%IC
Total	101,996	35.6	34.7; 36.5	28.3	27.4; 29.3	42.5	41.5; 43.6
Age group							
11-14	68,871	35.9	34.9; 37.0	28.3	27.2; 29.4	42.3	41.1; 43.5
15-19	33,201	34.9	33.7; 36.1	28.4	27.1; 29.7	43.2	41.5; 44.9
p-value*			0.15		0.35		0.35
Socioeconomic level <sup>a,b</sup>							
1st tertile	34,865	32.0	30.8; 33.2	24.3	23.0; 25.8	38.3	36.9; 39.7
2nd tertile	32,245	37.7	36.4; 39.0	29.2	27.8; 30.7	45.7	43.9; 47.5
3rd tertile	34,962	37.1	35.9; 38.3	30.9	29.5; 32.3	43.9	42.4; 45.5
p-value*			<0.01		<0.01		<0.01
School type							
Public	81,154	35.1	34.1; 36.1	27.6	26.5; 28.7	42.3	41.1; 43.5
Private	20,918	38.4	36.5; 40.4	32.7	30.9; 34.6	43.9	41.4; 46.6
p-value*			<0.01		<0.01		<0.26
Study shift <sup>b</sup>							
Morning	62,891	41.9	40.9; 42.9	33.5	32.3; 34.6	50.0	48.8; 51.2
Evening	37,144	24.4	23.1; 25.7	18.7	17.3; 20.1	29.6	27.9; 31.3
Intermediate or integral	1,920	27.4	21.5; 34.4	22.9	17.7; 29.2	31.5	23.4; 40.9
Night	87	38.8	19.6; 62.3	50.2	28.6; 71.8	17.4	4.5; 48.4
p-value*			<0.01		<0.01		<0.01
Race/Skin Color							
White	33,775	36.8	35.7; 38.0	29.9	28.5; 31.4	43.9	42.3; 45.4
Black	12,849	35.5	33.8; 37.3	27.9	25.9; 30.1	45.3	42.9; 47.8
Yellow	4,580	36.6	34.3; 39.0	26.5	23.4; 29.8	43.9	40.7; 47.3
Brown	46,935	34.5	33.4; 35.6	27.0	25.7; 28.3	40.6	39.2; 42.0
Indigenous	3,825	36.6	33.5; 39.8	29.7	25.6; 34.1	44.5	40.3; 48.7
p-value*			<0.01		0.13		<0.01
Maternal education <sup>b</sup>							
No study	7,777	28.8	26.8; 30.9	19.1	16.7; 21.7	37.3	34.5; 40.2
Incomplete EF	25,176	33.6	32.2; 35.1	24.4	22.7; 26.2	41.1	39.1; 43.1
EF complete/MS incomplete	16,603	35.4	33.8; 37.0	27.7	25.7; 29.9	42.7	40.5; 45.0
EM complete	30,694	37.1	35.7; 38.4	30.0	28.2; 31.9	43.9	42.0; 45.9
University education	21,651	37.9	36.5; 39.2	32.5	30.9; 34.2	43.3	41.3; 45.3
p-value*			<0.01		<0.01		<0.01
Type of municipality							
Capital	51,192	37.6	36.5; 38.7	30.6	29.3; 31.9	44.5	43.1; 45.8
Non capital	50,880	35.0	33.9; 36.1	27.6	26.4; 28.8	42.0	40.7; 43.3
p-value*			<0.01		<0.01		<0.01
Paid work							
Not	51,192	35.4	34.5; 36.3	27.8	26.8; 28.8	41.9	40.8; 43.0
Yes	50,880	37.2	35.6; 38.9	31.0	29.1; 32.9	49.7	47.0; 52.4
p-value*			0.02		<0.01		<0.01
Lives with the parents							
Yes	58,669	32.3	31.4; 33.3	25.5	24.5; 26.6	39.2	37.9; 40.5
Just with the mother	31,707	40.8	39.6; 42.0	32.7	31.0; 34.3	47.6	46.2; 49.1
Just with the father	4,909	38.9	36.3; 41.6	32.3	28.7; 36.1	48.7	44.7; 52.7
No	6,621	39.4	37.2; 41.6	33.4	30.2; 36.8	43.6	40.6; 46.7
p-value*			<0.01		<0.01		<0.01

<sup>a</sup> Calculated according to score of goods and services (EBS). <sup>b</sup> Variables have missing information. 95%CI: 95% confidence interval. \* Pearson's chi-square test, with second-order Rao-Scott correction for the sample design.

Source: Authors.

reported using cigarettes and drinking alcohol, studied in schools with canteens, irregularly consuming school meals and meals with their parents, who considered themselves very fat/fat, and attempted to lose weight. The proportion of adolescents who perceived themselves as “fat/very fat” was 54.4% (95%CI: 52.8;56.1) for girls, higher than among boys (40.7%; 95% CI: 38.6;42.9), and more than half of the girls reported trying to lose weight (51.1%; 95%CI: 49.6;52.7) (Table 2).

In the hierarchical Poisson regression, only the variables related to the age group, type of municipality, ethnicity/skin color, and physical activity level in both genders did not remain associated with skipping breakfast (Tables 3 and 4). The variables referring to maternal schooling, tobacco use in females, and available canteens and school type in males, did not remain associated with skipping breakfast.

At the distal level of the hierarchical model, we observed, for both genders, the highest prevalence of skipping breakfast among students of the highest socioeconomic levels, compared to the first tertile, who studied in the morning shift when compared to the afternoon shift, and who engaged in paid work compared to those who did not. Boys whose mothers had a higher schooling level, who studied at night, and girls who studied at a public school, were more likely to skip breakfast (Tables 3 and 4).

At the intermediate level, for both genders, the regular intake of alcohol, sedentary behavior, and irregular consumption of school meals and meals with parents were positively associated with skipping breakfast. A higher likelihood of skipping breakfast was observed among girls who visited canteen schools and among boys with regular tobacco use. At the proximal level, considering oneself too fat/fat, trying to lose weight in both genders, and considering oneself too thin/thin for girls were positively associated with skipping breakfast. On the other hand, considering oneself very thin/thin for boys and maintaining and gaining weight for both genders were inversely associated with skipping breakfast (Tables 3 and 4). When this perception was evaluated regarding skipping breakfast, self-perceiving as very fat/fat was positively associated with skipping breakfast in both genders.

## Discussion

More than a third of the Brazilian adolescents evaluated in the National School Health Survey

skipped breakfast, which was higher in females than males. In both genders, skipping this meal was higher among adolescents of higher socioeconomic level, who studied in the morning shift, who were engaged in paid work, who did not live with their parents, were sedentary, with regular alcohol intake, and who consumed irregularly school meals and meals with parents, those who considered themselves too fat/fat, and those who attempted to lose weight. Maternal schooling level and tobacco use were positively associated with skipping breakfast only among boys, while the presence of a canteen and studying in a private school was associated with skipping the meal only among girls.

The prevalence of omission observed in this study was similar to that found in PeNSE 2012 (38.1%)<sup>29</sup> and higher than that observed in another Brazilian study, in which 19% did not consume breakfast or consumed it in only one of the two evaluation days<sup>5</sup>. This variation in prevalence can be understood by the different definitions attributed to breakfast and the cutoff points used to classify skipping<sup>30</sup>. Marchioni *et al.*<sup>11</sup> considered breakfast as the first meal consumed from waking up to 11 am, from Monday to Friday, or until 11:30 am. on weekends, skipping was considered not consuming food or drink during this period. In turn, Pereira *et al.*<sup>5</sup> considered breakfast as the first meal moment informed by most of the study participants, which was from 6 am to 9:59 am. The authors classified the participants as consumers (consumed breakfast in the two evaluation days), occasional consumers (consumed breakfast in just one evaluation day), and non-consumers (did not consume breakfast in both evaluation days).

The positive association of females with skipping breakfast was also found in several previous studies<sup>8,31-33</sup>. A possible explanation is a dissatisfaction with body image, and the girls understand this practice as a weight control option and adaptation to the acceptable standard<sup>6</sup>. Hassan *et al.*<sup>34</sup> found that girls aged 10-16 who consume breakfast irregularly are more likely to engage in a diet than girls who consume breakfast regularly.

The association between age and skipping breakfast has been observed in previous studies. However, this study showed no significant association in both genders, corroborating the findings of Hallström *et al.*<sup>35</sup>, who analyzed the data of European adolescents participating in the study Healthy Lifestyle in Europe by Nutrition in Adolescence (HELENA-CSS). Notwithstanding this, evidence reveals in children and adolescents

**Table 2.** Breakfast omission among Brazilian adolescents according to lifestyle behaviors and body image, stratified by sex. Brazil, 2015.

	N	General		Male		Female	
		%	95%IC	%	95%IC	%	95%IC
Physical activity <sup>a,b</sup>							
Active	35,145	34.5	33.3; 35.6	29.2	28.0; 30.5	43.0	41.4; 44.7
Insufficiently active	61,186	36.1	35.0; 37.1	27.5	26.3; 28.7	42.5	41.2; 43.7
Inactive	5,622	38.1	35.8; 40.3	29.3	25.4; 33.4	41.7	39.0; 44.4
p-value*			<0.01		0.05		0.67
Consumption of alcoholic beverages <sup>a,c</sup>							
Yes	22,708	44.3	42.9; 45.7	34.7	32.9; 36.4	52.4	50.7; 54.2
No	79,364	32.9	32.0; 33.8	26.5	25.5; 27.5	39.3	38.2; 40.4
p-value*			<0.01		<0.01		<0.01
Tobacco <sup>a,c</sup>							
Yes	5,462	47.2	44.4; 50.0	39.0	35.7; 42.4	55.6	51.6; 59.5
No	96,072	35.0	34.1; 35.8	27.7	26.7; 28.7	41.8	40.8; 42.9
p-value*			<0.01		<0.01		<0.01
Sedentary behavior <sup>d</sup>							
>4 hours/day	43,374	41.8	40.8; 42.9	33.3	32.1; 34.6	49.3	47.8; 50.7
≤4 hours/days	58,071	30.7	29.8; 31.7	24.7	23.5; 25.8	36.8	35.5; 38.1
p-value*			<0.01		<0.01		<0.01
School feeding <sup>a,d</sup>							
Regular	22,204	31.9	30.4; 33.4	24.3	22.7; 25.9	39.6	37.6; 41.7
Irregular	79,829	36.8	35.9; 37.8	29.7	28.6; 30.8	43.4	42.3; 44.6
p-value*			<0.01		<0.01		<0.01
Canteen presence							
Yes	46,071	38.5	37.2; 39.9	30.9	29.4; 32.5	46.0	44.3; 47.7
No	55,860	33.6	32.3; 34.8	26.4	25.1; 27.8	40.2	38.8; 41.6
p-value*			<0.01		<0.01		<0.01
Meal with parents <sup>a,e</sup>							
Regular	74,129	30.4	29.5; 31.3	24.2	23.2; 25.2	36.8	35.6; 38.0
Irregular	27,817	50.6	49.3; 51.8	42.5	40.7; 44.3	56.5	55.0; 57.9
p-value*			<0.01		<0.01		<0.01
Body image <sup>a</sup>							
Very thin/thin	26,265	32.9	31.7; 34.2	25.8	24.3; 27.3	39.9	38.2; 41.7
Normal	56,611	32.5	31.5; 33.5	26.4	25.3; 27.5	38.9	37.7; 40.2
Very fat/fat	18,119	49.2	47.8; 50.5	40.7	38.6; 42.9	54.4	52.8; 56.1
p-value*			<0.01		<0.01		<0.01
Attitude towards weight <sup>a</sup>							
None	39,151	34.0	32.9; 35.2	27.9	26.6; 29.2	40.8	39.5; 42.2
I tried to lose	25,802	45.2	44.0; 46.5	36.0	34.2; 37.8	51.1	49.6; 52.7
I tried to win	17,258	30.0	28.6; 31.4	23.7	22.0; 25.5	36.6	34.6; 38.7
I tried to keep	18,682	30.9	29.6; 32.2	25.1	23.5; 26.7	36.8	35.0; 38.7
p-value*			<0.01		<0.01		<0.01

<sup>a</sup> Variables have missing information. <sup>b</sup> Active: ≥300 min/week; Insufficiently active: ≤299 min/week; Inactive: did not perform physical activity during the previous week. <sup>c</sup> At least once in the last 30 days. <sup>d</sup> Regular consumption: ≥3 days/week. <sup>e</sup> Regular consumption: ≥5 days/week. 95%CI: 95% confidence interval. \* Pearson's chi-square test, with second-order Rao-Scott correction for the sample design.

Source: Authors.

that the higher the age, the lower the consumption of breakfast, which can be explained by the

decreased influence of parents and higher autonomy with age<sup>6,36,37</sup>.

**Table 3.** Hierarchical Poisson regression model of breakfast omission among male Brazilian adolescents. Brazil, 2015.

	PR	95%IC	p-value
<b>Distal Level: Sociodemographic variables</b>			
Socioeconomic level <sup>a,b</sup>			
1st tertile	1.00	-	
2nd tertile	1.17	1.09; 1.26	<0.01
3rd tertile	1.16	1.07; 1.24	<0.01
Study shift <sup>a</sup>			
Morning	1.75	1.61; 1.90	<0.01
Evening	1.00	-	
Intermediate or integral	1.16	0.90; 1.49	0.24
Night	2.76	1.64; 4.67	<0.01
Maternal education <sup>b</sup>			
No study	1.00	-	
Incomplete EF	1.20	1.05; 1.35	<0.01
EF complete/MS incomplete	1.30	1.15; 1.46	<0.01
EM complete	1.32	1.17; 1.49	<0.01
University education	1.33	1.17; 1.50	<0.01
Paid work <sup>b</sup>			
No	1.00	-	
Yes	1.09	1.02; 1.16	<0.01
Lives with parents <sup>b</sup>			
Yes	1.00	-	
Just with the mother	1.32	1.24; 1.39	<0.01
Just with the father	1.27	1.13; 1.43	<0.01
No	1.39	1.25; 1.54	<0.01
<b>Intermediate Level: Lifestyle and school-related variables</b>			
Regular consumption of alcoholic beverages <sup>b,c</sup>			
No	1.00	-	
Yes	1.16	1.09; 1.22	<0.01
Smoke <sup>b,c</sup>			
No	1.00	-	
Yes	1.20	1.09; 1.32	<0.01
Sedentary behavior <sup>b</sup>			
≤4 hours/days	1.00	-	
>4 hours/day	1.22	1.17; 1.29	<0.01
School meals <sup>b,d</sup>			
Regular	1.00	-	
Irregular	1.16	1.08; 1.25	<0.01
Meal with parents <sup>b,e</sup>			
Regular	1.00	-	
Irregular	1.59	1.51; 1.67	<0.01
<b>Proximal Level: Perception of body image and attitudes towards weight</b>			
Body image <sup>b</sup>			
Very thin/thin	0.97	0.90; 1.03	<0.01
Normal	1.00	-	
Very fat/fat	1.27	1.18; 1.37	<0.01
Attitude towards weight <sup>b</sup>			
None	1.00	-	
I tried to lose	1.11	1.04; 1.18	<0.01
I tried to win	0.86	0.80; 0.93	<0.01
I tried to keep	0.09	0.08; 0.10	0.01

<sup>a</sup> Calculated according to score of goods and services (EBS). <sup>b</sup> Variables have missing information. <sup>c</sup> At least once in the last 30 days. <sup>d</sup> Regular consumption: ≥3 days/week. <sup>e</sup> Regular consumption: ≥5 days/week. RP: Prevalence Ratio. 95%CI: 95% confidence interval.

Source: Authors.

**Table 4.** Hierarchical Poisson regression model of breakfast omission among Brazilian female adolescents. Brazil, 2015.

	PR	95%IC	p-value
<b>Distal Level: Sociodemographic variables</b>			
Socioeconomic level <sup>a,b</sup>			
1st tertile	1.00	-	
2nd tertile	1.14	1.08; 1.20	<0.01
3rd tertile	1.19	1.13; 1.25	<0.01
Type of school			
Public	1.10	1.04; 1.17	<0.01
Toilet	1.00	-	
Study shift <sup>b</sup>			
Morning	1.69	1.59; 1.81	<0.01
Evening	1.0	-	
Intermediate or integral	1.10	0.84; 1.42	0.48
Night	0.61	0.18; 1.99	0.41
Paid work <sup>b</sup>			
No	1.00	-	
Yes	1.14	1.08; 1.20	<0.01
Lives with parents <sup>b</sup>			
Yes	1.00	-	
Just with the mother	1.25	1.20; 1.30	<0.01
Just with the father	1.26	1.16; 1.38	<0.01
No	1.16	1.09; 1.25	<0.01
<b>Intermediate Level: Lifestyle and school-related variables</b>			
Regular consumption of alcoholic beverages <sup>b,c</sup>			
No	1.00	-	
Yes	1.20	1.16; 1.27	<0.01
Sedentary behavior <sup>b</sup>			
≤4 hours/days	1.00	-	
>4 hours/days	1.20	1.16; 1.26	<0.01
Canteen presence <sup>b,d</sup>			
Yes	1.10	1.04; 1.16	<0.01
No			
School feeding <sup>b,e</sup>			
Regular	1.00	-	
Irregular	1.16	1.08; 1.25	<0.01
Meal with the parents <sup>b,e</sup>			
Regular	1.00	-	
Irregular	1.07	1.02; 1.13	<0.01
<b>Level 3: Perception of body image and attitudes towards weight</b>			
Body image <sup>b</sup>			
Very thin/thin	1.05	1.00; 1.09	0.04
Normal	1.00	-	
Very fat/fat	1.17	1.12; 1.22	<0.01
Attitude towards weight <sup>b</sup>			
None	1.00	-	
I tried to lose	1.11	1.07; 1.16	<0.01
I tried to win	0.82	0.85; 0.95	<0.01
I tried to keep	0.87	0.88; 0.98	<0.01

<sup>a</sup> Calculated according to score of goods and services (EBS). <sup>b</sup> Variables have missing information. <sup>c</sup> At least once in the last 30 days. <sup>d</sup> Regular consumption: ≥3 days/week. <sup>e</sup> Regular consumption: ≥5 days/week. RP: Prevalence Ratio. 95%CI: 95% confidence interval.

Source: Authors.



Among the reasons for not consuming regular or daily breakfast, children and adolescents report not having time, not feeling hungry in the morning, and taking the time to sleep more<sup>6,30</sup>, which is also a possible explanation for the higher prevalence of skipping breakfast in this study among adolescents studying in the morning shift. In a study that evaluated the association between eating habits and the diet quality of Brazilian adolescents, Rodrigues *et al.*<sup>38</sup> also observed that students in the afternoon period consumed breakfast more frequently than those who studied in the morning shift.

Skipping breakfast was positively associated with a higher socioeconomic level, corroborating the study conducted with data from Brazilian adolescents participating in the 2008-2009 National Food Survey<sup>5</sup>. Contrary to what was observed, Hallstrom *et al.*<sup>39</sup> found in their study that the consumption of breakfast was more frequent among adolescents of higher economic level compared to those of lower economic level, as observed by MacDiarmid *et al.*<sup>40</sup> among Scottish adolescents. Also, in this study, boys born to mothers with a higher schooling level were more likely to skip breakfast, which is also a factor that reflects their socioeconomic level.

School meals are a student's right guaranteed by implementing the National School Food Program (PNAE), which is considered an essential strategy for promoting healthy eating<sup>41,42</sup>. The program offers food for all public primary education students during their stay in schools, and breakfast is one of the meals provided<sup>43</sup>. Thus, the lowest proportion of skipping breakfast may occur among adolescents of lower socioeconomic status, from public schools, students from schools without a canteen, or adherence to the PNAE.

Living only with the mother, the father, or neither was associated with a higher prevalence of skipping breakfast in both genders. The household is an essential factor in the children's food consumption since food choices are transmitted to them by repeating these habits<sup>44,45</sup>.

Although it does not show much interference in adolescents' dietary decisions compared to children, studies show that eating with parents is associated with better eating habits<sup>17,46,47</sup>. Thus, this study evidenced that adolescents who regularly consumed meals with their parents were less likely to skip breakfast. Family monitoring of adolescents is a protective effect for risk behaviors such as tobacco, alcohol, and drug use<sup>48</sup>.

The positive relationship between tobacco use and skipping breakfast was only observed in

males, while regular alcohol consumption and sedentary behavior was associated with both genders. Kapantais *et al.*<sup>49</sup> observed that the weekly consumption of alcoholic beverages and the number of cigarettes smoked daily among Greek schoolchildren aged 13-19 was higher among adolescents of both genders who skipped breakfast.

The results of a study that evaluated children and adolescents from 12 countries showed that a higher proportion of time performing moderate/vigorous physical activity and light physical activity in the morning and less sedentary activity time were associated with frequent breakfast consumption<sup>7</sup>. Another study that described the frequency of breakfast consumption among Chinese adolescents and examined the association with other behaviors found that computer use and tobacco and alcohol intake were inversely associated with daily breakfast consumption<sup>50</sup>. Insufficient physical activity, tobacco use, unhealthy eating, and alcohol abuse are considered health risk behaviors that tend to group in the opposite direction to health-friendly behaviors<sup>51,52</sup>.

As in this edition of PeNSE, the previous one showed a positive association between the consumption of school meals and breakfast among students<sup>22</sup>, indicating that consuming school meals may be related to healthier eating behaviors. Also, the presence of a canteen in the school was positively associated with skipping breakfast among girls. Evaluating the same data from this study, Noll *et al.*<sup>53</sup> found that the availability of a canteen was associated with a higher likelihood to consume ultraprocessed foods among students. Thus, it is suggested that skipping breakfast among adolescents may be related to the replacement of this meal by other foods purchased at the school canteen, which meet their food preference.

This study has some limitations since using a self-administered questionnaire in a survey can hinder participants' understanding of questions, which is a possible cause of information bias. However, measures were taken to minimize possible flaws, such as choosing ninth-graders to participate in the survey, justified by the higher level of schooling that facilitates understanding the questionnaire<sup>15</sup>. Furthermore, the definition and variability in the cutoff points used by the studies to classify skipping breakfast can influence the results and their interpretation. In this study, we chose to consider skipping as consuming fewer than five times a week, considering the importance of regular intake of this meal, and changes in adolescent eating habits, such as

skipping meals during the weekend<sup>54</sup>. Also, the PeNSE questionnaire only considered the students' perception of the concept of breakfast.

A strong point of this study is using PeNSE data, which have significant breadth and represent Brazil. Considering the limited national studies analyzing factors associated with the habit of skipping breakfast in this age group, this study contributes to knowledge by analyzing a nationally representative sample of schoolchildren aged 10-19, evaluating a wide range of demographic, socioeconomic, and lifestyle-related risk behavior characteristics among adolescents.

We conclude by saying that skipping breakfast is associated with demographic, socioeconomic, and lifestyle behavior factors among Brazilian adolescent students. The study's findings also highlight the need to give special attention to the specific female audience, considering that they are more likely to skip breakfast.

Mapping adolescents' behavior and eating habits allows employing more appropriate strategies for the adjustment of inappropriate standards, considering that this is a moment for consolidating practices that can interfere in adult life.

### **Collaborations**

PAS Silva wrote this study, reviewed the literature, and performed the analysis. AP Muraro proposed the study analysis, performed the revision of the analysis and reviewed the literature. M Froelich, PRM Rodrigues, BSN Souza, B Gorgulho and NF Moreira performed the revision of the analysis, reviewed the literature, and helped with the discussion. All authors contributed to multiple revisions of the article. All authors read and approved the final manuscript.

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