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Breakfast eating among Brazilian adolescents: Analysis of the National Dietary Survey 2008-2009

Desjejum dos adolescentes brasileiros: análise do Inquérito Nacional de Alimentação 2008-2009

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ABSTRACT

Objective

To characterize breakfast eating among Brazilian adolescents.

Methods

Food intake was estimated based on a 1-day food record of adolescents aged 10-19 years, according to the first National Diet Survey (2008-2009). Breakfast was considered as the first meal of the day eaten between 4 and 11 am.

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Results

Ninety-three percent of adolescents reported eating breakfast. This meal contributed to 17.7% of the daily energy intake. The most commonly consumed food groups were: coffee and tea, breads, butter/margarine, milk, cakes and cookies, packaged snacks, corn-based dishes, cheese, processed meats, and fruit juice. In the Northern region there was a higher frequency of coffee and tea and roots and tubers intake and lower frequency of milk intake than that in the other regions in the country. In the Northeastern region, the intake of corn and eggs was high; in the Southern region, there was high intake of processed meats and fruits. Adolescents from families in the first income quartile reported higher intake of coffee and tea, packaged snacks, corn, and roots and tubers intake, and lower intake of milk and dairy products. Adolescents from families in the highest income quartile reported higher intake of milk, fruit juice, cheese, and sugar-added beverages.

Conclusion

In Brazil, the contribution of breakfast to daily energy intake among adolescents is low. The nutritional quality of breakfast improved with increased income. The three most frequently consumed items were coffee and tea, breads, and butter/margarine.

Keywords: Adolescent. Breakfast. Food consumption.

RESUMO

Objetivo

Caracterizar o desjejum dos adolescentes brasileiros.

Métodos

O consumo alimentar foi estimado com base em um dia de registro alimentar de adolescentes entre 10 e 19 anos de idade do primeiro Inquérito Nacional de Alimentação (2008-2009). Considerou-se como desjejum a primeira ocasião de consumo alimentar entre 4 e 11 horas da manhã.

Resultados

Noventa e três porcento dos adolescentes realizaram desjejum. Essa refeição contribuiu com 17,7% da ingestão diária de energia. Os grupos de alimentos mais consumidos foram: café e chá, pães, manteiga/margarina, leite, bolos e biscoitos, salgadinhos e chips, preparações à base de milho, queijo, carnes processadas e suco da fruta. Na região Norte observou-se frequência mais elevada de consumo de café e chá e de raízes e tubérculos e menor relato para leite do que nas demais regiões. Na região Nordeste, destaca-se o consumo de milho e de ovos e na região Sul, o de carnes processadas e frutas. Adolescentes de famílias do primeiro quartil de renda relataram frequência mais elevada de consumo de café e chá, salgadinhos e chips, milho e raízes e tubérculos e menor relato para o grupo do leite. Os adolescentes de famílias do quartil mais elevado de renda referiram consumo mais expressivo de leite, suco de fruta, queijo e bebidas com adição de açúcar.

Conclusão

No Brasil, o desjejum dos adolescentes tem baixa contribuição para o consumo diário de energia. A qualidade nutricional do desjejum melhora com o incremento da renda. Os três principais itens consumidos foram café/chá, pães e manteiga/margarina.

Palavras-chave: *Adolescente. Desjejum. Consumo alimentar.*

INTRODUCTION

Eating habits have a significant influence on the growth, development, and health of individuals [1,2]. High consumption of fat and sugar rich foods and low consumption of fruits and vegetables [3] has been observed among Brazilian adolescents, resulting in nutritionally inadequate diets [4]. Meal skipping [5,6] and eating away from home have also been observed [7]. Moreover, when compared to adults and older adults, Brazilian adolescents consume more soft drinks, cookies, and sandwiches and less beans, salads, and vegetables [8].

Breakfast is considered as the first and most important meal of the day [9]. The quality

of food at breakfast has been identified as essential for children and adolescents to achieve or maintain adequate health conditions [10] since the consumption of cereal and fruit is important for the prevention of chronic non-communicable diseases [11].

In children and adolescents, breakfast has been associated with improvement in attention, memory, and mood; it has also been possibly associated with improvements in motivation, cognitive function, and academic achievement [12,13], as well as with higher intakes of vitamin D and calcium [14]. However, irregular breakfast habits have been associated with unfavorable health outcomes and weight gain among adolescents [15-17].

In Brazil, studies carried out in different locations have evaluated breakfast eating among adolescents [9,17]. However, there are few studies addressing breakfast patterns among adolescents according to population-based data. Therefore, the present study proposes to characterize Brazilian adolescents' breakfast eating based on the data from the first National Dietary Survey, conducted in 2008-2009.

METHODS

The data used were obtained from the *Inquérito Nacional de Alimentação* (INA, National Dietary Survey) conducted in 2008-2009 with a sub-sample (approximately 25% of the households evaluated in the *Pesquisa de Orçamentos Familiares* (POF, Family Budget Survey, 2008-2009) developed by the *Instituto Brasileiro de Geografia e Estatística* (IBGE, Brazilian Institute of Geography and Statistics). The 2008-2009 POF was carried out with a representative sample of 55,970 Brazilian households. A sub-sample of these households was probabilistically selected for the investigation of individual food consumption. The study was carried out for 12 months; therefore, in the four quarters that made up that year, all geographic and socioeconomic statuses were adequately represented. Residents (n=34,003 individuals) aged at least 10 years of age living in the 13,569 households included in the INA completed the diet and nutrition survey, of which 7,613 were adolescents aged between 10-19 years [8]. In the present study, pregnant adolescents (n=67) and nursing mothers (n=121) were excluded, resulting in a sample of 7,425 adolescents.

This study was approved by the Research Ethics Committee of the Institute of Social Medicine of the *Universidade do Estado do Rio de Janeiro* on July 19, 2011 (CAAE 0011.0.259.000-11).

The instrument used to collect food consumption data was the two-day food record collected on non-consecutive days. Participants were asked to record all foods and beverages they consumed over the course of the day, including food items (food or preparations), amount consumed (in household measures or volume/mass measures), time and place of consumption (home – which also included foods prepared at home for consumption elsewhere or away from home – foods purchased and consumed away from home).

There was an extra question about the use of sugar and sweetener in beverages and other preparations [8]. For the participants who reported using only sugar to sweeten beverages, the proportion of sugar added to beverages was standardized at 10%; for those who reported using sugar and artificial sweetener, this proportion was 5% [8].

In the present study, the foods mentioned by the participants in the food record were divided into 58 groups, according to Pereira *et al.* [18]. Briefly, this food grouping system, proposed by the Department of Nutrition of the University of North Carolina, considers nine major United States Departament of Agriculture food groups disaggregated into subgroups according to the nutritional characteristics of foods and beverages and usual consumption pattern. The nutritional composition of the foods reported in the food survey was estimated

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based on the table of nutritional composition of foods adopted by the INA [19].

Only food records of the first day were used in this study. This decision was made due to the fact that even when two data sets are used, during the analysis for correction for intra-individual variations, a large number of zero intakes for many foods/food groups is observed, which can lead to biased estimates. In addition, the literature shows that the use of a single day of food record can provide reliable estimates of a mean intake of large groups and that the first day of record is the one with higher quality of reported information [20].

Breakfast was considered as the first meal of the day eaten between 4 and 11 am. To characterize it, the 43 groups of foods mentioned as foods consumed at breakfast by at least 2% of the adolescents were considered. Chart 1 shows the contributions to the daily consumption of energy and nutrients considering the regions of the country, the income quartiles, the time of the meal, and the number of items consumed at breakfast.

The *per capita* household income was estimated by the sum of the total income of all household residents divided by the number of residents. The monthly *per capita* household was classified into quartiles.

Breakfast habits were evaluated according to:

- Macro-regions of Brazil (North, Northeast, Central-West, South, and Southeast);

- Place of residence (urban or rural);

- Day of consumption: reports made on Saturday and Sunday were considered as weekend consumption; reports made form Monday to Friday were considered as weekday consumption;

- Location of breakfast consumption (home and away from home);

- Time of breakfast consumption was divided into three categories (4–6 am, 7–8 am, and 9–11 am);

- Number of food items consumed at breakfast (1 food item, 2 food items, 3 food items, ≥4 food items).

Sample weights and the sample design effect were considered in the analysis. Differences in energy and nutrient consumption (continuous variables) between the categories evaluated were analyzed by linear regression (Generalized Linear Models [GLMs]) using the Complex Sample module of the Statistical Package for the Social Sciences (SPSS, Chicago, Illinois, United States), version 19 with Bonferroni correction. They were compared according to household income class, and geographic regions, time of breakfast, and number of items consumed.

Chi-square test was used to evaluate the differences between strata of the categorical variables, considering 95% confidence interval.

RESULTS

The sample analyzed consisted of 52.0% of males; 61.0% of the adolescents were aged between 10 and 15 years (mean age of 14.5 years), and 32.0% were from families in the first income quartile. It was observed that 93.1% of the adolescents reported having eaten breakfast between 4 and 11 am, and there were no differences according to gender. As for the geographic regions, a significant difference was observed only for the Southern region, where 90.3% of the adolescents reported breakfast eating within this period of time, and this proportion was significantly lower than that in the other regions of the country (Table 1). The first meal of the day was taken between 7–8 am by 59.0% of the adolescents, and only 10.7% had breakfast away from home (Table 1).

On average, breakfast contributed to 17.7% of the daily energy intake, and no significant difference was observed according to gender. In the highest income quartile, the contribution of breakfast to daily energy intake was lower than that in the other quartiles. The

Chart 1.The most-frequently reported food groups consumed at breakfast among Brazilian adolescents – *Inquérito Nacional de Alimentação* (INA, National Dietary Survey).

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Food groups	Food items consumed
Coffee and tea	Traditional mate, Yerba mate, *chimarrão* (a traditional South American caffeine-rich infused drink made from fresh yerba mate leaves, tea, organic mate, tea with flour, instant coffee, cappuccino, coffee, coffee with milk.
Breads	Bread and butter/margarine, hamburger bun, sliced loaf, french bread roll, *bisnaguinha* (subtly sweet small roll), whole wheat bread, bread (non-specified), toast.
Butter or margarine	Butter or margarine with or without salt, bottled butter, lard, *pururuca* (fried pork skin), olive oil.
Cakes and cookies	Cookies, stuffed cookies, cake, and baker's confectionery and pastries: *brevidade* (popular Brazilian pastry), *cuca* (popular muffin cake), *filhos* (deep fried scones made with wheat flour and eggs), *grustoli* (deep fried sweet dough shaped into twisted ribbons), *panetone* (sweet bread loaf, honey buns, sweet bread, different flavors of *pavé* (layered sponge cake dessert), sponge cake roll, *rosca doce* (sweet lightly textured loaf or rolls), *rosca recheada* (stuffed sweet loaf or rolls), *sonho* (donut type dessert without a hole), pies.
Packaged salty snacks	Baked crackers, crackers, snack chips, popcorn.
Corn-based dishes	*Angú* (cornmeal puree), *cremogema* (instant cornstarch porridge), *curau* (traditional Brazilian sweet custard-like dessert), *cuscuz* (steamed corn meal dish made with flaked corn flour), corn flour, cornmeal porridge, *pamonha* (paste made with sweet corn, boiled wrapped in corn husks), cornmeal mush, cornstarch.
Milk	Whole cow's milk, fresh cow's milk, goat's milk, whole milk powder, skim milk powder, milk powder, fermented milk, flavored milk, milk with chocolate milk powder mix, skim cow's milk, low-fat cow's milk, pasteurized milk (non-specified).
Eggs	Chicken egg, quail egg, omelet.
Roots and tubers	Cassava, sweet potato, Russet potato, *beiju* (pacake made with *tapioca*), cassava bun, *cará* (a tuber from the Yam Family), *farinha d'água* (a flour made with peeled cassava roots soaked in water for a few days), *copioba flour* (a sand-like crunch cassava flour), cassava flour, yam, corn, *tapioca de goma* (gum starch extracted from cassava root).
Fruit juice	Pineapple juice, *acerola* juice, *cupuaçu* juice, guava juice, orange juice, banana orange juice, papaya juice, mango juice, passion fruit juice, strawberry juice, peach juice, sugarcane juice, organic juice.
Processed meats	*Apresuntado* (type of ham with less meat and more fat), *blanquet de perú* (turkey sausage),sun-dried meat, beef jerky, *chouriço* (a type of pork sausage), sausage, mortadella, canned beef, beef paté, sliced turkey breast, ham, salami, frankfurter, tender (a type of smoked ham).
Cheese	*Queijo prato* (a Brazilian soft yellow cheese), colonial cheese, mozzarella, *queijo do reino* (a semi-hard matured cheese with a pink rind), *queijo minas* (a type of cheese traditionally produced in the Brazilian state of *Minas Gerais*), rennet cheese, *canastra Cheese* (cheese made in the state of *Minas Gerais* in the *Serra da Canastra* region), ricotta (an Italian whey cheese), pasteurized cheese, *requeijão* (a loose, ricotta-like cheese), cheese (non-specified).
Fruits	Avocado, pineapple, *açaí, acerola*, plum, banana (lady's finger banana, Burro or Chunky banana, yellow Cavendish or Dwarf Cavendish banana, plaintain or cooking banana, etc.), *cajá-manga cajarana*, cashew, persimmon, cherry, fruit (non-specified), guava, soursop, *ingá*, *jabuticaba*, jackfruit, orange, lemon and lime, apple, papaya, mango, *mangaba*, watermelon, cantaloupe or honey dew, tangerine, strawberry, pear, peach, sugar apple, fruit salad, tamarind, *tanja*, grape, raisin.
Deep fried or baked snacks	*Coxinha* (popular deep fried food in Brazil, made with shredded chicken meat, covered in dough) *empada* (a small pot pie with a top crust), *enroladinho* (deep fried stuffed roll), *esfirra* (sfiha – meat pie [open-face or not], *minipastel* and *pastel* (traditional deep fried Brazilian pastry filled with various sweet or savory ingredients), *rizole* (deep fried small baked or deep fried pastry filled with various ingredients), fried *kibe* and other typical deep fried or baked snacks.

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Chart 1.The most-frequently reported food groups consumed at breakfast among Brazilian adolescents – *Inquérito Nacional de Alimentação* (INA, National Dietary Survey).

Food groups	Food items consumed
Sweets and chocolates	Candies, chocolate bar, wrapped chocolate candy, c*anudinho* recheado (cone shaped fried pastry filled with sweet ingredients), bubble gum, *cocada* (coconut candy or confectionery), egg-based sweets or confectionery), peanut candy, candied fruit, fruit preserves, freeze pop, *goiabada* (guava paste), *maria-mole* (marshmallow like dessert), mariola (candy made with banana and dried cashew or guava), *paçoca* (candy made with ground peanuts, sugar and salt), hard candy, peanut brittle, popsicle, lollipop.
Sandwiches	*Bauru* (melted cheese, meat, tomato), hot dog, *croissant, misto-quente* ou *frio* (hot or cold ham and cheese sandwich) mortadella sandwich, ham sandwich, *queijo minas* sandwich, *queijo prato* sandwich, salami sandwich, vegetarian sandwich.
Milk/soy/yogurt-based beverages	Yogurt, flavored soymilk, milk shake, fresh fruit dairy beverage.
Sugar-added beverages	Soft drinks, *guaraná* syrup, fruit nectar or fruit juice, fruit juice powder mix.

contribution of breakfast to daily energy intake was higher on weekends than on weekdays (19.6 *versus* 17.5%, p=0.02). It was also found that the contribution of breakfast to daily energy intake was greater when it was taken between 9–11 am (20.8%) than between 4–6 am (16.0%) and 7–8 am (19.2%). The higher the number of food items consumed at breakfast, the greater the breakfast contribution to the daily intake of energy and consequently of other nutrients, except for sugar, which remained stable around 30.0% regardless of the number of items consumed in that meal. Iron was another exception since it was about 4 times higher when the number of food items consumed at breakfast increased from 4 or more items (Table 2).

The contribution of breakfast to daily calcium intake among adolescents living in the urban area was higher than that of the adolescents living in rural areas (24.0 *versus* 19.2%, p<0.01). Breakfast contribution to the daily intake of added sugar among those living in the rural areas was higher than that of those in urban areas (42.1 *versus* 31.4%, p<0.01). The contribution of breakfast to the daily intake of carbohydrates in the Northeastern region was higher than that in the other regions. In the Northern and Northeastern regions, breakfast contribution to the daily intake of added sugar was higher than that in the Southeastern, Southern, and Central-Western regions. The contribution of breakfast to the daily intake of added sugar among the adolescents from families in the lowest income quartile income was higher than that of adolescents from families in the other income quartiles income (Table 2).

The contribution of breakfast consumed on weekends to the daily intake of carbohydrates, lipids, and fibers was higher than that consumed on weekdays. Breakfast eaten at home had a more significant contribution to the intake of lipids, saturated fat, and trans fat than that eaten away from home. It was also observed an increase in the contribution of breakfast to the daily intake of carbohydrates, proteins, total lipids, and fiber when breakfast was eaten between 9 and 11 am compared to that of the breakfast consumed earlier (Table 2).

The most common food groups consumed at breakfast reported by at least 2% of adolescents were: coffee and tea (58%), breads (46%), butter/margarine (28%), milk (19%), cakes and cookies (5%), packaged salty snacks (8%), con-based dishes (5%), cheese, processed meats, fruit juice (4%), fruits, deep fried or baked snacks (3%), roots and tubers,

Table 1. Sample characterization and prevalence of breakfast consumption among adolescents. Brazil, National Dietary Survey 2008-2009.

Characteristics	Population distribution (%)	Breakfast frequency (%)	95%CI
Adolescents (Total)		93.1	91.8–94.0
Gender			
Female	52	92.9	91.4–94.1
Male	48	93.2	91.7–94.5
Place of residence			
Urban	81	92.8	91.5–93.9
Rural	19	94.3	92.1–95.9
Regions of Brazil			
North	10	94.1*	92.0–95.7
Northeast	39	94.7	93.3–95.8
Southeast	37	92.6	90.0–94.5
South	13	90.3	87.3–92.7
Central-West	1	92.5	89.8–94.9
Quartile of per capita household income			
1st	32	94.2	92.5–95.6
2nd	27	93.2	90.7–95.0
3rd	23	93.2	90.7–95.2
4th	18	90.7	88.0–92.8
Days of the week			
Weekday	-	93.0	91.8–94.1
Weekend	-	93.5	89.9–95.8
Location of breakfast consumption			
Home	-	89.3	88.0–90.4
Away from home	-	10.7	9.6–11.9
Time of breakfast consumption			
4–6 am	-	17.2**	15.5–18.9
7–8 am	-	58.7	56.4–60.9
9–11 am	-	24.2	22.2–26.3
Number of food items consumed at breakfast			
1	-	20.6**	18.7–22.5
2	-	37.9	35.9–39.9
3	-	35.0	32.9–37.2
≥4	-	6.5	5.5–7.7

Note: *p-value <0.05; **p-value <0.01 (Chi-square test).
95%CI: 95% Confidence Interval.

sweets and chocolates, sandwiches, milk/soy/yogurt-based beverages, and sugar-added beverages (2%). There were no differences in the food groups according to gender and day of the week, except for the coffee and tea group, which was more commonly reported among boys than among girls (60 *versus* 56%, p=0.01), and the packaged salty snack group, which was more frequently consumed on weekdays than on weekends (9 *versus* 4%, p<0.01).

The adolescents who ate breakfast away from home showed higher intake of deep fried or baked snacks (9 *versus* 2%, p<0.01), fruit juice (8 *versus* 4%, p<0.01), sugar-added beverages (5 *versus* 2%, p<0.01), and sweets and chocolates (5 *versus* 1%, p<0.01) than those

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Table 2. Percentage contribution of breakfast to daily energy and nutrient intake among adolescents. Brazil, National Dietary Survey 2008-2009.

Characteristics	Percentage contribution of breakfast to daily intake (%)									
	Energy	Carbohydrate	Protein	Lipid	Saturated fat	Trans fat	Added sugar	Fiber	Calcium	Iron
Adolescents (Total)	17.7	19.6	12.0	17.9	21.2	20.4	33.4	12.2	23.1	9.1
Gender										
Female	17.7	19.5	12.2	17.9	21.1	20.9	31.8**	12.5	23.9	9.1
Male	17.6	19.7	11.9	18.1	21.3	20.1	34.7	11.9	22.4	9.2
Place of residence										
Urban	17.8	19.5	12.2*	18.3	21.0*	21.0**	31.0**	12.0	24.0**	9.0
Rural	17.4	20.3	11.1	16.8	20.0	17.0	42.0	11.0	19.0	9.0
Regions of Brazil										
North	16.5[a]	19.7[a]	9.5[ad]	16.9[a]	20.2[ac]	21.3[ac]	40.2[a]	11.5[a]	20.9[a]	8.8[a]
Northeast	19.8[b]	22.5[b]	13.5[bc]	18.8[a]	21.7[a]	18.3[a]	36.8[a]	14.6[b]	21.9[a]	10.9[b]
Southeast	17.2[a]	18.4[ac]	12.2[ce]	18.4[a]	22.3[a]	22.1[bc]	30.7[db]	10.9[a]	25.2[b]	8.3[abc]
South	15.8[a]	17.3[c]	10.9[de]	16.4[b]	18.6[bc]	20.1[ac]	27.9[ce]	11.8[a]	21.0[a]	8.5[bc]
Central-West	16.4[a]	18.6[c]	10.7[cde]	16.8[a]	19.6[ac]	19.9[ac]	35.4[de]	10.6[a]	23.7[ab]	7.7[c]
Quartile of per capita *household income*										
1st	18.8[a]	21.6[a]	11.9[a]	17.9[a]	20.9[a]	19.8[ac]	41.9[a]	12.6[a]	20.2[a]	9.4[a]
2nd	17.9[a]	19.8[b]	11.7[a]	18.5[a]	21.6[a]	22.6[a]	33.6[b]	11.9[b]	22.8[ab]	8.7[a]
3rd	17.2[a]	18.8[bc]	12.1[a]	18.4[a]	22.0[a]	21.2[a]	29.7[c]	12.0[c]	25.2[b]	9.0[a]
4th	15.9[b]	16.9[c]	12.6[a]	16.8[a]	20.1[a]	17.5[bc]	23.4[d]	12.1[d]	26.0[b]	9.5[a]
Days of the week										
Weekday	17.5*	19.4**	11.9	17.7*	20.9	19.9*	33.0	11.9*	22.8	9.1
Weekend	19.6	21.8	13.0	20.1	23.3	24.7	36.5	14.5	26.1	9.8
Location of breakfast consumption										
Home	19.2	21.2	12.9	19.6**	23.2**	22.5*	36.1	13.1	24.9	9.7
Away from home	17.8	20.4	12.6	16.8	19.5	18.1	32.1	13.1	24.5	10.8
Time of breakfast consumption										
4–6 am	16.0[a]	18.1[a]	11.1[a]	15.9[a]	19.1[a]	17.7[a]	34.9[a]	11.2[a]	22.8	8.3[a]
7–8 am	19.2[b]	19.2[b]	12.8[b]	19.5[b]	23.2[b]	22.7[b]	36.7[a]	12.9[b]	23.8	9.3[a]
9–11 am	20.8[c]	22.6[c]	14.5[b]	21.3[c]	24.6[b]	23.3[b]	33.8[a]	14.9[c]	26.5	12.1[b]
Number of food items consumed at breakfast										
1	9.5[a]	10.9[a]	7.2[a]	8.9[a]	11.9[a]	9.7[a]	27.4[a]	7.3[a]	19.9[a]	4.3[a]
2	19.2[b]	22.5[b]	13.1[b]	16.7[b]	20.1[b]	12.4[a]	39.7[b]	13.6[b]	24.5[b]	11.2[b]
3	23.1[c]	24.5[c]	14.8[c]	26.1[c]	30.0[c]	36.3[b]	36.7[b]	14.9[c]	26.9[c]	10.7[b]
≥4	26.3[d]	26.1[c]	19.6[d]	31.2[c]	34.3[c]	39.1[b]	33.0[b]	18.4[c]	31.0[c]	14.4[b]

Note: *p-value<0.05; **p-value <0.01. Estimates obtained using General Linear Models with Bonferroni correction. Different superscript letters indicate significant differences between the estimates in each category.

who ate breakfast at home. Compared with the urban area, in the rural area, the consumption of the following food groups at breakfast was significantly higher: coffee and tea (74 *versus* 54%, p<0.01), packaged salty snacks (13 *versus* 7%, p<0.01), corn-based dishes (13 *versus* 3%,

p<0.01), roots and tubers (6 *versus* 1%, *p*=0.04), and eggs (5 *versus* 3%, *p*=0.04)).

Compared with the adolescents from families in other income categories, adolescents from families in the first income quartile reported higher consumption of: coffee and tea, packaged salty snacks, corn-based dishes, and roots and tubers, and lower consumption of milk. As for the other quartiles of household income, the adolescents from families in the last income quartile reported significantly higher consumption of milk, fruit juice, cheese, and sugar-added beverages (Figure 1).

In the Northern region, there was higher consumption of coffee and tea (72%) and roots and tubers (7%), but milk consumption was lower (11%) than that in the other regions. In the Northeastern region, there was higher consumption of con-based dishes (13%) and eggs (6%) at breakfast. On the other hand, in the Southern region, there was higher consumption of processed meats (7%) and fruits (6%) (Data not shown).

Among the adolescents who reported consuming only one food item at breakfast, the most commonly consumed items were: coffee and tea (36%), milk (22%), deep fried or baked snacks (7%), and sweets and chocolates (3%). Among those who consumed two food items, cakes and cookies (25%) were the most frequently mentioned foods. Among the adolescents who reported consuming four or more items, the most commonly consumed food groups were breads (86%), butter/margarine (76%), processed meats (22%), fruits (16%), eggs (13%), and cheese (11%) (Figure 2).

The consumption of fruits (4%) was higher among the adolescents who ate breakfast between 4-6 am when compared to that of the adolescents who ate breakfast late in the morning. For those who ate breakfast between 7–8 am, there was higher consumption of breads

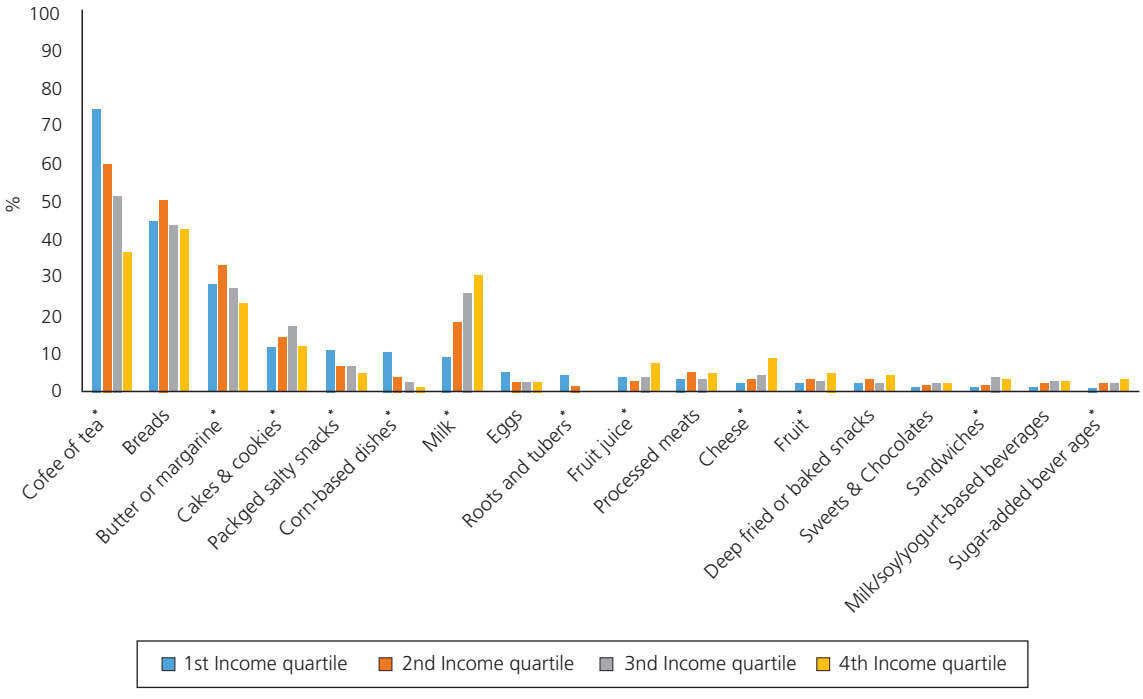

Figure 1. Most commonly consumed food groups at breakfast among adolescents, according to the income quartile. Brazil, National Dietary Survey 2008-2009.

Note: Chi-square test; *p-value<0.05.

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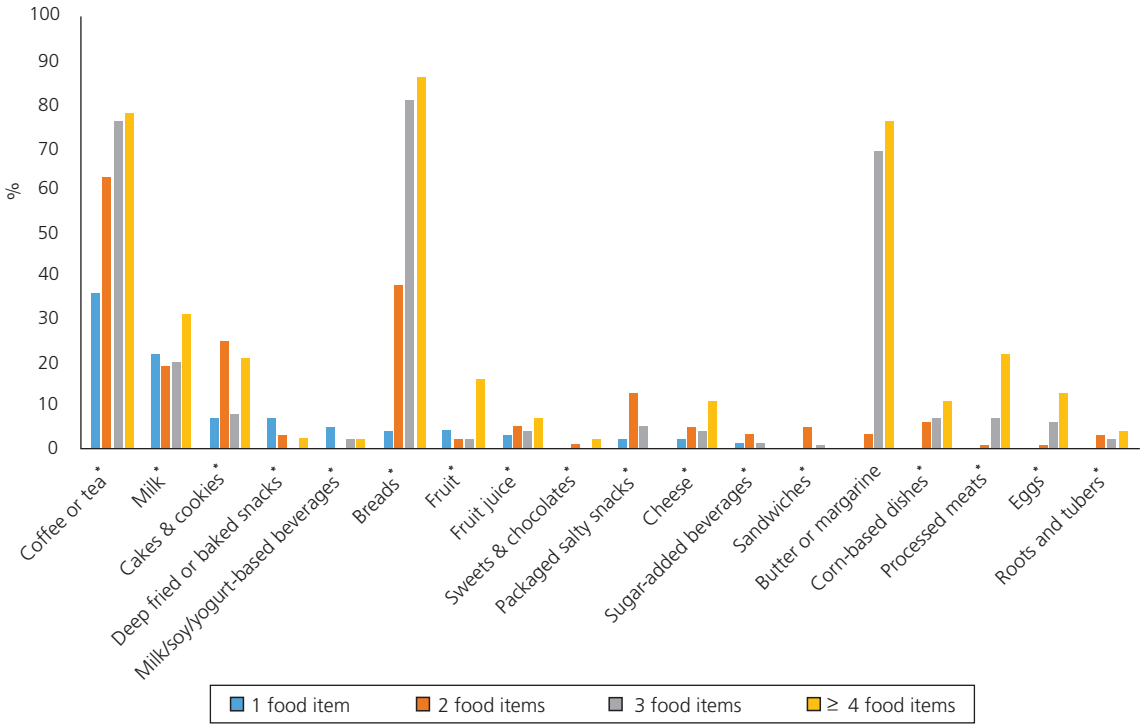

Figure 2. Most commonly consumed food groups at breakfast among adolescents, according to the number of food items included in the meal. Brazil, National Dietary Survey 2008-2009.
Note: Chi-square test; *p-value<0.05.

(53%), butter/margarine (33%), and corn-based dishes (7%) than in the other breakfast times investigated. On the other hand, the adolescents who ate breakfast between 9–11 am showed a higher consumption of deep fried or baked snacks (6%), sugar-added beverages (5%), and sweets and chocolates (3%) (Data not shown).

DISCUSSION

The results obtained indicate that coffee or tea, bread and butter or margarine are the most typical breakfast foods among Brazilian adolescents. However, there were differences according to income and the macro-regions of the country. The contribution of breakfast to daily energy intake was slightly lower than those reported in similar studies [21,22]. Milk was the fourth most commonly consumed food all over the country, and its consumption was three times higher in the Southeastern and Central-Western regions than in the Northern region. Energy, lipid, and trans fat intake was higher on weekends than on weekdays.

The most commonly consumed foods at breakfast found in the present study are similar to those described by Trancoso *et al.* [23], who carried out a review study characterizing breakfast among Brazilians in terms of the consumption of coffee with milk and bread and butter or margarine. This basic composition may be related to convenience and practicality, which has contributed to a change in the consumption of regional foods, as pointed out by Maluf [24] and Pinheiro [25]. Nevertheless, significant regional differences were observed in the consumption of milk, corn-based dishes, roots and tubers, eggs, fruits, and processed meat.

Based on food frequency questionnaire data and on a population-based study of adolescents from two different regions in

Spain, Monteagudo *et al.* [22] found that the contribution of breakfast to daily energy intake ranged from 21.14% (girls aged 14 to 17 years) to 25.81% (boys aged 10 to 13 years), which shows slightly higher proportions than those found in the present study. However, it is worth highlighting the different methods used in these two studies to obtain food consumption data.

It was found that the contribution of breakfast to daily calcium intake increased with income. Moreover, this contribution was more significant in the urban area than in the rural area. These findings are consistent with those of Levy *et al.* [26], who reported that the contribution of milk and dairy products in terms of dietary energy availability with the increase in income.

The large amount of saturated fat, trans fat, and added sugar in the foods consumed by Brazilian adolescents at breakfast found in this study corroborates the findings about food consumption characteristics among adolescents in international studies [27] and in data from the *Pesquisa Nacional de Saúde Escolar* (PeNSE, National School Health Survey) [28]. Pereira *et al.* [18] evaluated the presence of foods high in saturated fat, trans fat, and added sugar consumed by the Brazilian population. The author found that the contribution of these foods to total energy intake was higher among adolescents (54%) than among adults (47%) and older adults (46%).

Good quality breakfast has been considered essential for children and adolescents to achieve and maintain adequate health conditions [10], and breakfast consumption has been associated with intake adequacy of micronutrients, cereals, and fruits [11]. The quality of breakfast consumed by Brazilian adolescents may be compromised since it was observed reduced fruit consumption and the presence of unhealthy foods, such as deep fried or baked snacks, sugar-added beverages, packaged snacks, sweets and chocolates, and processed meats. An important aspect to highlight is the significant contribution of breakfast to the daily intake of added sugar, since it provided an average of 17.7% of the daily energy, and 33.4% of the added sugar consumed per day came from foods eaten at breakfast.

In the present study, the proportion of adolescents who skipped breakfast was much lower than that found by other authors [6,29,30], who reported breakfast skipping rates between 29 and 51%. These differences can be attributed to the methods used to evaluate breakfast eating habits. In this study, we analyzed the proportion of participants who reported having consumed breakfast on a 1-day food record; in the other studies, food frequency questionnaires were used to evaluate how often breakfast was usually consumed.

Food record is a widely used method in population studies, and it has the advantage of not relying on respondent's memory and providing more accurate information regarding dietary intake. However, one disadvantage stems from conscious or unconscious changes in eating habits that may occur while the person is keeping the record [31,32]. Therefore, the high proportion of reports of breakfast eating observed in the present study may be related to the method used to evaluate food consumption and does not necessarily indicate the prevalence of breakfast consumption or breakfast skipping.

Accordingly, it is worth highlighting the different breakfast definitions that have been provided. Aranceta *et al.* [33] define breakfast based on the time of consumption, considering breakfast as the intake of solid or liquid foods between 6 and 10 am on weekdays and between 6 and 11 am on weekends and holidays. Similarly, Affenito *et al.* [34] define breakfast according to the time of consumption. The authors characterize breakfast as the consumption of any food between 5 and 10 am on weekdays and between 5 and 11 am on the weekend. On the other hand, Matthys *et al.* [35] define breakfast as the first meal of the day.

The present study showed some limitations. Despite the great effort to obtain reliable data about the nutritional composition of foods, the estimates of added sugar intake may be biased since table sugar consumption data were not directly obtained.

This study describes the nutritional characteristics and identifies the most commonly consumed foods at breakfast among Brazilian adolescents, according to the regions of the country, urban-rural residence, and income. The results showed that breakfast contribution to daily energy intake is low and that its nutritional quality improves with income. In Brazil, information about breakfast eating habits of adolescents is still scarce although it is considered an important meal for health and healthy eating promotion, according to the *Guia Alimentar para População Brasileira* (Dietary Guidelines for the Brazilian Population) [36]. This study offers a significant contribution to support the development of more effective intervention programs aimed at promoting health in Brazilian adolescents.

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CONTRIBUTIONS

LS MONTEIRO, AM SOUZA, BK HASSAN e CCP ESTIMA contributed to data analysis and interpretation and manuscript writing. R SICHIERI contributed to data interpretation and manuscript revision. RA PEREIRA contributed to the conception and design of this study, data analysis and interpretation, and manuscript writing and critical revision.

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