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Differences in dietary intake of adolescents in the Midwest and other Brazilian regions

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Abstract

The study aimed to analyze the frequency of consumption of healthy and unhealthy foods and differences in knowledge and consumption of typical Brazilian food among adolescents in the Midwestern region, as compared to other regions. This is a cross-sectional study conducted with 10,514 adolescents, aged 13 and 14, who responded to an online questionnaire. Data were analyzed with the software package SPSS statistical, using univariate analysis to estimate the frequency of dietary intake and the chi-square test for the categorical variables knowledge and consumption of Brazilian food. The level of significance was 5%. High frequency consumption of unhealthy foods and low frequency consumption of unhealthy foods were both observed. Adolescents from the Midwestern Region had higher frequency of consumption of beans and vegetables and lower frequency of consumption of fried snacks and cookies, with significant difference ($p < 0.001$) for the other regions. National foods were widely known, except for sweet yam, which only 32.1% of adolescents in the Midwest Region reported being familiar with. Consumption of these typical foods was really varied and differed significantly from other regions for sweet yam, tripe stew, cassava, dried beef rice, canjica and grape. Further detailed research is needed on food consumption in households and as well as studies on consumption that include the achievement of Food and Nutritional Safety standards.

Keywords: Food Consumption. Adolescents. Food Habits. Midwest.

Introduction

Adolescence is a stage that occurs between childhood and adulthood. Adolescents are generally characterized by the pursuit of independence and sense of identity, changes in psychological and hormonal profile, and greater susceptibility to pressure from peers, school and the media.[1]Typically, the dietary patterns of this group include monotony in food choice; low intake of fruits and vegetables; high consumption of sugar-rich, fat-rich, high energy density foods; lack of daily breakfast intake, among other behaviors.[1,2]

Data from the National School-based Health Survey[3] have confirmed this pattern. This survey collected data on food intake by 9th grade students in elementary schools. High consumption of unhealthy foods (fried foods, cookies, soft drinks, sweets and sausages) was observed in contrast to reduced intake of healthy foods such as beans, fruits, vegetables and milk.

It is noteworthy that there are food-related cultural aspects that are built over time and are constantly subject to influences within and outside individuals. The culture of a population can be understood by the characterization of internal relations where symbols are used and specific meanings are assigned to actions performed.[4]

The dietary pattern of the population is changing and adapting to these different circumstances, influenced by changes in urban lifestyle, advancing technologies, various advertising campaigns, and easy physical and financial access to food. However, a relationship has been found, over the last few years, between food consumption and the rise of chronic, noncommunicable diseases.[5]

For the World Health Organization (WHO), developing healthy eating habits in childhood and adolescence allows the perpetuation of good habits throughout adulthood and provides greater protection against chronic diseases.[6,7] For this reason, it should be stressed that knowledge of the eating habits of adolescents is crucial to make nutritional and educational interventions for preserving food identity and promoting healthy living conditions.

The objectives of this study are to analyze the frequency of consumption of healthy and unhealthy foods and identify differences in knowledge and consumption of typical Brazilian food by adolescents in the Midwest Region (MW) compared to adolescents from other regions of Brazil.

Methodology

A cross-sectional study was conducted in the Brazilian capitals. The target public was comprised of adolescent elementary school 9th graders, regularly attending both public and private schools. Data in this study are part of the survey *Mapeamento da cultura alimentar da população adolescente*

nas capitais brasileiras e Distrito Federal" (Mapping food culture of adolescents in Brazilian state capitals and the Federal District), conducted between March 2011 and December 2012.

Single-stage cluster sampling was performed in order to generate representative data for the adolescent population living in capital cities of Midwestern states. Calculations were made with the maximum error of 0.05 (absolute value) and confidence level of 95%. The sample for the capitals of the Midwest region was estimated at 3,978 students, 2,940 in public schools and 1,038 in private schools. Exclusion criteria were failure to complete the *online* questionnaire, and adolescents out of the 13-14 age range at the time of collection.

Public and private schools were randomly selected for the survey, based on records of the 2010 School Census, conducted by the National Institute of Educational Research (INEP) and the Ministry of Education and Culture. After generating this random list, the collaborative team contacted the schools by phone. The research team asked the staff in the schools whether they had a computer lab with Internet access,how many students were enrolled in the 9th grade, how many students attended classes regularly and whether they studied in the morning or in the afternoon. Upon meeting the first selection criterion, a given school was considered for sampling; if a school failed to meet the criterion, it was discarded, and the next school on the list was contacted. State and/or municipal departments of education cooperated with the researchers by providing assistance for scheduling meetings and making the first contact with the staff of public schools. School staff that attended the meeting were given all the necessary information for administering the questionnaire, including a consent form to be signed by students' parents. Data collection was scheduled individually with each school, depending on number of students and time availability.

All the capitals were visited by two nutritionists from the research team, who held a meeting with representatives of the selected schools and the municipal and state departments of education, in order to convey information required for accessing and completing the questionnaires. Data were collected through an*online* questionnaire, which contained the following blocks of questions: socio-demographic characteristics of the respondent; food frequency questionnaire; and regional foods and dishes.

Dietary intake addressed the weekly frequency of consumption of foods considered as indicative of healthy eating, according to the National School-based Health Survey (PeNSE)[3]:-beans, raw and cooked vegetables, raw salad, fruit and milk, as well as those indicative of an unhealthy diet: potato chips, fried snacks, sausages, crackers, cookies, sweets and soft drinks. The percentage of food consumption in five days or more per week was used as a diagnostic parameter of healthy or unhealthy diets.

Students were shown images of particular regional foods and dishes, and they were asked questions about knowledge and consumption of such food. The answers were pre-defined as "yes" or "no." If respondents answered "yes", the system automatically generated new questions about the same food, investigating whether the students ate that food, how and how often they ate it, and if they liked it. IIf respondents answered "no", they were asked whether or not they would consider trying the particular food and why (not). Consumption and knowledge of 12 national foods and respective preparations were considered, namely: coconut, grapes, sweet yam, cassava, sweet potato, kale, okra, stew, tripe stew, dried beef rice, mungunzá or canjica and feijoada. The national foods used for the study were those described by Ginani[8] as the most commonly eaten in all Brazilian regions.

Students completed the questionnaire in the school computer lab during the class hours. Adolescents were excluded from the sample as respondents when they were absent on the day of the interview, or if they had some limitation that prevented them from answering the questionnaire*online*. Parents were informed and signed a consent form; schools signed a Term of Institutional Awareness.

Comparisons were made between the habits of adolescents in the Midwest Region and adolescents from four other regions: North, Northeast, Southeast and South. The software used for data analysis was SPSS version 16.0 (SPSS Inc., Chicago, USA), a tool for data analysis using basic and advanced statistical techniques. The study variables were classified as follows: scalar (frequency of food consumption) and nominal (knowledge and consumption of national food and respective preparations). Univariate analysis of expressed the frequency of the variables consumption of healthy and unhealthy foods between the two groups in the form of proportions, with a significance level of 5%. Chi-square tests were used for the categorical variables, i.e. knowledge and consumption of national foods. The association of these variables with the (Midwest and other capitals) analyzed regions was performed. Significance level was considered at 5%.

Results

The final sample consisted of 10,514 adolescents with a mean age of 14 years (SD = 1.3 years), 55.6% female (*n*=5,850) and 44.4% males (n=4,664). Table 1 shows the percentage of adolescents attending the 9th year of elementary school that answered the questionnaire.

Table 1. Percentage of students attending the 9th year of primary education by state in the Midwest Region and other regions. Mapping food culture of adolescents in Brazilian state capitals and the Federal District, 2012.

State municipalities and the Federal District	Percentage of students attending the 9th year of primary education by state	
	n	%
Mid-West Region	1,591	15.1
Brasília	347	3.3
Goiânia	591	5.6
Campo Grande	331	3.1
Cuiabá	322	3.1
Other regions	8,923	84.9

There was a significant difference ($p < 0.001$) in parents' educational level between the compared regions (Table 2). Most students did not inform or reported they did not know their parents' educational level. Just over a quarter of the students reported that their parents had completed higher education. The highest prevalence of schooling occurred in the Midwest Region.

Table 2. Educational level of adolescents' mother and father in the Midwest region and in other capitals. Mapping food culture of adolescents in Brazilian state capitals and the Federal District, 2012.

	Adolescents in the Midwest Region (%)		Adolescents in the other regions (%)	
	Mother	Father	Mother	Father
Did not attend school	0.9	2.1	2	2.6
Elementary School	11.4	18.7	15.2	24
High School	15.6	17.3	17.5	16
Higher Education	28	24.5	27.4	22.7
Not informed/Does not Know	44.1	37.4	38	34.7

Consumption of foods indicative of healthy eating

Table 3 shows the percentage of consumption of foods indicative of a healthy diet, investigated in five or more days of the week by students in the Midwest Region and other regions.

Table 3. Percentage of students attending the 9th year of primary education with dietary intake of healthy and unhealthy foods greater than or equal to five days, over the last seven days, in the Midwest Region and other regions. Mapping food culture of adolescents in Brazilian state capitals and the Federal District, 2012.

Foods	Region		p value
	Mid-West	Other	
	%	%	
Healthy foods			
Beans	66.2	51.8	<.001
Vegetables	36.8	31.6	<.001
Raw vegetables	40.1	26.7	<.001
Cooked vegetables	10.4	12.3	0.021
Fruit	36.8	37.8	0.690
Milk	54.4	55.8	0.909
Unhealthy foods			
French fries	5.9	7.1	0.139
Fried snacks	11.5	15.9	<0.001
Sausages	20	22.9	0.116
Crackers	29.8	33.5	0.001
Cookies	28	33.8	<0.001
Sweets	47.7	45.2	0.127
Sodas and colas	42.3	39.6	0.006

Beans had the highest percentage of consumption (66.2%) among students, when compared with other healthy foods in the Midwest Region. It was observed that in other Brazilian regions, the consumption of beans (51.8%) was the second largest among healthy foods, ranking below "milk" only. Milk consumption in five days or more by the students in the other capitals was higher compared to the other groups, with a percentage of 55.8%. Fruits were eaten in five days or more by 36.8% of the students in the Midwest Region and 37.8% of the students in the rest of the country.

The consumption of vegetables could be observed depending on their preparation. Considering food intake for five days or more, cooked vegetables were the least consumed by adolescents in the Midwest Region (10.4%) and in the other regions (12.3%). Raw vegetables were more frequently eaten by students in the Midwest Region (40.1%), with significant difference ($p < 0.001$) for students from other regions (26.7%).

Consumption of foods as indicative of an unhealthy diet

Among foods indicative of an unhealthy diet (Table 3), there was a significant difference in the consumption of fried snacks and cookies between the samples compared. There is lower consumption of these foods by adolescents in the Midwest Region than in the other regions.

For unhealthy foods, the highest consumption percentages were observed for sweets and soft drinks. In the Midwest Region, 47.7% of students responded that they consumed such foods five or more days a week. In the rest of the country, they were consumed by 45.2% of students. Soft drinks were consumed by 42.3% of the students in the Midwest Region and 39.6% in the other regions.

Consumption of cookies and was lower in the Midwest (28%) than in the other regions (33.8%), and the same behavior was observed for crackers: 29.8% and 33.5%, respectively. Sausages were consumed by 20% of students in the Midwest Region and 22.9% of students in the rest of the country.

In the capital cities of the Midwest Region, there was 5.9% consumption of French fries and 11.5% of fried snacks in five days or more. For the other states, there was a higher consumption of French fries (7.1%) and fried snacks (15.9%) by the students. Overall, it was noted that the consumption of sweets and soft drinks was higher than that of fruits and vegetables in the two areas of the country under analysis. Figure 1 shows the variability in frequency in the last seven days of consumption of healthy and unhealthy foods in the Midwest and other regions, respectively.

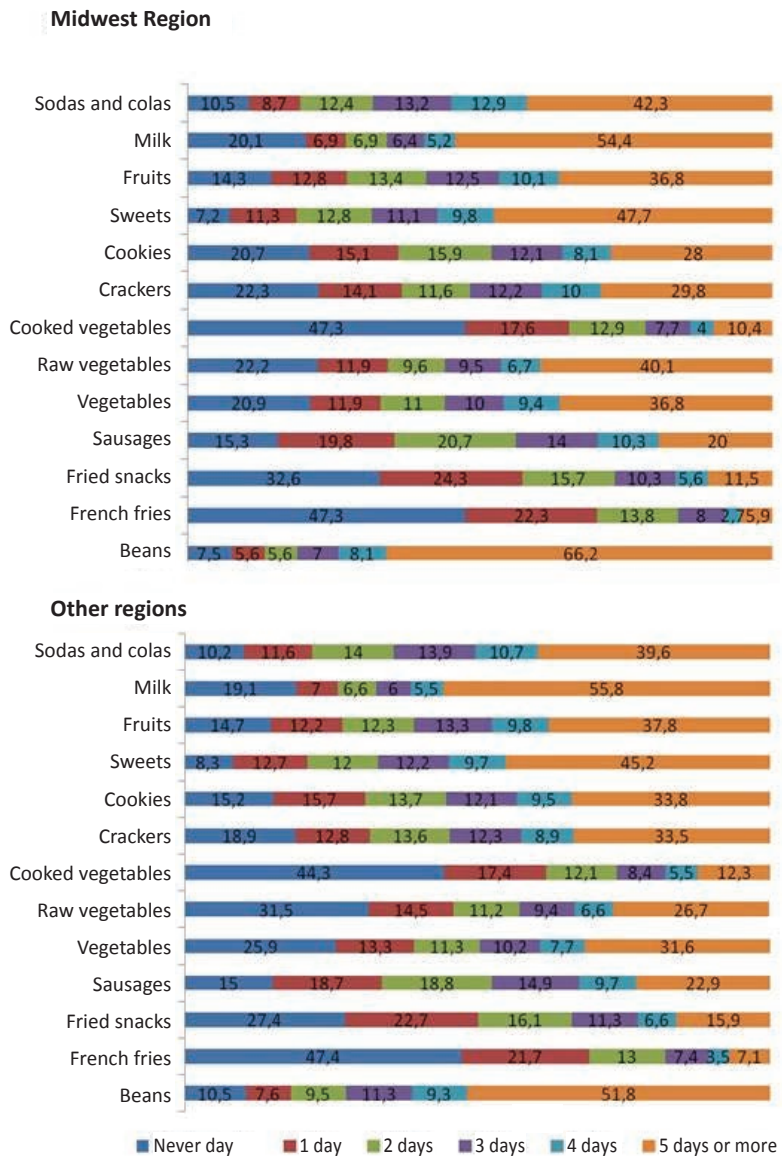

Figure 1. Percentage of students attending the 9th year of primary school, per regular food consumption, according to foods consumed in the capitals of the Midwest region and other regions – 2012.

Knowledge and consumption of national foods and preparations

There was a significant difference in knowledge of seven out of the 12 national foods and preparations shown to students in the Midwest Region and in other Brazilian capitals (Table 4). The percentage of knowledge was higher in the Midwest for the following foods: sweet yam (32.1%), kale (81.1%), tripe stew (61.8%), cassava or manioc or cassava (82%), canjica (89.5%) and grape (89%). Kale, in turn, was worth of notice because it was the least known by students in the two areas analyzed.

Table 4. Percentage of students attending the 9th grade of primary school who know/do not know and eat/do not eat the national foods and dishes presented, in the Midwest and other regions of Brazil. Mapping food culture of adolescents in Brazilian state capitals and the Federal District), 2011

Food or dish	Region		p value
	Mid-West	Other	
	Percentage (%)	Percentage (%)	
KNOW			
Sweet potato	91.6	91.9	0.806
Sweet yam	32.1	28	0.002
Coconut	97.9	97.7	0.724
Kale	81.1	67.4	<0.001
Stew	77.8	81	0.012
Tripe stew	61.8	56.4	<0.001
Feijoada	95.7	96.9	0.001
Cassava	82	57.1	<0.001
Dried beef rice	94.8	93.7	0.193
Canjica	89.5	68.4	<0.001
Okra	86.5	88	0.232
Grape	89	83.8	<0.001
EAT			
Sweet potato	54.4	57.7	0.044
Sweet yam	15	16.5	<0.001
Coconut	89.4	87.7	0.138
Kale	55.2	38.9	<0.001
Stew	57	59.9	0.011
Tripe stew	26.1	26.6	<0.001
Feijoada	79.1	82.6	0.001
Cassava	11.4	6.9	<0.001
Dried beef rice	88.2	78.9	<0.001
Canjica	79.2	56.7	<0.001
Okra	63.3	65.6	0.165
Grape	35.3	30.7	<0.001

The least frequently consumed foods by students in the Midwest Region were cassava (11.4%), sweet yam (15%), tripe stew (26.1%) and grape (35.3%). Between the two areas studied, a difference was observed in the consumption of sweet yam, kale, stew, tripe stew, feijoada, cassava, dried beef rice, canjica and grape ($p < 0.005$). In the capital cities of the Midwest Region, foods and respective preparations with the highest percentage of consumption by students were coconut (89.4%), dried beef rice (88.2%), canjica (79.2%) and feijoada (79.1%) (Table 4). For the other regions of the country, foods and preparations with the highest percentage of consumption by students were coconut (87.7%), feijoada (82.6%) and dried beef rice (78.9%). Foods that had statistically significant difference ($p < .005$) between regions and showed low consumption are sweet yam, kale, tripe stew, cassava and grape.

Discussion

This study showed a predominance of females, mean age of 14, and varying maternal and paternal educational level. As a result of the exclusion criteria for the sample and the smaller number of respondents than expected, the final sample included 10,514 adolescents: 1,591 from the Midwest Region and 8,923 in other regions, without prejudice to regional representation.

The data obtained in the survey *Mapeamento da cultura alimentar da população adolescente nas capitais brasileiras e Distrito Federal" (Mapping food culture of adolescents in Brazilian state capitals and the Federal District)*, 2012, collected information on regular food intake, knowledge and consumption of national food and respective preparations by adolescents aged 13-14 years old.

National guidelines on healthy eating advocate the importance and necessity of daily consumption of fruits, vegetables, milk, meat and beans while avoiding the consumption of sweets, soft drinks, cookies and fried foods. Healthy eating habits, when added to people's behavior since youth, contribute to the promotion of health in adulthood and reduce the risk of developing chronic diseases.[6] Furthermore, preservation of food culture is assumed by Law no. 11346, which defines the concept of food and nutrition safety in Brazil.[9] Therefore, there is no food safety without respect for cultural practices. The *Guia Alimentar Brasileiro ("Brazilian Food Guide")* defines the concept of healthy eating the respect to regional food practices.[6] Hence the importance of assessing the knowledge and consumption of these traditionally Brazilian foods among adolescents.

The results of PeNSE, 2012,[3] which investigated a similar population to the one in the present study, showed a pattern of food intake among students characterized by high consumption of fried foods, sweets, sausages, cookies, crackers and low consumption of beans, fruits, vegetables

and milk. This pattern is consistent with the results observed in the present study, and it is often more evident among adolescents in the Midwest region, when compared to the other regions. Soft drink consumption for more than five days a week, for example, was greater in the Midwest ($p < 0.006$), practiced by 42.3% of the sample.

Beans have good nutritional value for their high content of fiber, protein, iron and folic acid. They are consumed daily by more than half of the adolescents. Consumption of beans for five or more days a week in the Midwest Region (66.2%) was higher than in other regions. Increased consumption by the population, in this region, is compatible with the results found by the Telephone-based Surveillance of Risk and Protective Factors for Chronic Diseases (Vigitel) 2006-2009.[10] According to PeNSE (2012)[3], bean consumption by students for five days or more per week (69.9%) is an indicator of health protection.

According to the Household Budget Survey (HBS), 2008-2009,[11] there was higher average *per capita* consumption of rice, beans, beef and whole milk (indicators of a healthy diet) in the Midwest than in the other regions. In the present study, consumption of beans was higher in the Midwest Region, but milk consumption was lower, although there was no significant difference. The consumption of rice and meat was not part of this research.

Although low intake of milk was observed, it represents a healthy eating habit among students. Milk is a source of calcium, an important micronutrient in the bone mineralization process during puberty. A study with adolescents from São Paulo found that consumption of milk and other dairy products is responsible for 56.5% of the dietary calcium present in the diet of the adolescents.[12] Therefore, intake of milk contributes to a healthy lifestyle and should be encouraged, especially in this age group, since it is still below the recommended level.

The low consumption of fruits and vegetables observed in adolescents is similar to that of adults, i.e. lower than recommended.[13] The WHO recommends a minimum daily intake of 400g of fruit and vegetables.[14] This research did not address the portions consumed, only the frequency of weekly consumption, which further emphasizes that it falls behind the recommended intake, as only 37% of adolescents eat fruit for five or more days a week. Although this figure is still unsatisfactory, it is greater than the percentage observed in PeNSE[3], where only 30.2% of the adolescents had this behavior.

Foods that are indicative of an unhealthy diet are present in the daily lives of adolescents. The high consumption of sweets, cookies, soft drinks and fried foods observed in this study hd been previously diagnosed, proving to be a national and global trend.[13,15] This diagnosis is important because it allows support of future actions by the Ministry of Health to promote Healthy Eating.[16]

Regarding knowledge of national foods and respective preparations, it was found that most 9th graders, both in the Midwest Region and in the other capital cities, often recognized most of these foods. The exception was kale, which was little known in all regions. Knowledge of national foods by adolescents of the Midwest Region was significantly higher than in other capitals, but prior to the present research, there were no studies that addressed these aspects. The heterogeneity of the group to which the Midwest Region was compared may have contributed to the observed difference. Data from the North, Northeast, Southeast and South regions were grouped together - thus the specificities of each region were mixed. Parents in the Midwest Region also had higher education level than the others. This may be a factor that fosters greater knowledge of these foods, since education is an income *proxy* and can provide easier access to various types of food[17].

In the case of national foods with low consumption, kale is a tuber belonging to the same group of cassava and yam, is grown nationwide and is easily accessible. Yet few adolescents reported consuming kale, a fact that is consistent with little knowledge of it, as observed in the present study. There were no studies that justified the low consumption and knowledge of kale. The consumption of cassava was also low, which was unexpected, because cassava is part of the Brazilian food culture: it is well-known, easily grown and easy to buy.[18] Tripe stew is a regional dish containing bovine tripe and white beans as main ingredients. It was the least consumed dish by adolescents, probably because of rejection based on sensory aspects typical of its preparation, which are essential components to good acceptance.[19]

Grapes, in turn, are widely known but have low consumption by the adolescents, possibly because they are expensive and difficult to find in some regions. It is noted that food choice is influenced by several factors, particularly the economic factor, ease of acquisition, dietary habits and sensory aspects[8]. In addition to geographical and financial matters, food choice is influenced by the valuation of food by the consumer and the degree of freedom of each individual to make their choices.[20,21]

To better understand these results, it is also essential to know the reason why people do not consume a given food: they do not like it, do not have access to it, it is not affordable, the food was not introduced to them, or influence of other people or the environment where people live.[20] The survey *Mapeamento da cultura alimentar da população adolescente nas capitais brasileiras e Distrito Federal" (Mapping food culture of adolescents in Brazilian state capitals and the Federal District)*, whose data were the basis of this study, had a much broader nature and took these aspects into consideration, but did not analyze them in this study.

Conclusion

The result of the present study indicates a high frequency of consumption of unhealthy foods (fried foods, sausages, crackers and snacks, sweets and soft drinks) and low frequency of consumption of foods indicative of a healthy diet (beans, vegetables, fruits and milk). The students of the Midwest Region had higher consumption of beans and vegetables than other regions and lower consumption of fried snacks and cookies. These were positive components of a healthy diet. Most national foods are widely known, but more specific research is needed on the presence of such foods in daily life of adolescents.

Several national foods and dishes had lower consumption or unsatisfactory consumption. For this reason, it should be stressed that it is important to conduct more complex analyses that take into account the assumptions of Food and Nutritional Safety. Actions aimed at the rescue and maintenance of healthy and culturally appropriate food practices should be encouraged, since eating has social and cultural meaning. The body needs nutrients; However, we consume food.

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