Original Articles

Renata Bertazzi Levy[I]

Rafael Moreira Claro[II]

Lenise Mondini[III]

Rosely Sichieri[IV]

Carlos Augusto Monteiro[V]

Regional and socioeconomic distribution of household food availability in Brazil, in 2008-2009

ABSTRACT

OBJECTIVE: To describe the regional and socioeconomic distribution of household food availability in Brazil.

METHODS: Data from the 2008-2009 Household Budget Survey on food and beverage acquisition for household consumption, conducted by the Instituto Brasileiro de Geografia e Estatística (Brazilian Institute of Geography and Statistics), were analyzed. The amounts of foods, recorded during seven consecutive days in the 55,970 sample households, were converted into calories and nutrients. Food quality indicators were constructed and analyzed according to the regional and socioeconomic strata of the Brazilian population.

RESULTS: The amount of energy from protein was adequate in all regional and socioeconomic strata. On the other hand, an excess of free sugars and fats was observed in all regions of the country, especially in the Southern and Southeastern regions. The proportion of saturated fats was high in urban areas and consistent with the greater contribution of animal-derived products. Limited availability of fruits and vegetables was found in all regions. An increase in the fat content and reduction in carbohydrate content of the diet were observed with the increase in income.

CONCLUSIONS: The negative characteristics of the Brazilian diet observed at the end of the first decade of the 21st century indicate the need to prioritize public policies for the promotion of healthy eating.

DESCRIPTORS: Food Habits. Food Consumption. Budgets. Socioeconomic Factors. Diet Surveys.

[I] Departamento de Medicina Preventiva. Faculdade de Medicina. Universidade de São Paulo (USP). São Paulo, SP, Brasil

[II] Núcleo de Pesquisas Epidemiológicas em Nutrição e Saúde. USP. São Paulo, SP, Brasil

[III] Instituto de Economia Agrícola. Secretaria de Agricultura e Abastecimento do Estado de São Paulo. São Paulo, SP, Brasil

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

[V] Departamento de Nutrição. Faculdade de Saúde Pública. USP. São Paulo, SP, Brasil

Correspondence:
Renata Bertazzi Levy
Departamento de Medicina Preventiva
Faculdade de Medicina da USP
Av. Dr. Arnaldo, 455 – 2º andar
Cerqueira Cesar
01246-903 São Paulo, SP, Brasil
E-mail: rlevy@usp.br

INTRODUCTION

Favorable conditions for the occurrence of malnutrition and infectious diseases have been gradually replaced by a context of growing epidemic of obesity and other non-communicable chronic diseases associated with excessive and/or imbalanced food consumption.[13] The analysis of the evolution of the Brazilian adult population's nutritional status showed that, whereas the prevalence of low weight has decreased, the prevalences of overweight and obesity have continually increased in recent decades.[a]

The World Health Organization (WHO) Global Strategy on Diet, Physical Activity and Health emphasizes the need for adequate world dietary standards,

[a] Instituto Brasileiro de Geografia e Estatística. Pesquisa de Orçamentos Familiares 2008-2009: antropometria e estado nutricional de crianças e adolescentes e adultos no Brasil. Rio de Janeiro; 2010.

one of the factors directly responsible for the increase in global load of obesity and non-communicable chronic diseases. The WHO stresses the need to reduce the consumption of foods with a high energy value, low nutrient content, and high content of sodium, saturated fats, trans fats and refined carbohydrates.[b]

The description of a population's dietary patterns must be preferably made through direct investigation of individual food consumption. Recently, the *Instituto Brasileiro de Geografia e Estatística* (IBGE – Brazilian Institute of Geography and Statistics) introduced a specific section that investigates individual food consumption in a sub-sample of the total number of households in Household Budget Surveys (HBS).

Regular surveys with data on household food availability derived from HBSs enable the characterization of changes in the Brazilian population's dietary habits in recent decades. These contributions are valuable as they provide information about the adequacy of household diet composition and enable specific comparisons of consumption of certain foods to be made, among other things. The following are examples of unfavorable aspects: the reduction in household availability of traditional food staples in the Brazilian diet such as rice and beans, the increase in the amount of energy from fats in this diet, and the continuous excessive contribution of sugar and reduced contribution of fruits and vegetables to it. On the other hand, the increase in the protein content in the diet, especially that from animal products, is an example of a positive aspect.[5,c]

The present study aimed to describe the regional and socioeconomic distribution of household food availability in Brazil.

METHODS

The study was conducted with secondary data derived from the 2008-2009 HBS in a probabilistic sample of 55,970 households.[d]

The 2008-2009 HBS used two-stage cluster sampling with a random selection of census tracts in the first stage and another of households in the second stage. All 12,800 sectors of the set of census tracts (Master Sample of Household Surveys and Common Sample)[d] were previously grouped to obtain household strata with high geographical and socioeconomic homogeneity.

Sector location (region, state, capital city or country-side, urban or rural area) and the range of variation in the economic level of families in each geographical locus, according to the individual responsible for the household (information obtained from the 2000 Demographic Census) were taken into consideration. The number of tracts randomly selected from each stratum was proportional to the number of households in this stratum, with least three tracts in the sample of each stratum. Households of each tract were selected by simple random sampling without replacement. The number of households with interviews per tract was established according to the research area (12 households in urban census tracts, 16 in rural census tracts). Interviews were uniformly distributed throughout four three-month periods to reproduce the seasonal variation in income and acquisition of food (and other products) in each stratum.

The weights required to obtain the estimated quantities of interest were calculated at the end of the data collection. Weights were calculated according to the sampling plan used, including adjustments to compensate for the lack of response of certain units. These weights were adjusted so that the sample could be proportional to the population projection, according to gender and age group on January 15th, 2009.[d]

We analyzed records of foods and beverages acquired for domestic consumption (approximately 850,000), noted down in a notebook by the household members themselves (or by the interviewer, if necessary) during seven consecutive days. In the majority of cases, the amount of products acquired could be measured (in kg or l); in the remaining cases, the amount was imputed according to the value spent and mean price of the product.

The description of relative contribution of foods to household availability resulted from 334 items of consumption (foods or groups of foods) categorized according to information from the HBS[e] and divided into 15 groups (cereals and derivatives; beans and other legumes; roots, tubers and derivatives; meat and derivatives; milk and derivatives; eggs; fruits and natural juices; vegetables; vegetable oils and fats; animal fats; table sugar and sodas; alcoholic beverages; oilseeds; condiments; processed food preparations and ready meals).

The conversion of raw amounts (items acquired) of foods into calories and macronutrients was based on the list of 334 items. The inedible parts were excluded,

[b] World Health Organization. Integrated prevention of noncommunicable diseases: global strategy on diet, physical activity and health. Geneva; 2004[cited 2011 Jan 04]. Available from: http://www.who.int/dietphysicalactivity/strategy/eb11344/en/index.html

[c] Instituto Brasileiro de Geografia e Estatística. Pesquisa de orçamentos familiares 2002-2003: análise da disponibilidade domiciliar de alimentos e estado nutricional no Brasil. Rio de Janeiro; 2004.

[d] Instituto Brasileiro de Geografia e Estatística. Pesquisa de Orçamentos Familiares 2008-2009: despesas, rendimentos e condições de vida. Rio de Janeiro; 2010.

[e] List based on the publication entitled "Pesquisa de Orçamentos Familiares 2008-2009 Quantidades de Aquisição Alimentar domiciliar per capita", published by the IBGE, which describes the methodology used to establish the amounts (in kg) associated with the list of 334 items analyzed in the present study.

according to the corresponding correction factors.[f] The total amount of each food was converted into energy and macronutrients using the *Tabela Brasileira de Composição de Alimentos* (TACO – Brazilian Food Composition Table).[g] The official American food composition table (USDA) was used when a certain food or nutrient was not available in the Brazilian table.[h] In the case of food items comprised of more than one food, the food that had the highest proportion was considered.

Carbohydrates were subdivided into free sugars (table sugar, *rapadura* – a type of candy made from sugarcane juice) –, and honey, in addition to mono- and disaccharides added to processed foods) and other carbohydrates (including sugars naturally found in basic foods, such as milk and fruits). Proteins were subdivided into animal and vegetable, whereas fats were divided into monounsaturated, polyunsaturated and saturated fatty acids. Relative contribution in household availability was described according to the percentage of calories of a certain food or macronutrient in the total energy content available for consumption.

The mean total energy value of household food availability (kcal *per capita* per day) and the relative contribution of groups of foods and macronutrients selected were estimated. The estimates were shown in terms of the group of Brazilian households and strata of such households, according to their urban or rural status, Brazilian regions and income level (quintiles of total monthly household income).

The assessment of contribution of fruits and vegetables and adequacy of composition of total proteins, carbohydrates and fats in household food availability was performed according to the WHO recommendations.[13] We considered the *Sociedade Brasileira de Cardiologia* (Brazilian Society of Cardiology) recommendations, which limit the proportion of calories from saturated fatty acids to a maximum of 7%.[11] The adequate level of consumption of fruits and vegetables in Brazil varied between 9% and 12% of the total energy value of a diet of 2,000 kcal/person/day, a value estimated according to the WHO recommendation of a minimum daily per capita consumption of 400 g.[i]

RESULTS

The mean food availability in Brazilian households was 1,611 kcal/person/day, 1,536 kcal in urban areas and 1,973 kcal in rural areas. Staple vegetables (cereals, legumes, roots and tubers) corresponded to 45% of the calories available for consumption; high-energy foods (vegetable oils and fats, animal fats, sugar and sodas, and alcoholic beverages), 28%; and animal food products (meats, milk and derivatives and eggs), 19%. Fruits and vegetables contributed to 2.8% of total calories and processed food preparations and ready meals corresponded to 4.6%. The contributions of condiments (0.3%) and oilseeds (0.2%) were not significant (Table 1).

The contribution of cereals and derivatives was similar in urban and rural areas (approximately 35%), although there were substantial differences in their components. Bread (7.4% of total calories in urban areas against 2.5% in rural areas) and cookies (3.6% against 2.8%) were more important in urban areas, while rice (19.3% of total calories in rural areas against 15.4% in urban areas), wheat flour (3.1% against 1.9%) and other cereals and derivatives (5.1% against 4.2%) were more important in rural areas. The contribution of beans and other legumes, roots and tubers, and pork was greater in rural areas, whereas that of processed meats was greater in urban areas.

The contribution of fruits and vegetables to total food availability was almost two times greater in urban areas, but lower than the recommendations of 9% to 12% of total calories. The contribution of high-energy foods was similar in both areas (approximately 28%), the specific contribution of table sugar was greater in rural areas (14% against 10%) and the contribution of soft drinks was greater in urban areas (2.0% against 0.8%). The contribution of alcoholic beverages to total calories, although reduced, was more important in urban areas (0.8%) than in rural areas (0.4%). The contribution of processed food preparations and ready meals and condiments was 2.5 times greater in urban areas (Table 1).

The five Brazilian regions showed different household food availability characteristics (Table 2). The contribution of rice to food availability in the Central-West was two times greater than that found in the South, while that of wheat flour was six times greater than the contribution of the remaining regions. A similar situation was observed for beans and cookies in the Northeast, cassava flour in the North and Northeast, and meats in general in the North and South. The contribution of fish in the North was approximately ten times greater than that of the Central-West and South. Greater availability of pork was found in the South; of fruits in the South and Southeast; of soybean oil in the Central-West and Southeast; of bacon in the South; of soft drinks,

Table 1. Relative contribution (%) of foods and food groups to household total energy availability per household status. Brazil, 2008-2009.

Food groups	Household status		
	Total	Urban	Rural
Cereals and derivatives	35.21	35.19	35.27
White rice	16.24	15.43	19.30
French bread	6.39	7.42	2.50
Cookies	3.39	3.55	2.80
Spaghetti	2.65	2.71	2.43
Wheat flour	2.14	1.89	3.09
Others	4.40	4.21	5.14
Beans and other legumes	5.44	5.08	6.82
Roots, tubers and derivatives	4.79	3.71	8.92
Potato	0.54	0.59	0.34
Cassava	0.33	0.26	0.60
Cassava flour and others	3.92	2.85	7.97
Meats	12.34	12.58	11.43
Beef	4.42	4.58	3.80
Chicken	4.03	4.16	3.53
Pork	0.68	0.61	0.96
Fish	0.64	0.54	1.00
Processed meat	2.22	2.42	1.46
Others	0.36	0.27	0.69
Milk and derivatives	5.77	6.11	4.49
Milk	4.44	4.58	3.90
Cheeses	1.09	1.24	0.51
Others	0.25	0.29	0.08
Eggs	0.71	0.71	0.68
Fruits and natural juices	2.04	2.25	1.23
Bananas	0.87	0.94	0.59
Oranges	0.25	0.27	0.16
Others	0.83	0.93	0.46
Natural juices	0.09	0.11	0.02
Vegetables	0.80	0.87	0.55
Tomato	0.22	0.24	0.13
Lettuce	0.02	0.02	0.02
Others	0.57	0.61	0.41
Oils and fats	14.07	14.41	12.71
Soybean oil	9.71	9.67	9.86
Margarine	1.71	1.88	1.06
Butter	0.34	0.38	0.19
Bacon	0.55	0.49	0.77
Others	1.76	1.99	0.83
Sugar and sodas	12.99	12.49	14.88
Sugar	11.24	10.50	14.05
Soft drinks	1.75	1.99	0.83

To be continued

Table 1 continuation

Food groups	Household status		
	Total	Urban	Rural
Alcoholic beverages	0.69	0.77	0.37
Beer	0.42	0.48	0.20
Spirits	0.08	0.07	0.10
Others	0.19	0.22	0.07
Oilseeds	0.23	0.17	0.44
Condiments	0.31	0.35	0.19
Ready meals and processed food preparations	4.61	5.30	2.02
Total	100%	100%	100%
Total calories (kcal/day/*per capita*)	1,610	1,536	1,973

alcoholic beverages, condiments and ready meals in the South and Southeast; and of oilseeds (Brazil nuts) in the North. Availability of milk and derivatives and vegetables in the North and Northeast was lower than the national mean value.

The effect of household income on the contribution of the majority of foods and food groups (Table 3) was significant. The contribution of food groups comprised of milk and derivatives, fruits and vegetables, animal fats, alcoholic beverages and ready meals tended to increase consistently with the level of household income. Food groups comprised of beans and other legumes, cereals and derivatives (due to the reduction in the contribution of rice with income) and roots, tubers and derivatives (due to the reduction in the contribution of cassava flour with income) had an inverse trend. Sugar and soft drinks and meats showed more complex consumption patterns with income: there was a decrease in the consumption of table sugar and an increase in the consumption of soft drinks with the increase in income and an increase in beef and processed meats and a reduction or stability in other types of meat were found.

Of the total calories in the diet analyzed, 59% were from carbohydrates, 12% from proteins and 29% from fats (Table 4), i.e. this diet met the nutritional recommendations (between 55% and 75% of calories from carbohydrates, between 10% and 15% from proteins, and between 15% and 30% from fats). However, imbalances were caused by a relative excess of free sugars (16.4% of the total calories against a maximum of 10% established by the WHO/FAO nutritional recommendations) and saturated fatty acid content (8.3% of total calories against a maximum of 7% recommended by the Brazilian Society of Cardiology).

The total fat content (29.7%) was close to the maximum limit of 30%, while the maximum limit of saturated fats was surpassed (8.7%) in urban areas. Total energy

Table 2. Relative contribution (%) of foods and food groups to household total energy availability per region. Brazil, 2008-2009.

Food groups	Regions				
	North	Northeast	South	Southeast	Central-West
Cereals and derivatives	29.71	37.23	34.23	35.03	37.59
White rice	15.41	16.68	12.37	16.45	23.32
French bread	5.54	6.80	4.65	7.27	4.83
Cookies	2.55	4.09	3.25	3.31	2.49
Spaghetti	2.19	2.88	2.87	2.61	1.98
Wheat flour	1.12	0.71	6.56	1.63	1.90
Others	2.89	6.06	4.54	3.75	3.07
Beans and other legumes	5.15	7.36	3.53	4.98	5.19
Roots, tubers and derivatives	14.40	7.69	2.36	1.99	2.20
Potato	0.24	0.28	0.88	0.67	0.45
Cassava	0.46	0.26	0.70	0.20	0.40
Cassava flour and others	13.69	7.15	0.78	1.13	1.35
Meats	16.21	11.95	13.61	11.41	11.26
Beef	5.44	4.43	5.10	3.79	5.07
Chicken	5.63	4.64	3.75	3.45	3.41
Pork	0.47	0.40	1.21	0.73	0.62
Fish	2.46	0.77	0.24	0.35	0.27
Processed meat	1.34	1.28	2.95	2.87	1.73
Others	0.88	0.43	0.37	0.22	0.17
Milk and derivatives	3.72	4.60	7.26	6.56	5.24
Milk	3.20	3.66	5.55	4.88	4.11
Cheeses	0.39	0.76	1.39	1.39	0.89
Others	0.12	0.18	0.32	0.30	0.24
Eggs	0.65	0.73	0.84	0.67	0.58
Fruits and natural juices	1.28	1.94	2.31	2.21	1.87
Bananas	0.58	0.95	0.96	0.87	0.74
Oranges	0.15	0.21	0.24	0.29	0.25
Others	0.48	0.73	1.03	0.92	0.76
Natural juices	0.07	0.05	0.08	0.13	0.11
Vegetables	0.54	0.65	0.88	0.92	0.88
Tomato	0.12	0.16	0.24	0.25	0.27
Lettuce	0.01	0.01	0.03	0.02	0.02
Others	0.42	0.48	0.61	0.64	0.59
Oils and fats	11.93	11.35	14.68	15.73	16.65
Soybean oil	8.90	7.78	9.46	10.78	13.02
Margarine	1.42	1.84	1.66	1.74	1.41
Butter	0.45	0.44	0.11	0.35	0.21
Bacon	0.15	0.21	0.99	0.68	0.62
Others	1.01	1.08	2.46	2.18	1.39
Sugar and sodas	11.79	13.12	12.10	13.51	13.11
Sugar	10.54	12.16	9.79	11.30	11.44
Soft drinks	1.25	0.96	2.31	2.21	1.67

To be continued

Table 2 continuation

Food groups	Regions				
	North	Northeast	South	Southeast	Central-West
Alcoholic beverages	0.33	0.38	0.92	0.88	0.74
Beer	0.21	0.18	0.59	0.56	0.48
Spirits	0.05	0.09	0.08	0.07	0.09
Others	0.07	0.11	0.25	0.25	0.17
Oilseeds	1.25	0.13	0.17	0.12	0.11
Condiments	0.20	0.20	0.50	0.36	0.25
Ready meals and processed food preparations	2.85	2.67	6.61	5.63	4.33
Total	100%	100%	100%	100%	100%
Total calories (kcal/day/*per capita*)	1,818	1,602	1,785	1,530	1,530

from fats was adequate (approximately 25%) and the total energy from saturated fats was not higher than 7% in rural areas. The consumption of free sugars was excessive in both urban and rural areas (16.1% and 17.1%, respectively) (Table 4). The relative excess of saturated fats in urban areas was in agreement with the greater contribution of animal food products (beef, chicken, processed meats and milk and derivatives) in the acquisitions made by these households.

There was an adequate protein content in all regions (between 11% and 13%), an excess of energy from fats in the South and Southeast (higher than 30%), a high amount of saturated fats in all regions, except for the Northeast (7%), and an excess of free sugars in all regions (between 13.9% in the North and 17.4% in the Southeast) (Table 4).

The dietary fat content increased and that of carbohydrates decreased with the increase in income. The minimum recommendation for carbohydrates (55% of total calories) was practically met in the highest quintile of income and approximately 30% of dietary carbohydrates at this income level (16% of 55%) corresponded to free sugars. Consumption of saturated fats tended to increase with income (between 6.7% in the lowest quintile and 10% in the highest quintile). Only in the lowest quintile of income were the total calories from these fats lower than the maximum recommendation of 7%. The total energy from free sugars at all income levels was substantially higher than the maximum amount recommended. Although the protein content tended to increase with income, the proportion of proteins was adequate at all levels of income (Table 4).

DISCUSSION

The in-depth study of food acquisitions made by Brazilian families in 2008-2009 provides relevant information to describe the recent situation and the regional and socioeconomic distribution of food quality in this country.

The protein content of the diets was adequate in all regions and income levels. However, there was an insufficient amount of fruits and vegetables and an excess of calories from free sugars and saturated fats.

An increase in the relative availability of ultra--processed foods such as French bread, cookies, soft drinks, alcoholic beverages, ready meals and food preparations was observed. In addition, there was a reduction in the availability of minimally processed foods and ingredients used to prepare these foods, such as rice, beans, milk, wheat and cassava flours, soybean oil and sugar, when compared to a previous study derived from the 2002-2003 HBS, considering the food processing level.[7]

One limitation to studies on food availability is that some of the foods were consumed out of the home. In 2008-2009, these foods corresponded to approximately 30% of total spending on food.[j] Although the 2008-2009 HBS calculated spending on each food item out of the home, the type and amount of foods acquired were not sufficiently specified to determine the percentage of calories coming from out of the home. Another limitation inherent in household budgets surveys was the fact that certain foods acquired but not consumed by household members were not taken into consideration.

The short period of reference (one week) to collect data on foods acquired by families determines that estimates of HBS should be calculated according to clusters of households rather than individual households. The impossibility of determining the variation in energy requirements of individuals from several strata of the population does not enable researchers to conclude, for example, that the probability of caloric deficits in Brazil is higher in urban areas than rural areas. In this case, it is

[j] Instituto Brasileiro de Geografia e Estatística. Pesquisa de orçamentos familiares 2008-2009: despesas, rendimentos e condições de vida. Rio de Janeiro; 2010.

Table 3. Relative contribution (%) of foods and food groups to household total energy availability per quintiles of per capita household income. Brazil, 2008-2009.

Food groups	Quintiles of *per capita* household income				
	1st	2nd	3rd	4th	5th
Cereals and derivatives	37.92	36.99	35.63	34.95	31.80
White rice	19.48	18.35	16.84	15.49	12.49
French bread	5.23	6.53	6.59	7.11	6.26
Cookies	3.45	3.29	3.09	3.39	3.70
Spaghetti	2.93	2.88	2.60	2.52	2.43
Wheat flour	1.68	1.71	2.50	2.53	2.11
Others	5.15	4.23	4.01	3.90	4.81
Beans and other legumes	7.00	6.20	6.02	4.68	3.96
Roots, tubers and derivatives	7.30	5.73	5.21	3.82	2.84
Potato	0.29	0.45	0.51	0.65	0.71
Cassava	0.27	0.33	0.39	0.36	0.30
Cassava flour and others	6.75	4.95	4.31	2.80	1.83
Meats	11.24	11.87	12.32	12.91	12.98
Beef	3.81	4.25	4.43	4.59	4.80
Chicken	4.17	4.18	4.19	4.03	3.67
Pork	0.44	0.53	0.57	0.80	0.96
Fish	0.82	0.71	0.63	0.51	0.56
Processed meat	1.61	1.89	2.15	2.57	2.65
Others	0.38	0.32	0.35	0.41	0.33
Milk and derivatives	3.86	4.93	5.35	6.45	7.51
Milk	3.39	4.21	4.36	4.92	4.97
Cheeses	0.36	0.55	0.79	1.25	2.12
Others	0.11	0.17	0.20	0.28	0.41
Eggs	0.66	0.69	0.74	0.73	0.71

To be continued

Table 3 continuation

Food groups	Quintiles of *per capita* household income				
	1st	2nd	3rd	4th	5th
Fruits and natural juices	1.20	1.53	1.76	2.33	3.00
Bananas	0.67	0.77	0.80	0.99	1.04
Oranges	0.13	0.18	0.22	0.29	0.36
Others	0.37	0.55	0.70	0.97	1.38
Natural juices	0.02	0.03	0.04	0.08	0.23
Vegetables	0.52	0.68	0.75	0.91	1.04
Tomato	0.13	0.18	0.21	0.24	0.28
Lettuce	0.01	0.01	0.02	0.02	0.03
Others	0.37	0.48	0.52	0.65	0.73
Oils and fats	13.11	13.93	14.01	14.27	14.67
Soybean oil	10.10	10.38	10.42	9.73	8.28
Margarine	1.46	1.57	1.61	1.85	1.94
Butter	0.23	0.30	0.26	0.32	0.53
Bacon	0.42	0.66	0.51	0.69	0.45
Others	0.90	1.02	1.21	1.68	3.47
Sugar and sodas	14.33	13.90	13.74	12.39	11.24
Sugar	13.46	12.69	12.15	10.26	8.66
Soft drinks	0.87	1.21	1.58	2.13	2.57
Alcoholic beverages	0.32	0.45	0.49	0.71	1.28
Beer	0.13	0.23	0.31	0.47	0.82
Spirits	0.11	0.10	0.06	0.08	0.04
Others	0.08	0.12	0.12	0.16	0.42
Oilseeds	0.25	0.19	0.26	0.18	0.27
Condiments	0.19	0.23	0.30	0.38	0.42
Ready meals and processed food preparations	2.11	2.67	3.44	5.28	8.29
Total	100	100	100	100	100
Total calories (kcal/day/*per capita*)	1,406	1,538	1,620	1,644	1,817

possible that the lower availability of calories in urban areas reflects a higher frequency of food consumption out of the home and, probably, lower energy requirements, when compared to rural areas.

However, data on food acquisition can and have been used to establish food consumption patterns,[4,9,12] especially when the indicators used focus on the relative contribution of different foods and food groups rather than absolute amounts, as observed in the present study. Household budget surveys reflect the beginning of the chain of consumption and enable the establishment of public policies that can change the availability of foods and population acquisition patterns.

Consumption patterns obtained according to household food acquisitions tend to approach the actual dietary pattern of populations, as shown in studies on food safety conducted in Cape Verde, Kenya and Armenia.[2,3,6] In these studies, food acquisition was closely associated with their effective consumption, with regard to both the contribution of food groups to the total calories consumed and the dietary macronutrient composition profile. In a study conducted in four European countries (Belgium, Greece, Norway and the United Kingdom), food consumption indicators derived from household budget surveys were highly correlated with indicators calculated from studies on individual consumption, identifying correlations higher than 0.80 for the consumption of meats, milk and derivatives, and fruits and vegetables.[8] In a study

Table 4. Relative contribution (%) of macronutrients to household total energy availability per household status, regions and quintiles of *per capita* household income. Brazil, 2008-2009.

Macronutrients	Household status		
	Total	Urban	Rural
Carbohydrates	59.22	58.01	63.80
Free sugars	16.36	16.15	17.15
Other carbohydrates	42.86	41.86	46.65
Proteins	12.08	12.26	11.38
Animal	6.69	6.88	5.98
Vegetal	5.39	5.38	5.40
Fats	28.71	29.73	24.82
Monounsaturated fatty acids	9.17	9.58	7.64
Polyunsaturated fatty acids	9.17	9.37	8.43
Saturated fatty acids	8.32	8.67	6.96

Macronutrients	Regions				
	North	Northeast	South	Southeast	Central-West
Carbohydrates	59.97	63.41	55.71	57.56	58.88
Free sugars	13.89	15.79	16.31	17.36	16.26
Other carbohydrates	46.08	47.62	39.40	40.20	42.62
Proteins	12.91	11.90	12.69	11.86	11.52
Animal	8.18	6.14	7.54	6.50	6.12
Vegetal	4.74	5.77	5.15	5.36	5.41
Fats	27.12	24.69	31.60	30.58	29.61
Monounsaturated fatty acids	8.46	7.98	10.20	9.78	9.07
Polyunsaturated fatty acids	8.43	7.80	9.71	9.86	10.54
Saturated fatty acids	8.23	7.04	9.40	8.85	7.99

Macronutrients	Quintiles of per capita household income				
	1st	2nd	3rd	4th	5th
Carbohydrates	63.57	61.23	60.01	67.72	55.28
Free sugars	16.60	16.49	16.63	15.99	16.19
Other carbohydrates	46.97	44.74	43.38	41.73	39.09
Proteins	11.20	11.59	11.94	12.41	12.88
Animal	5.56	6.11	6.51	7.10	7.73
Vegetal	5.64	5.48	5.43	5.31	5.15
Lipids	25.23	27.18	28.05	29.87	31.84
Monounsaturated fatty acids	7.87	8.57	8.82	9.63	10.45
Polyunsaturated fatty acids	8.82	9.18	9.33	9.31	9.15
Saturated fatty acids	6.76	7.51	7.91	8.79	9.96

conducted in Sweden, the comparison between food acquisition and effective consumption showed a reasonable level of agreement for all food groups, except for confectionery products and alcoholic beverages.[1]

Studies with data on food availability can overcome relevant bias of individual methods, such as the underestimation of effective food consumption (particularly among overweight individuals).[10] They enable the observation of seasonal variations in food consumption, as exemplified in the IBGE Household Budget Surveys, whose data collection period lasts 12 months.

The household food availability pattern shown in the 2008-2009 HBS and the comparison made with a previous study are consistent with the relevant growing contribution of non-communicable chronic diseases to the morbi-mortality profile of the Brazilian population and with the increasingly high prevalence of overweight and obesity in this country.[k]

---

[k] Instituto Brasileiro de Geografia e Estatística. Pesquisa de orçamentos familiares 2008-2009: antropometria e estado nutricional de crianças e adolescentes e adultos no Brasil. Rio de Janeiro; 2010.

The quality of the diet has relevant repercussions for the health of individuals and the negative aspects of the diet of the Brazilian population at the end of the first decade of the 21st century indicate the high priority of public policies that promote healthy dietary habits.

REFERENCES

1. Becker W. Comparability of household and individual food consumption data – evidence from Sweden. *Public Health Nutr.* 2001;4(5b):1177-82.

2. Clodomir P, Troubat N, Sibrian R. Food data collected using acquisition and intake approaches in Cape Verde's IDRF 2001/2002. In: Sibrian R, editor. Deriving food security information from national household budget survey: experiences, achievements, challenges. Roma: Food and Agriculture Organization; 2008. p. 81-9.

3. Kaara J, Ramasawmy S. Food data collected using acquisition and consumption approaches with a seven-day recall method in Kenya's KIHBS 2005/2006. In: Sibrian R, editor. Deriving food security information from national household budget survey: experiences, achievements, challenges. Roma: Food and Agriculture Organization; 2008. p. 69-79.

4. Lagiou P, Trichopoulou A, DAFNE contributors. DAta Food NEtworking. The DAFNE initiative: the methodology for assessing dietary patterns across Europe using household budget survey data. *Public Health Nutr.* 2001;4(5B):1135-41.

5. 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: 10.1590/S0034-89102005000400003

6. Martirosova D. Food data collected using acquisition and consumption approaches with daily diaries in Armenia's 2004. In: Sibrian R, editor. Deriving food security information from national household budget survey: experiences, achievements, challenges. Roma: Food and Agriculture Organization; 2008. p. 59-67.

7. Monteiro CA, Levy RB, Claro RM, Castro IRR, Cannon G. A new classification of foods based on the extent and purpose of food processing. *Cad Saude Publica.* 2010;26(11):2039-49. DOI:10.1590/S0102-311X2010001100005

8. Naska A, Paterakis S, Eeckman H, Remaut AM, Trygg K. Methodology for rendering household budget and individual nutrition surveys comparable, at the level of the dietary information collected. *Public Health Nutr.* 2001;4(5B):1153-8.

9. Naska A, Fouskakis D, Oikonomou E, Almeida MD, Berg MA, Gedrich K, et al. Dietary patterns and their socio-demographic determinants in 10 European countries: data from the DAFNE databank. *Eur J Clin Nutr.* 2006;60(2):181-90. DOI: 10.1038/sj.ejcn.1602284

10. Scagliusi FB, Ferriolli E, Pfrimer K, Laureano C, Cunha CS, Gualano B, Lourenco BH, Lancha Jr AH. 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: 10.1016/j.jada.2008.09.012

11. Sposito AC, Caramelli B, Fonseca FAH, Bertolami MC, Afiune Neto A, Souza AG, et al. IV Diretriz Brasileira sobre dislipidemias e prevenção da aterosclerose. *Arq Bras Cardiol.* 2007;88(Supl 1):2-19. DOI: 10.1590/S0066-782X2007000700002

12. Trichopoulou A, Naska A. European food availability databank based on household budget surveys: the Data Food Networking initiative. *Eur J Public Health.* 2003;13(3 Suppl):24-8. DOI: 10.1093/eurpub/13.suppl_1.24

13. World Health Organization. Diet, nutrition and the prevention of chronic diseases. Geneva; 2003. [WHO - Technical Report Series, 916].