Original Articles

Amanda de M Souza[I]

Rosangela A Pereira[II]

Edna M Yokoo[III]

Renata B Levy[IV]

Rosely Sichieri[I]

Most consumed foods in Brazil: National Dietary Survey 2008-2009

[I] Departamento de Epidemiologia. Instituto de Medicina Social. Universidade do Estado do Rio de Janeiro. Rio de Janeiro, RJ, Brasil

[II] Departamento de Nutrição Social Aplicada. Instituto de Nutrição Josué de Castro. Universidade Federal do Rio de Janeiro. Rio de Janeiro, RJ, Brasil

[III] Departamento de Epidemiologia e Bioestatística. Instituto de Saúde da Comunidade. Universidade Federal Fluminense. Rio de Janeiro, RJ, Brasil

[IV] Departamento de Medicina Preventiva. Faculdade de Medicina. Universidade de São Paulo. São Paulo, SP, Brasil

Correspondence:
Amanda de Moura Souza
Departamento de Epidemiologia, Instituto de Medicina Social – UERJ
Rua São Francisco Xavier, 524, 7º andar Bloco E
20550-900 Rio de Janeiro, RJ, Brasil
E-mail: amandamoura@msn.com

Received: 11/25/2011
Approved: 7/10/2012

ABSTRACT

OBJECTIVE: To describe the most commonly consumed foods in Brazil.

METHOD: This analysis is based on food intake data obtained on the first of two non-consecutive days' food records from 34,003 subjects aged 10 or over, resident in 13,569 households selected to participate in the National Dietary Survey 2008-2009 from the probabilistic sample defined for the Household Budget Survey 2008-2009. Consumption patterns were analyzed according to gender, age, regions and per capita family income.

RESULTS: The most frequently recorded foods were rice (84.0%), coffee (79.0%), beans (72.8%), bread (63.0%), and red meat (48.7%). The intake of fruit juice (39.8%) and soft drinks (23.0%) is notable, as is the low intake of fruit (16.0%) and vegetables (16.0%). This scenario was similar across all age and sex groups; however, adolescents were the only age group which did not report any vegetables and included candies, sweetened dairy beverages and cookies among the most frequently recorded foods. Some foods are of markedly regional intake, such as manioc flour in the North and Northeast and tea in the South Region. Analysis according to income quartile revealed important differences between the highest and lowest income stratum. Subjects in the highest income quartile reported consuming sandwiches, tomatoes, and lettuce and those in the lowest income quartile cited manioc flour and fish and seafood among the most recorded foods.

CONCLUSIONS: There is a basic food intake pattern in Brazil based on rice, beans, coffee, bread, and beef with small but consistent regional variation. The consumption of items rich in fat and sugar is also frequent, particularly among adolescents.

DESCRIPTORS: Food Habits. Food Preferences. Staple Food. Diet Surveys, utilization.

INTRODUCTION

The profound social, economic and cultural changes which have taken place in the country in the last few decades have led to alterations in dietary habits and behavior; for example, the increase in away-from-home eating,[4] increased consumption of processed food[10] and the replacement of traditional meals and dishes with snacks which are high in calories, fat, added sugar and salt.[5] Such dietary characteristic are associated with conditions related to nutrition and metabolism, such as obesity, cardiovascular disease, high blood pressure, diabetes and cancer,[9] which are the main causes of death in Brazil.[13]

This situation leads to the need to diagnose and monitor patterns of food consumption at an individual level, as these trends can be predictors of the population's nutritional and health situation and act as an early warning system for creating health and nutrition policies and campaigns, impossible without the, nationwide dietary surveys regularly carried out.

The aim of this study was to characterize the foods most frequently consumed by the Brazilian population.

METHODS

Data were analyzed for Brazilian individuals of both sexes, aged over ten years old, selected to take part in the INA (National Dietary Survey) which is part of the 2008-2009 Household Budget Survey, carried out by the IBGE (Brazilian Institute of Geography and Statistics). Details on the sample and data collection can be found in IBGE publications.[a]

The Household Budget Survey 2008-2009 (POF)[a] used a two-stage cluster sample, after the geographical and statistical stratification of the primary sample units based on the 2000 Brazilian Demographic Census. In the first stage, primary sample units were selected with probability proportional to the number of residences in each sector, and a subsample of sectors was selected by simple random sampling in each strata. In the second stage, households were selected using simple random sampling without replacement in each of the primary sample units selected. The primary sample units were evaluated throughout the 12 months of the survey so that, in the four three-month-periods, all of the geographical and socio-economic strata were represented. A subsample of 25% of households from the original 2008-2009 Household Budget Survey sample was randomly selected for investigating individual food consumption. All inhabitants aged over ten resident in the subsample participated

in the National Dietary Survey.[b] From a total of 55,970 households selected for the 2008-2009 POF, 34,003 individuals aged over ten participated in the assessment of individual food consumption.

Food consumption was estimated using food records from two non-consecutive days, in which individuals reported all of the food and drink consumed on the days in question, the time, the quantities consumed according to portion sizes, cooking method as well as the source of the food (at home or away-from-home). Additional data on sugar and/or sweetener consumption was also collected. When the interviewee was unable to complete the food record, these were completed by another resident in the household, or someone indicated by the interviewee.

The food records were checked by the interviewers in the participants' home, at the same time as the data were stored in a program specially developed for this research. This program contained around 1,500 items (food and drink) from the 2002-2003 POF database. However, the interviewers were able to add other food and drink which did not appear in this database. The program also contained methods of preparation and pre-defined portion sizes.

Partial analyses were carried out during the data collection, to control the quality by verifying frequencies of response, mean of items consumes in the first and second days' food records, codifying items which were not registered and analyzing items incorrectly entered, among others.

Details on the pre-test, training, validation of the instrument and data input were published by the IBGE.[b]

When verifying the reliability of the data, 29 individuals were excluded as their records were considered to be incomplete. In addition, quantities considered to be improbable were entered and the data entered registered in the database. This took into consideration mean portions estimated for each food according to previously defined statistical criteria, which included characteristics such as the gender and age group of the participant, the location and the measurement unit reported.[b]

INA participants reported 1,971 food items, which were organized into 21 groups. Prevalence of consumption was estimated for the foods/groups reported on the first day's record, according to gender, age group (from ten to 19: adolescents; 20 to 59: adult; 60 and over: elderly), region (North, Northeast, Midwest, Southeast

[a] Instituto Brasileiro de Geografia e Estatística. Pesquisa de orçamentos familiares, 2008-2009. Aquisição alimentar *per capita*. Rio de Janeiro; 2010.
[b] Instituto Brasileiro de Geografia e Estatística. Pesquisa de orçamentos familiares, 2008-2009. Análise do consumo alimentar pessoal no Brasil. Rio de Janeiro; 2010.

and South) and income quartiles.[8] The first day's food records were as the quality of data on the first day was superior to that of subsequent days' food records.[16] The 20 most prevalent foods/groups are described for each strata considered in the analysis.[b]

Income was characterized by estimating total income and mean monthly household variation in assets per capita, which represents the sum of monthly monetary gross income, monthly non-monetary gross income and the variation in household assets, divided by the number of individuals in the household. The variable monthly household income per capita was analyzed per quarter.

All of the estimates were calculated using the Statistical Analysis System version 9.1 software, taking into account expansion factors of the POF and the complexity of the sample design.

The protocol of this research was approved by the Ethics Committee of the Instituto de Medicina Social of the Universidade do Estado do Rio de Janeiro (CAAE 0011.0.259.000-11), July 19th, 2011.

RESULTS

Rice (84%), coffee (79%), beans (72.8%), bread (63%) and beef (48.7%) were the foods with the highest rates of prevalence on the first day's food record. Banana was the most cited fruit (16.0%) and salad (16%) the most frequently consumed vegetable dish among Brazilians. Prevalence rates for consuming juices (39.8%) and soft drinks (23%) occupied sixth and ninth place respectively. The prevalence rate of consuming whole milk was 12.4%, and cheese was 13.5%. Crackers (15.9%), cake (13.4%), fried and roasted snacks (12.5%) and sweets (11.7%) were also among the top 20 most commonly consumed foods in the country.

Analysis according to gender revealed that men and women had similar rates of prevalence or consumption. Men consumed higher levels of rice, beans, beef and soft drinks, whereas women had higher prevalence of consuming coffee, bread, juice and soft drinks, cake and oil and fat. Potatoes and fried and roasted snacks were among the most prevalent items for men, and soup and broth and sweets were among the most prevalent among women. However, neither potatoes nor soups and broths appeared among the 20 most prevalent items in Brazil (Figure 1).

Analysis stratified by region confirmed that across the entire country, rice, beans, coffee, bread and beef are the five most commonly consumed foods. Coffee was the most prevalent item in the North (82.8%) and Northeast (83.6%), and rice was the most prevalent
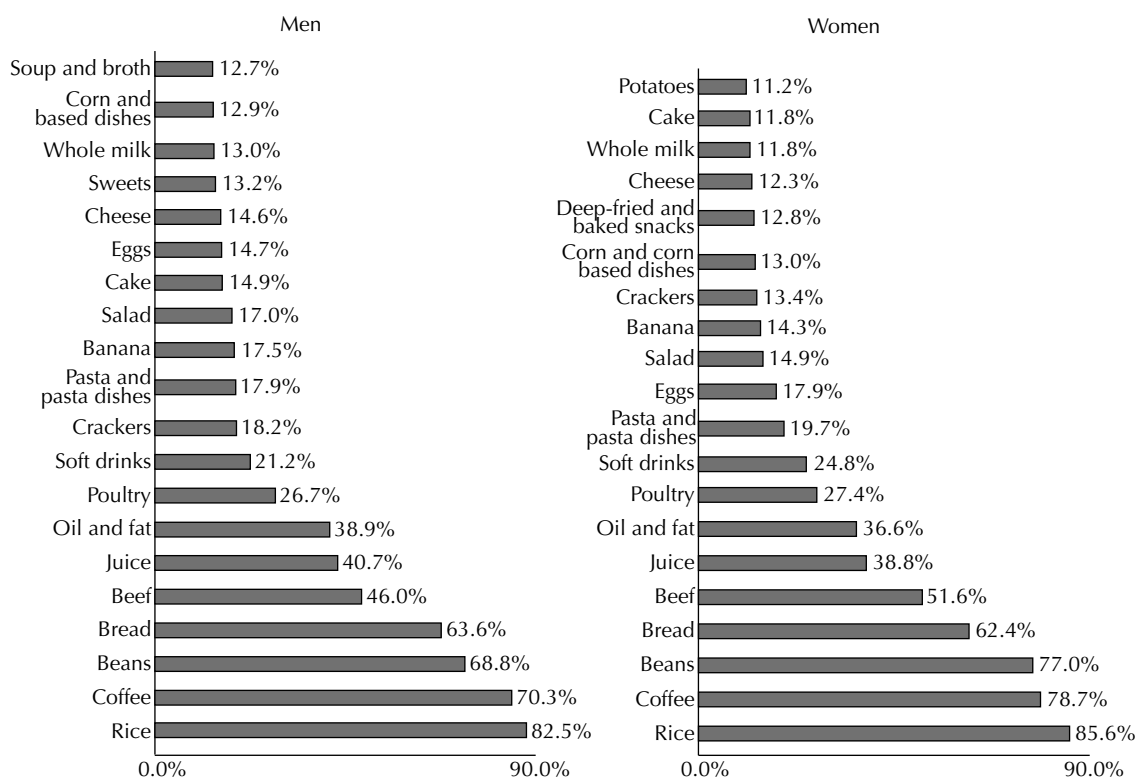

Figure 1. Most commonly consumed foods in Brazil, according to sex. Brazil, 2008-2009.

in the Southeast, South and Midwest. Juice was also among the most commonly consumed items in all of the regions, varying between sixth (Northeast, South and Midwest) and seventh (North and Southeast) position. Soft drinks were the eighth most prevalent item in the Southeast, and tenth most prevalent in the South and Midwest; in these regions the prevalence of consumption of this item varied between 245 and 27%. In the North and Northeast, the prevalence rate of consuming soft drinks was 19.7% and 16.1%, corresponding to 11th and 14th position respectively.

Banana was the most prevalent fruit in all of the regions, and was also the only one to feature in the 20 most prevalent items, with rates of prevalence of consumption ranging between 13.9% (Midwest) and 17.5% (South). Vegetables were most commonly cited in the form of salad in the North (20th position, 10.2%), Northeast (20th position, 10.6%), Southeast (tenth position, 17.8%) and Midwest (eighth position, 27.4%). Tomato (Southeast and Midwest) and lettuce (South and Midwest) also appeared among the 20 most prevalent items.

Some items, which appeared among the most prevalent foods only in some regions, demonstrate local dietary habits: for example, manioc flour in the North (sixth position, 45.3%) and Northeast (13th position, 18.2%). Fish and fish based dishes appeared among the most prevalent foods in the North (tenth position, 21.6%). Tea was among the most prevalent items in the South (15th position, 16.7%). Sweets were among the most prevalent foods in the North, Northeast and South, with prevalence rates around 13%. Potatoes were among the most prevalent foods in the South (13.1%) and Southeast (17.2%) and cheese in the South, Southeast and Midwest, with rates of prevalence varying between 13% and 20%. Deep-fried and baked snacks were only not among the most prevalent foods in the Northeast. Crackers and eggs were among the most prevalent items in all of the regions except for the South, and milk was among the most prevalent items except in the North.

Analysis by age group also underscored the ubiquity of rice, beans, coffee, bread and beef as the five most commonly consumed items, coffee being the most prevalent item among the elderly. Juice was the sixth most commonly consumed item among adolescents (43.5%) and adults (40.3%), and seventh among the elderly (31.3%). Again, the banana was the most prevalent fruit in all age groups and it was only among the elderly that another fruit made it into the top 20 most prevalent items: the orange. Adolescents did not have any vegetables at all among the top 20 most commonly consumed foods; adults included salad; the elderly, however, reported lettuce in addition to salad. Whole milk was reported by 12.9% (18th position) of
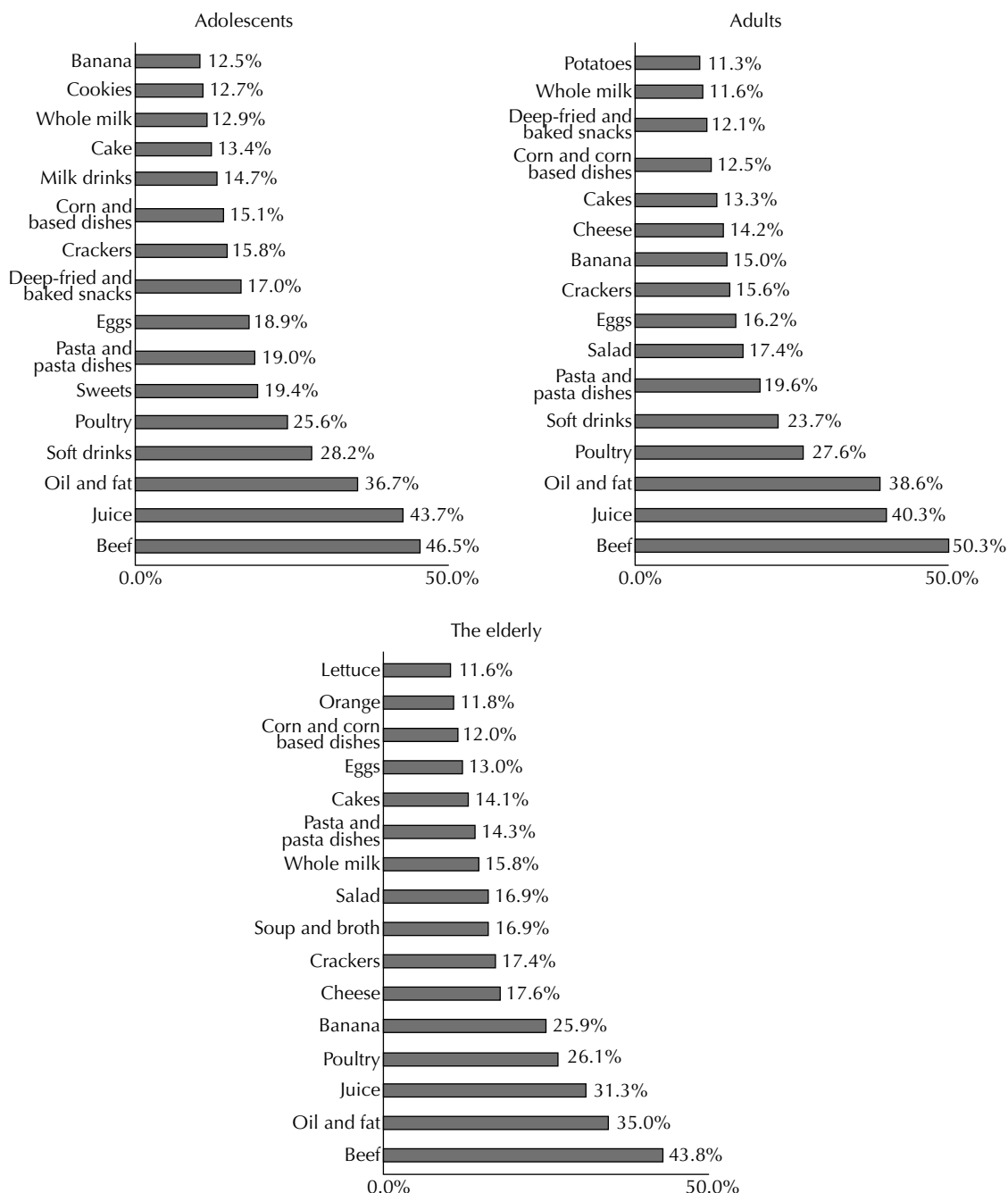
adolescents, 11.6% of adults (19th position) and 15.8% of the elderly (14th position). Soft drinks and deep-fried and backed snacks was among the most commonly consumed items for adolescents and adults only, and salad and cheese were among the most prevalent only for adults and the elderly. Sweets, milk-based flavored drinks and cookies only appeared among the most commonly consumed foods for adolescents, occupying 11th, 16th and 19th position in the ranking respectively (Figure 2).

Rice, beans, coffee, bread and beef were the five most commonly consumed food items observed in all household income quartiles. Coffee was the most prevalent item in the first quartile (83.4%) and rice was the most prevalent in the other income quartiles. Juice occupied sixth position in all income quartiles and soft drink consumption varied from 14.4% in the lowest income quartile (14th position) to 31.1% in the group with the highest income (eighth position) (Figures 3A and 3B).

The only fruit included among the most prevalent foods for all income categories was the banana, with prevalence rates of consumption varying between 11.7% (lowest income group) and 22.7% (group with the highest income). The 25% with the lowest household income did not report any vegetables among the 20 most commonly consumed foods; in the second and third quartiles salad was reported with prevalence rates of 15.5% and 18.3% respectively. The 25% of the population with the highest levels of income included lettuce and tomato, as well as salad, among the 20 most commonly consumed foods (Figures 3A and 3B).

Prevalence of whole milk consumption varied from 10.9% in the first quartile to 14.1% in the third income quartile; however, milk was not included among the 20 most commonly consumed foods in the highest income group. The same was observed in the case of eggs and sweets. Corn and corn based dishes appeared among the most prevalent foods only in the first and second household income quartiles, whereas cheese and potatoes were among the most prevalent foods in the two higher income quartile (Figures 3A and 3B).

It was only in the first income quartile that the most commonly reported foods consumed included fresh fish, dishes made with fresh fish and manioc flour; whereas corn and corn based dishes only appeared among the most prevalent foods in the first and second income quartiles. Fried and roasted snacks did not appear among the most prevalent foods in the quartile with the lowest income, whereas sandwiches were only among the most prevalent in the quartile with the highest income (Figures 3A and 3B).

Adolescents

Food	%
Banana	12.5%
Cookies	12.7%
Whole milk	12.9%
Cake	13.4%
Milk drinks	14.7%
Corn and based dishes	15.1%
Crackers	15.8%
Deep-fried and baked snacks	17.0%
Eggs	18.9%
Pasta and pasta dishes	19.0%
Sweets	19.4%
Poultry	25.6%
Soft drinks	28.2%
Oil and fat	36.7%
Juice	43.7%
Beef	46.5%

Adults

Food	%
Potatoes	11.3%
Whole milk	11.6%
Deep-fried and baked snacks	12.1%
Corn and corn based dishes	12.5%
Cakes	13.3%
Cheese	14.2%
Banana	15.0%
Crackers	15.6%
Eggs	16.2%
Salad	17.4%
Pasta and pasta dishes	19.6%
Soft drinks	23.7%
Poultry	27.6%
Oil and fat	38.6%
Juice	40.3%
Beef	50.3%

The elderly

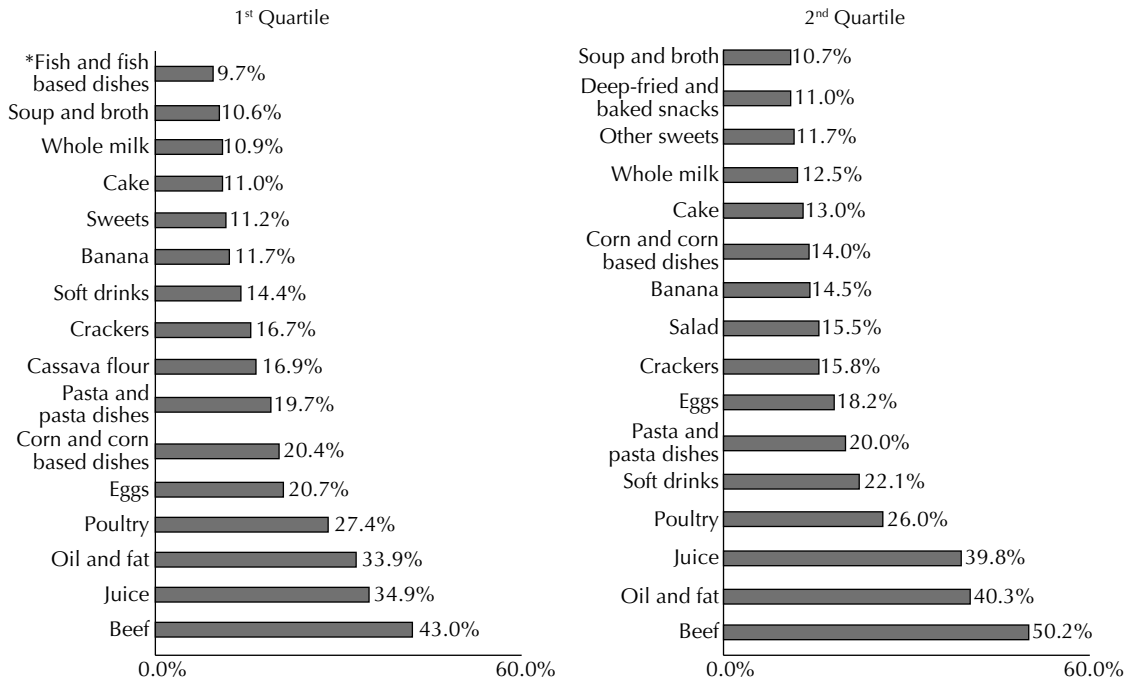| Food	%
Lettuce	11.6%
Orange	11.8%
Corn and corn based dishes	12.0%
Eggs	13.0%
Cakes	14.1%
Pasta and pasta dishes	14.3%
Whole milk	15.8%
Salad	16.9%
Soup and broth	16.9%
Crackers	17.4%
Cheese	17.6%
Banana	25.9%
Poultry	26.1%
Juice	31.3%
Oil and fat	35.0%
Beef	43.8%

Figure 2. Most frequently consumed foods according to age group, excluding rice, beans, coffee and bread. Brazil, 2008-2009.
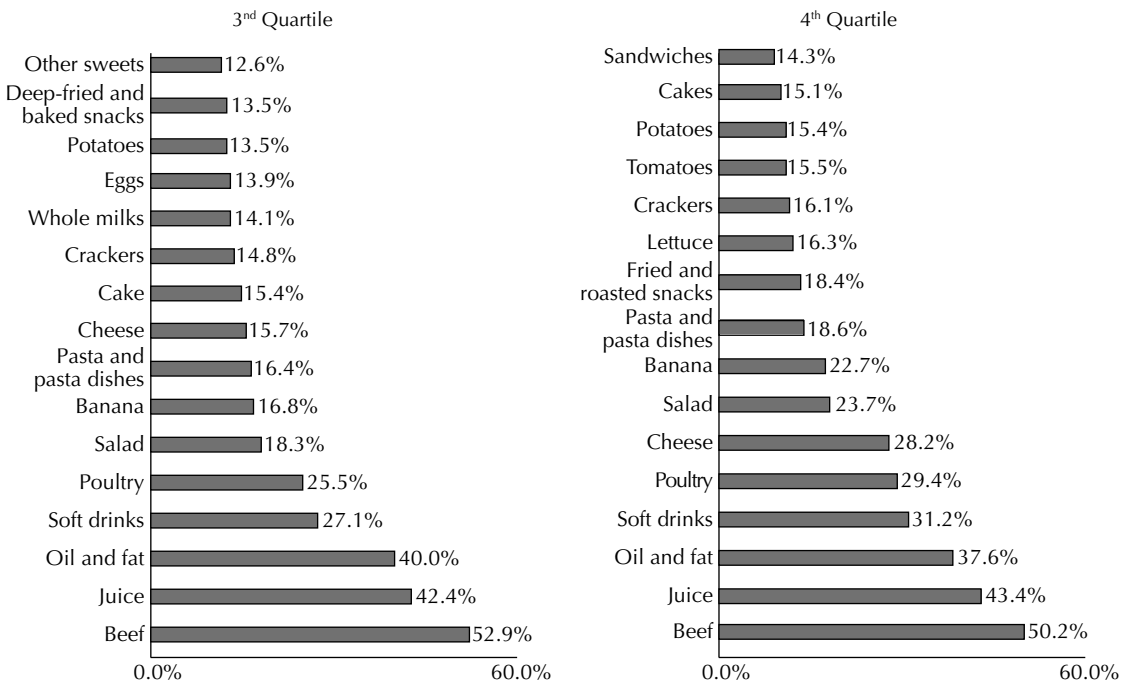
DISCUSSION

The basic Brazilian diet is characterized by the presence of fruit juices and soft drinks, as well as consumption of coffee and bread, rice, beans and beef, and low levels of fruit and vegetables. Although this configuration presents few variations when stratified by gender and age group, it was observed that adolescents were the only group which failed to report any vegetables

and which included sweets, milk drinks and cookies among the most commonly consumed items. On the other hand, the elderly were the only group to include a greater number of fruit and vegetables among the most prevalent foods. However, it is possible that the prevalence of oil, fat and other ingredients used in food preparation was underestimated, as these items were not reported in isolation when they were part of a dish.

1st Quartile

Food	%
*Fish and fish based dishes	9.7%
Soup and broth	10.6%
Whole milk	10.9%
Cake	11.0%
Sweets	11.2%
Banana	11.7%
Soft drinks	14.4%
Crackers	16.7%
Cassava flour	16.9%
Pasta and pasta dishes	19.7%
Corn and corn based dishes	20.4%
Eggs	20.7%
Poultry	27.4%
Oil and fat	33.9%
Juice	34.9%
Beef	43.0%

0.0%   60.0%

2nd Quartile

Food	%
Soup and broth	10.7%
Deep-fried and baked snacks	11.0%
Other sweets	11.7%
Whole milk	12.5%
Cake	13.0%
Corn and corn based dishes	14.0%
Banana	14.5%
Salad	15.5%
Crackers	15.8%
Eggs	18.2%
Pasta and pasta dishes	20.0%
Soft drinks	22.1%
Poultry	26.0%
Juice	39.8%
Oil and fat	40.3%
Beef	50.2%

0.0%   60.0%

*fresh fish and fish dishes

Figure 3A. Most frequently consumed foods according to income quartiles, excluding rice, beans, coffee and bread. Brazil, 2008-2009.

3nd Quartile

Food	%
Other sweets	12.6%
Deep-fried and baked snacks	13.5%
Potatoes	13.5%
Eggs	13.9%
Whole milks	14.1%
Crackers	14.8%
Cake	15.4%
Cheese	15.7%
Pasta and pasta dishes	16.4%
Banana	16.8%
Salad	18.3%
Poultry	25.5%
Soft drinks	27.1%
Oil and fat	40.0%
Juice	42.4%
Beef	52.9%

0.0%   60.0%

4th Quartile

Food	%
Sandwiches	14.3%
Cakes	15.1%
Potatoes	15.4%
Tomatoes	15.5%
Crackers	16.1%
Lettuce	16.3%
Fried and roasted snacks	18.4%
Pasta and pasta dishes	18.6%
Banana	22.7%
Salad	23.7%
Cheese	28.2%
Poultry	29.4%
Soft drinks	31.2%
Oil and fat	37.6%
Juice	43.4%
Beef	50.2%

0.0%   60.0%

Figure 3B. Most frequently consumed foods according to income quartile, excluding rice, beans, coffee and bread. Brazil, 2008-2009.

Some foods have a markedly regional character to their consumption, such as manioc flour in the North and Northeast and teas in the South. In the North, milk was not included among the most prevalent foods, and deep-fried and backed snacks did not appear in the most commonly consumed foods in the Northeast. When income categories are taken into consideration, important discrepancies can be observed between low

and high income quartiles. Individuals in the highest income level reported consuming sandwiches, tomatoes and lettuce and those in the first quartile cited fish and manioc flour among the most prevalent foods, food types which were also reported with high prevalence in the North and Northeast regions. This similarity may be explained by the fact that 44% of individuals in the North and 52% in the Northeast are in the first income quartile, proportions which are much higher than those observed in the Southeast (17%), South (16%) and Midwest (23%) of the country.

It is difficult to compare data on individual food consumption obtained in the INA with data on the availability of foods in the home obtained from the same 2008-2009 POF, as it refers to food acquired for the household and does not include food consumed away-from- home. On the other hand, the INA did not obtain information on children aged under ten. However, we note that foods with the highest prevalence of consumption by individuals also represent an important part of the calories of food acquired for the household, especially rice and beans, which together represent 22% of the total calories available in the home. Beef, the most commonly consumed meat, contributed 4% to the total calories consumed in the home and represented a third of calories provided by meat in the assessment of food available in the home. As for bread, it was verified that its household availability corresponded to 6% of total calories. However, the items which present the highest prevalence rates of consumption: rice, beans, beef and bread, together correspond to approximately 32% of calories available in the home. At the other extreme of prevalence rates, it can be seen that fruit and vegetables contribute only 2.8% of total calories available in the home, which concords with the low prevalence of consumption found for these foods. However, discrepancies were also observed when trying to collate data on availability in the home with those of individual consumption, particularly with relation to soft drinks, which contribute around 2% of calories available in the home. The frequency presented in the Household Budget Survey 2008-2009 suggests that there is significant consumption of these products away-fom-home.[a]

Regional characteristics highlighted in individual consumption confirm the differentiated profiles of availability of food which characterize the five main regions of the country. Thus, for example, the high prevalence of manioc flour consumption in the North and Northeast, the high rates of prevalence of fish and low rates of milk in the diet in the North, the high prevalence of rice in the Midwest and of soft drinks in the Southeast, found in both surveys. The effect of household income was similar for the two approaches, individual and household. Both in the availability of the foods in the home and in individual consumption, an increased presence of fruit and vegetables, soft drinks

and an inverse tendency to consume beans and manioc flour was observed as income increased.[a]

The results of this study corroborate findings of other localized studies, such as those observed by Andrade et al[2] (2009), which reported that rice, beans, coffee, beef and bread occupied first, second, fourth, seventh and 11th positions, respectively among the most commonly consumed foods for women aged over 35 living in the city of Rio de Janeiro in 2004-2005. Other items most commonly consumed included juice (12th position), milk (16th position) and soft drinks (20th position).

These data are in agreement with the findings of other population based studies investigating the prevalence rates of consumption of items in the Brazilian diet; for example, Neutzling et al[11] (2009) indicated that among adults in Pelotas, Southeastern Brazil, consumption was more frequent among women than among men (26.9% *versus* 12.9); moreover, the prevalence ratio of fruit and vegetable consumption among individuals aged over 60 compared with those under 30 was 2.30.

Considering the adolescent age group, the data in this study are related to the results of the National Pupils' Health Survey 2009,[8] in which the majority of adolescents regularly consumed beans (62.6%), milk (53,6%) and candy (95.09%), with higher proportions of regular consumption of beans and milk reported in males, and of candies, cookies and sausages among females. Low levels of fruit and vegetable consumption were also reported, with more than 20% of adolescents reporting that they had not consumed these foods in the week prior to the study.[8] In contrast to our results, which suggest higher levels of soft drink consumption according to income, the results of the National Pupils' Health Survey[8] found an inverse relationship between soft drink consumption and socio-economic status (mother's level of schooling and range of goods and services) among adolescents.

Population based studies carried out with adolescents in other countries have also demonstrated high levels of fast food consumption and low levels of fruit and vegetable consumption. Bauer et al[3] (2008) verified that on average, 31% of adolescents consume fast food at least three times a week. In Canada, Storey et al[14] (2009), analyzed adolescents in public schools and observed that fewer than 50% met the recommendations for fruit and vegetable and dairy consumption.

It is possible that there is some degree of under reporting in the Household Budget Survey. However, the methods used in this survey were validated in a study which adopted the doubly labelled water method[c] as the gold standard for estimating energy expenditure. In the validation study, 79 adults (31 men and 48 women) aged between 20 and 59 were investigated. These individuals constituted a subsample of a population based survey

developed in Duque de Caxias, Southeastern Brazil. The results indicated that concordance of the reporting varied according to gender, age and nutritional state. Sub-estimation of calorie consumption was, on average, 17%; however, individuals whose weight was within the normal band presented underestimates of around 13% and those who were in the obese category presented underestimates of approximately 30%.[c] These results were comparable to those obtained in other assessments of dietary records against the doubly labelled water method carried out in Brazil. Among elderly residents in urban areas, the percentage of under reporting of calorie consumption was 17.7%.[6] In studies carried out with women from two universities in the city of São Paulo, Southeastern Brazil, underestimating calorie consumption varied between 26%, 28% and 32% when consumption was assessed by 24hr recall, food record and a food frequency questionnaire respectively were compared with the doubly labelled water method data.[12]

The results presented indicate that the Brazilian diet is becoming characterized by the introduction of processed food of high calorie content and drinks with added sugar, although the traditional dietary habits are still maintained. This pattern of consumption is compatible with the high levels of overweight individuals with metabolic disorders which has marked the epidemiological and nutritional scene in the country.

Our findings reaffirm the importance of dietary and nutritional policies which involve encouraging the consumption of healthy foods, such as fruit, vegetables and whole grains and maintaining consumption of traditional basic foods, such as rice and beans, while, at the same time, encouraging reduced consumption of processed foods high in sodium, saturated fat and sugar.

The development of proposals for interventions in dietary habits aimed at adolescents could be considered urgent and of top priority, as this age group presented consumption marked by low fruit and vegetable intake and high consumption of foods considered to be unhealthy, such as cookies and soft drinks.

[c] Lopes TS, Ferrioli E, Pfrimer K, Hoffman D, Sichieri R, Pereira RA. Validation of energy intake estimated by the food record applied in a Brazilian national individual dietary survey by the double label water method. In: II World Congress of Public Health Nutrition, 2010, Porto, Portugal. Public Health Nutrition; 2010;13:326.

REFERENCES

1. Alvarez MM, Vieira ACR, Sichieri R, Veiga GV. Associação das medidas antropométricas de localização de gordura central com os componentes da síndrome metabólica em uma amostra probabilística de adolescentes de escolas públicas. *Arq Bras Endocrinol Metabol*. 2011;52(4):649-57. DOI: http://dx.doi.org/10.1590/S0004-27302008000400011

2. Andrade RG, Pereira RA, Sichieri R. Mudanças no consumo alimentar de mulheres do Município do Rio de Janeiro, Brasil. *Cad Saude Publica*. 2009;25(11):2419-32. DOI: http://dx.doi.org/10.1590/S0102-311X2009001100012

3. Bauer KW, Larson NI, Nelson MC, Story M, Neumark-Sztainer D. Socio-environmental, personal behavioral predictors of fast –food intake among adolescents. *Public Health Nutr*. 2008;12(10):1767-74. DOI: http://dx.doi.org/10.1017/S1368980008004394

4. Bezerra IN, Sichieri R. Eating out of home and obesity: a Brazilian nationwide survey. *Public Health Nutr*. 2009;12(11):2037-43. DOI: http://dx.doi.org/10.1017/S1368980009005710

5. Dishchekenian VRM, Escrivão MAMS, Palma D, Ancona-Lopes F, Araújo EAC, Taddei JAAC. Padrões alimentares de adolescentes obesos e diferentes repercussões metabólicas. *Rev Nutr*. 2011;24(1):17-29. DOI: http://dx.doi.org/10.1590/S1415-52732011000100002

6. Ferriolli E, Pfrimer K, Moriguti JC, Lima NK, Moriguti EK, Formighieri PF, et al. Under-reporting of food intake is frequent among Brazilian free-living older persons: a doubly labelled water study. *Rapid Commun Mass Spectrom*. 2010;24(5):506-10. DOI: http://dx.doi.org/10.1002/rcm.4333

7. Levy-Costa RB, Sichieri R, Pontes NS, Monteiro CA. Disponibilidade domiciliar de alimentos no Brasil: distribuição e evolução (1974-2003). *Rev Saude Publica*. 2005;39(4):530-40. DOI: http://dx.doi.org/10.1590/S0034-89102005000400003

8. Levy-Costa RB, Castro IRR, Cardoso LO, Tavares LF, Sardinha LMV, Gomes FS, et al. Consumo e comportamento alimentar entre adolescentes brasileiros: Pesquisa Nacional de Saúde do Escolar (PeNSE), 2009. *Cienc Saude Coletiva*. 2009;15(Supll2):3085-97. DOI: http://dx.doi.org/10.1590/S1413-81232010000800013

9. Malik VS, Poppkin BM, Bray GA, Despres JP, Willett WC, Hu FB. Sugar-sweetened beverages and risk of metabolic syndrome and type 2 diabetes: a meta-analysis. *Diabetes Care*. 2010;33(11):2477-83. DOI: http://dx.doi.org/10.2337/dc10-1079

10. Monteiro CA, Levy RB, Claro RM, Castro IR, Cannon G. Increasing consumption of ultra-processed foods and likely impact on human health: evidence from Brazil. *Public Health Nutr*. 2011;14(1):5-13. DOI: http://dx.doi.org/10.1017/S1368980010003241

11. Neutzling MB, Rombaldi AJ, Azevedo MR, Hallal PC. Factors associated with fruit and vegetable intake among adults in a Southern Brazilian city. *Cad Saude Publica*. 2009;25(11):2365-74. DOI: http://dx.doi.org/10.1590/S0102-311X2009001100007

12. Scagliusi FB, Ferriolli E, Pfrimer K, Laureano C, Cunha CS, Gualano B, et al. Underreporting of energy intake in Brazilian women varies according to dietary assessment: a cross-sectional study using doubly labeled water. *J Am Diet Assoc*. 2008;108(12):2031-40. DOI: http://dx.doi.org/10.1016/j.jada.2008.09.012

13. Schmidt MI, Duncan BB, Silva GA, Menezes AM, Monteiro CA, Barreto SM, et al. Chronic non-communicable diseases in Brazil: burden and current challenges. *Lancet*. 2011;377(9781):1949-61. DOI: http://dx.doi.org/10.1016/S0140-6736(11)60135-9

14. Storey KE, Forbes LE, Fraser SN, Spence JC, Plotnikoff RC, Raine KD, et al. Diet quality, nutrition and physical activity among adolescents: the Web-SPAN (Web-Survey of physical Activity and Nutrition) project. *Public Health Nutr*. 2009;12(11):2009-17. DOI: 10.1017/S1368980009990292

15. Strazzullo P, D'Elia L, Kandala NB, Cappuccio FP. Salt intake, stroke, and cardiovascular disease: meta-analysis of prospective studies. *BMJ*. 2009;339:b4567. DOI: http://dx.doi.org/10.1136/bmj.b4567

16. Subar AF, Kipnis V, Troiano RP, Midthune D, Schoeller DA, Bingham S, et al. Using intake biomarkers to evaluate the extent of dietary misreporting in a large sample of adults: the OPEN study. *Am J Epidemiol*. 2003;158(1):1-13. DOI: http://dx.doi.org/10.1093/aje/kwg09