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Sources of excessive saturated fat, *trans* fat and sugar consumption in Brazil: an analysis of the first Brazilian nationwide individual dietary survey

Rosangela A Pereira[1,2], **Kiyah J Duffey**[2], **Rosely Sichieri**[3], and **Barry M Popkin**[2]

Rosangela A Pereira: rosangela@nutricao.ufrj.br; Kiyah J Duffey: kduffey@unc.edu; Rosely Sichieri: sichieri@ims.uerj.br; Barry M Popkin: popkin@unc.edu

[1]Department of Social and Applied Nutrition, Federal University of Rio de Janeiro

[2]Department of Nutrition, University of North Carolina at Chapel Hill

[3]Department of Epidemiology, University of the State of Rio de Janeiro

Abstract

Objective—To examine the patterns of consumption of foods high in Solid Fats and Added Sugars (SoFAS) in Brazil.

Design—Cross-sectional study; individual dietary intake survey. Food intake was assessed by means of two non-consecutive food records. Foods providing >9.1% of energy from SAFA, or >1.3% of energy from TFA, or >13% of energy from added sugars per 100g were classified as high in SoFAS.

Setting—Brazilian nationwide survey, 2008-09.

Subjects—≥10 years old individuals.

Results—Mean energy intake was 8,037 kJ [1,921kcal], 52% of calories came from SoFAS foods. Contribution of SoFAS foods to total energy intake was higher among women (52%) and adolescents (54%). Subjects in rural areas (43%) and in the lowest quartile of per capita family income (43%) reported the smallest contribution of SoFAS foods to total energy intake. SoFAS foods were large contributors to total SAFA (87%), TFA (89%), added sugar (98%), and total sugar (96%) consumption. The SoFAS food groups that contributed most to total energy intake were the meats and beverages. Top SoFAS foods contributing to SAFA and TFA intakes were meats and fats and oils. Most of the added and total sugar in the diet was supplied by SoFAS beverages and sweets and desserts.

Conclusions—SoFAS foods play an important role in the Brazilian diet. This study identifies options for improving the Brazilian diet and reducing nutrition-related non communicable chronic diseases, but also points out some limitations of the nutrient-based criteria.

INTRODUCTION

Overweight and other nutrition-related non-communicable diseases represent major health problems in Brazil [(1)]. Parallel to deep social and economic changes, this country has experienced a transition from the traditional dietary pattern to diets high in saturated fat and

Corresponding Author: Rosangela A Pereira, Department of Social and Applied Nutrition, Federal University of Rio de Janeiro, Av Carlos Chagas Filho, 373 - CCS - Bloco J – 2º andar; Cidade Universitaria, Rio de Janeiro-RJ, Brazil. Cep: 21.941-902, Phone: 55 (21) 2562-6599/Fax: 55 (21) 2280-8343.

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sugar [2]. Major efforts focused on improving diet are being made [3], specifically the issuing of the Brazilian Dietary Guidelines in 2006 [4] and other regulations aimed at reducing *trans* fat and sodium in selected processed foods [5].

In recent decades, Brazil has experienced rapid growth in income, increased urbanization, and major changes in the overall food system. These changes are linked with rapid increases in the use of modern supermarkets and increased mass media promotion of food and beverage products [6–8]. Consequently, countless sources of commercial foods with high energy content and low nutrient density are broadly available in different social environments. Also, income growth has brought increased access to these foods and beverages, even among very poor families assisted by cash transfer programs [9].

A large part of the newly available processed food items are foods that provide energy from solid fats and added sugars (hereafter SoFAS) [10, 11], and the purchase of these food items is increasingly found in Brazil's household food expenditures surveys. Monteiro *et al*. [12] found that between 1987–88 and 2002–03 the contribution of ultra-processed foods to total household energy availability increased 46%, going from 19.2 to 28.0%, replacing the intake of unprocessed and minimally processed foods. Furthermore, in Brazil, sugar and soft drinks consumption was responsible for 13.4% of household energy availability and was correlated to the obesity prevalence ($r=0.60$; $p=0.001$) [13]. According to analysis carried out by Levy *et al*.[14], high sugar household availability was associated with total energy household availability 40 to 60% over the recommended value.

This work's goal is to examine the patterns of consumption of foods high in SoFAS in the first Brazilian nationally representative individual dietary survey (IDS). This analysis represents the first attempt to define a food- and nutrient-based measure of dietary intake in Brazil.

METHODS

This study analyzes data from the first IDS carried out by the IBGE - Instituto Brasileiro de Geografia e Estatistica (Brazilian Institute of Geography and Statistics) along with the 2008–09 Brazilian Household Budget Survey (HBS), which investigated a probabilistic sample of 55,970 households selected by a two-stage complex cluster sampling design [15]. Because of the specific requirements for the implementation of the IDS, a subsample, corresponding to 25% of the households included in the 2008–09 HBS was randomly selected for the dietary survey, which was answered by individuals 10 years old and more. Also, it was assured that all sectors selected for HBS were represented in the IDS 2008–09 sample and the census tracts, the primary sampling units, were equally allocated among the four quarters of the survey to guarantee that all strata were represented at all quarters to reproduce seasonal variations food consumption. Therefore, a representative sample of the Brazilian population totaling 34,003 individuals from 13,569 households composed the sample examined in the IDS 2008–09 [15].

The IDS protocol was approved by the Ethics Research Committee from the Institute of Social Medicine (University of the State of Rio de Janeiro).

Assessment of food intake

Individuals over 10 years-old residing in the households selected for the survey completed two non-consecutive food diaries on pre-determined days spanning one week. They were asked to report all foods and beverages consumed and to include information on time, amount, and place of intake (inside or outside home). Details on the preparation mode were required for specific foods, mainly meats and vegetables. Additionally, information on the

consumption of sugar and/or or artificial sweetener was collected using a separated question ("What do you use more frequently: sugar, artificial sweetener, both, or none?"). Information on water and use of nutritional supplements was not collected.

During in-person interviews, trained interviewers reviewed the food records and probed the participants on usually forgotten foods. When the dietary record presented periods longer than three hours without any reported food intake, the respondents were asked to either confirm that no foods/beverages were consumed during that period or to provide the necessary information.

The data storage was done on specific software with a database containing approximately 1,500 food and beverages, 106 measurements units, and 15 modes of preparation. However, the interviewers were able to include new food items that were not found on the database [16]. Partial analyses were performed during data collection to check data quality. Details of the pre-test, interviewer training process, and the validation study of data collection protocol are presented in specific publication from the IBGE [15].

Food composition estimates were based on the Nutrition Coordination Center Nutrient Databank [17] and on the Brazilian Food Composition Table [18]. Portion size measures came from various Brazilian publications and/or direct weighing of some foods and dishes [19, 20]. For each food a "standard unit" was also defined, which was imputed to atypical units of measurement (for example: a unit of rice). A series of decisions on dilutions of common beverages (fruit for fruit juice, powered cocoa for chocolate drinks, etc) were standardized based on Brazilian research, for example, to prepare a glass of milk (240ml), two table spoons of powdered milk were added to 200ml of water [15]. Nutritional composition for dishes based on meat, fish, and poultry, and cooked or braised vegetables were estimated with the addition of soybean oil [17].

Characterizing foods with regard to saturated fat, trans-fatty acids, and added sugar content

The criteria used to identify foods high in SAFA, TFA and AdS were adapted from the standards proposed by the International Choices Programme (ICP) [21], which evaluates foods according to the nutritional profile of specific food groups (Table 1). In this analysis, the estimations excluded the naturally occurring trans-fat from milk and meat. From the 2,070 unique foods, dishes, and beverages reported in the IDS, alcoholic beverages (n=23), no sugar- or fat-added fresh fruits, vegetables, and roots and tubers (n=254) were excluded, resulting in 1,793 individual food/beverage items for profiling.

The ICP applies threshold criteria based on the proportion of energy provided by the targeted nutrients in 100g of food. The criteria for AdS and TFA were based on the World Health Organization recommendations for healthy eating promotion [22]. Additionally, the most recent 2010 USDA recommendation on SAFA [11], which is slightly more stringent than that proposed in ICP, was considered. Therefore, the classification of SoFAS foods was completed using the following two-step process:

1st step: Generic energy based criteria—The World Health Organization recommends that the consumption of TFA should be less than 1% and AdS under 10% of total daily energy intake [22]. The 2010 American Dietary Guidelines recommend SAFA intake at no more than 7% of total energy intake [11]. To account for the fact that these are whole diet recommendations, rather than recommendations for any single food item, an additional 30% over these limits were allowed to classify foods as excessive or allowable with respect to the energy provided by SAFA, TFA, and AdS [21]. Therefore, foods were considered as source of excessive SAFA, TFA, and AdS (SoFAS), if they provided more

than 9.1% of energy from SAFA, or more than 1.3% of energy from TFA, or more than 13% of energy from AdS per 100g of food (Table 1).

2nd step: criteria for specific groups—Specific food groups were classified according to alternative criteria. Some of these criteria were based on the "level of insignificance" as a means of ensuring that low energy- or nutrient-dense products would not be (mistakenly) excluded [21]. The cut-off point for the "level of insignificance" was 5% of the daily recommendation in grams per 100g of food considering the WHO/FAO recommendation of 2,000 kcal (8,368 kJ) per day [22]. For example, the 'level of insignificance' for TFA is 0.1g/100g of food (5% of recommended daily allowance of 2g) [22]. Correspondingly, the cut-off points for the "level of insignificance" of AdS and SAFA are 2.5g and 0.78g per 100g of food respectively. Specific criteria were defined for specific food groups: cheeses, fats and oils, ready-to-eat cereals (RTE cereals), and milk/soy/yogurt based beverages [21] (Table 1).

- **Beverages (except milk/soy/yogurt beverages):** Classified according to the "level of insignificance" for SAFA and TFA. Additionally, beverages providing more than 20 kcal (84 kJ) per 100 ml (equivalent to 5g of sugars) were classified as SoFAS beverages.
- **Cheeses**: SAFA cut-off point was 15g per 100g and TFA cut-off point was the "level of insignificance" of 0.1g/100g. No criteria for AdS were applied.
- **Fats and Oils**: Considered as source of excessive SAFA or TFA if their content of saturated fat was over 30% of total fat or energy provided by *trans*-fatty acids was over 1.3% of *trans*-fatty acids.
- **Fried potatoes and other fried starchy vegetables and savory snacks**: Were thus considered as sources of excessive SAFA and TFA if the content of SAFA was over 0.78g per 100g or TFA was above 0.1g per 100g of food.
- **Milk and Dairy (including milk/soy/yogurt beverages and excluding cheeses):** SAFA cut-off limit was 1.4g per 100g while the TFA cut-off point was the "level of insignificance" of 0.1g/100g, and AdS must be less than 5g per 100g.
- **RTE cereals:** Considered as SoFAS foods if they provided more than 0.78 of SAFA, more than 0.1g of TFA, or more than 20g of AdS in 100g of food.

Food grouping

Food grouping was based on the groups adopted by the Department of Nutrition, University of North Carolina, USA. This system of grouping foods and beverages was based on the nine major USDA food groups, which were disaggregated into food groups according to nutritional features and usual dietary habits (Slining MM & Popkin BM, unpublished results). For this analysis, foods and beverages were aggregated into 28 groups (See Appendix 1 for a detailed description of groups and foods included in each group).

Statistical analysis

This analysis considered the first day of food records for 34,003 individuals and took into account sex and three age groups (adolescents: 10 to 19 years old; adults: 20 to 64 years old; and elders: 65 years old and older). The prevalence of intake of allowable and SoFAS food groups, the average percent contribution to total energy intake, and energy provided by saturated fat, trans fatty acids, added sugar, and total sugar were estimated for each food group for the total population and across age groups. Additionally, mean estimates of total energy intake (kJ/kcal) and proportion of energy from SoFAS foods (%) were calculated for area of residence, (urban vs. rural), geographic region (North, Northeast, Southeast, South and Central West), level of education (less than eight vs. eight or more years of education),

quartile of per capita family income (which was estimated by summing income earned by all family members and dividing by the number of persons in the family), and according to the place of food consumption (in the household only vs. eating away-from home at least once in the first day of recorded intake). The differences of mean energy intake and of total energy intake from SoFAS foods across the categories of age, sex, income, education, geographic region, and urbanicity were tested by univariate linear regression models, having energy intake and proportion of total energy intake from SoFAS foods as dependent variables, and the explanation variables, as independent variables. All statistical analyses considered the sample weights and design effect and were performed using survey procedures from SAS release 9.3 (Cary, NC, USA).

RESULTS

Sixty-six (66) percent of the foods cited in the IDS were classified as SoFAS (Appendix 1). Mean energy intake was 8,037 kJ [1,921 kcal] and, on average, 52% of calories came from SoFAS foods. Individuals living in the rural areas (43%), in the lowest quartile of per capita family income (43%), and from the Northern region (45%) reported the smallest contribution of SoFAS foods to total energy intake. The highest intakes of SoFAS foods were observed among individuals in the highest quartile of per capita family income (57%), in the country's Southern region (56%), and among adolescents (54%) and women (52%). Contribution of SoFAS foods to total energy intake for individuals who ate only at home was lower compared to those who reported consuming away-from-home food (55 *vs*. 48%; $p<0.01$) (Table 2).

On average, 9.5% of total energy intake came from SAFA, 1.4% from TFA, and 7.2% from added sugar and SoFAS foods provided the majority of the energy coming from SAFA (87%), TFA (89%), added (98%), and total sugar (96%).

Considering all the foods, the groups that contributed most to total energy intake were rice, corn and other cereal dishes, beverages, meats, legumes, and breads. The main food groups in SAFA intake were meats, sweets and desserts, fats and oils, milk and dairy, and processed meat. The top food groups in the intake of TFA were fats and oils, meats, sweets and desserts, breads, savory snacks, and poultry. Sweets and desserts, beverages, milk and dairy, sugar and syrups, and savory snacks were the food groups that contributed most to the consumption of AdS. Finally, the major food groups in the consumption of total sugar were beverages, sweets and desserts, and milk and dairy (Table 3).

Considering only the SoFAS food groups, the major contribution to total energy intake was provided by SoFAS beverages and meats, the SoFAS food groups that contributed most to SAFA and TFA intake were the meats and fats and oils, finally, the SoFAS food groups that contributed most to added and total sugar intakes were sweets and desserts and beverages (Figure 1).

Adolescents presented higher proportional contribution of SoFAS foods to energy intake and added sugars than adults and elders ($p<0.01$). On the other hand, SoFAS foods provided roughly equal proportions of energy to total SAFA and TFA across the age groups. Considering the contribution of foods groups to the intake of the analyzed components, the main difference across the age groups was observed for SoFAS beverages and sweets and desserts. Combined, these groups provided 20% of adolescents' total energy intake, but just 15% and 14% of total energy intake among adults and elders respectively (Appendix 2).

The most commonly consumed allowable food groups were rice and cereal dishes, legumes, breads, and beverages. The most reported SoFAS foods were from the groups of beverages,

meats, fats and oils, and sweets and desserts. The prevalence of consumption of SoFAS sweets and desserts among adolescents was 50% higher than that observed for adults and elders. Additionally, the processed meat prevalence of consumption among elders was 50% lower than the prevalence estimated for adolescents and adults (Table 4).

DISCUSSION

Internationally accepted nutrient-based criteria were applied to analyze data obtained in the first nationwide Brazilian individual dietary survey, showing that a small number of SoFAS food groups account for a large proportion of the intake of total energy, saturated fat, *trans*-fatty acids, and added and total sugar: beverages, sweets and desserts, meats, milk and dairy, and fats and oils. In general, SoFAS foods have an important contribution to food consumption in Brazil, accounting for a large proportion of the intake of total energy, saturated fat, and sugar.

SoFAS foods are mostly processed foods and mixed dishes cooked with the addition of fats and/or sugar. For example, filled rolls were classified as SoFAS breads while allowable breads included light white and whole wheat loaves and rolls. Also, SoFAS milk and dairy included sugar added flavored milk/soy/yogurt/whey based beverages while allowable milk and dairy included low fat and skimmed milk.

Adolescents presented greater proportionate intake of SoFAS foods and greater consumption of SoFAS beverages and sweets and desserts than was observed for adults and elders. Andrade *et al.* [23] analyzed data from a population-based cross-sectional study developed in Rio de Janeiro in the mid-1990 and observed that about one quarter of total energy intake were provided by sodas and high energy-dense foods, including French fries, chocolate flavored milk, cake, cookies, and sweets and desserts. Food habits of Brazilian and US adolescents are comparable, with desserts and sodas contributing most to total energy intake, desserts and pizzas to solid fat intake, and sodas to added sugar intake in US adolescents [10].

The results for the most commonly consumed allowable foods (rice and corn dishes, beverages and legumes) confirm findings of studies that have previously analyzed food consumption patterns in Brazil. Using principal components analysis of data from the 2002–2003 Brazilian Household Expenditures Survey, a common dietary pattern based on rice and beans, caffeinated beverages (coffee and tea), and vegetable oils was observed across all regions of Brazil [24]. This traditional Brazilian dietary pattern, also identified in other studies [25–27], is recognized as healthy and has been associated with favorable weight outcomes in an 18-month randomized trial [28] and with reduced body mass index and waist circumference in low-income women living on the periphery of Rio de Janeiro [29].

The high contribution of red meat to energy intake indicates a deleterious aspect of the Brazilian diet; this finding is consistent with recent observations on high consumption of red and processed meat in Brazil [30]. Consumption of red meat has been associated with an increased risk of total, CVD, and cancer mortality in two US prospective studies [31], with colorectal cancer and with higher levels of oxidative stress biomarkers in European prospective studies [32, 33]. Additionally, the increased consumption of red meat negatively impacts the environment as a result of deforestation for cattle grazing, emission of greenhouse gases, increased water pollution, and biodiversity loss [34, 35].

The results in this study suggest that the intake of SoFAS in Brazil is excessive and much higher than the range proposed by Maillot and Drewnowski [36], who suggested that a healthy diet can have between 17 and 33% of energy from SoFAS foods [37]. According to

the USDA, 35% of energy intake in the United States is provided by SoFAS foods [38], which is lower than the estimated participation of SoFAS foods in Brazil. However, the criteria to classify SoFAS was more conservative in this analysis, as the cut-off limit for SAFA intake was based on 7% of total energy intake instead of the 10% used by the USDA; additionally, the 'level of insignificance' criteria were applied to specific food groups.

The importance of processed foods in the Brazilian diet has been evidenced. Monteiro *et al*. [12] showed that ultra-processed foods, including breads, crackers, cookies, sweets, soft drinks, sausages, cheeses, preserved meat, ready-to-eat meals, mayonnaise and sauces provided 28% of the energy available in the Brazilian households in 2002–03. Additionally, between 2002–03 and 2008–09, possibly as a consequence of the increase in away-from-home food consumption, there has been a reduction in the overall household food availability, except for certain food groups, like beverages, bakery products, and ready-to-eat meals, which include ultra-processed items [39].

This study represents the first examination at the individual level with the use of in-depth dietary intake data of the impact of low nutritional quality foods in the Brazilian diet. The use of individual dietary intake data provides greater ability to create a more detailed analysis of each food and hence a more detailed food categorization system. While the purpose of the broad classification suggested by Monteiro *et al*. [40] is different and innovative, the criteria proposed in this study are based on internationally accepted and scientifically defined dietary recommendations, which are linked with a large diet and disease literature [11, 22]. At the same time, it is highly likely that all the ultra-processed high sugar and fatty foods classified by Monteiro are included as SoFAS. The food classification system used in this paper provides guidance on foods that must have a limited consumption or must be included in the diet with caution.

Recommended limits of SAFA, TFA, and AdS intake are defined for the whole diet and not for single foods [11, 22]. Given the fact that the diet encompasses a variety of foods, and that a considerable proportion of those foods do not contain the restricted components, we elected to allow values which were 30% over the cut-off points. As pointed out by Roodenburg *et al*.[21], this value (30%) is a starting point and future studies should test its consistency and adequacy to the Brazilian dietary pattern. We did not go a step further as was done in the original study [21] and categorize foods into basic and discretionary as that did not change the categorization in excessive content of saturated fat, *trans*-fat and added sugar.

In order to be properly translated into food and nutrition policies and public health messages, the proposed criteria could be improved, for example, by incorporating favorable aspects of foods, like the fiber content, noting that fresh vegetables and fruits are not included in this classification because their consumption should be encouraged. The criteria applied to classify foods in this work are easily understood and can be universally applied as long as the cultural context and the particular public health scenario are considered.

There is another complexity when it relates to nutrient-related cutoffs. Selected foods would be classified as SoFAS if consumed in excessive amounts; however, they represent important sources of beneficial fats, vitamins, minerals and bioactive components, for example, nuts and seeds [41–43]. Such foods are not extensively consumed in Brazil, yet their consumption could favor individuals adopting diets aiming to reduce weight or to improve health. In Brazil the deficiency of vitamin A is still a significant public health problem [44], thus foods like eggs and whole milk, which are important sources of vitamin A, deserve special consideration. Choices of reduced fat milk and cheeses, lean cuts of meats, cooking methods that require less fat/oil (for example: steaming, boiling, baking, grilling) could help

to reduce the amount of SoFAS in the Brazilian diet. Therefore, food selection must consider the helpful combination of nutrients and other components of the foods, and should be guided by principles involving the amount and frequency of consumption. By clearly defining the foods that should have limited consumption (and those that should be encouraged) in each food group, the proposed food profiling criteria provide helpful guidance on healthy food and nutrition and offer directions for health oriented food-processing industry.

This study is not without limitations. First, table sugar consumption was not directly obtained. The amount of sugar in coffee, tea, and fruit-based drinks was standardized to 10% for sugar only and 5% for sugar plus artificial sweetener consumption. Levy *et al*. [45] analyzed household sugar availability data obtained in the Brazilian 2002–2003 HBS and concluded that 75% of the calories from sugars came from “refined sugars and other caloric sweeteners” while 25% came from the sugars added to processed foods. Thus, sugar intake might be based on biased estimates, which is very important given the risen rates of obesity, diabetes, and other metabolic disorders in Brazil.

Second, despite intense efforts to obtain reliable data on food composition, for some foods, the nutritional composition was estimated based on similar foreign foods or preparations. The latest version of the Brazilian Food Composition Table (TACO) contains information on the nutritional composition of about 600 food items [18], while approximately 2000 foods and preparations were cited in the Brazilian IDS. Finally, although this analysis is based only on the first day of food records, it is recognized that single 24-h recalls and food records provide decent estimates for population means in extent studies [46].

There are several strengths of this study as well. The Brazilian IDS food record was evaluated and provides an accurate estimation of energy intake [47]. Additionally, the estimates for the intake of energy and nutrients were comparable with data obtained in similar studies [37, 48, 49].

The present study found very high levels of SoFAS foods consumption in Brazil. Interventions aimed at improving overall diet quality are necessary and should take in consideration foods containing excessive saturated fat, *trans*-fatty acids, and added sugars, making the consumption of SoFAS foods a major target for Brazilian food and nutrition policies.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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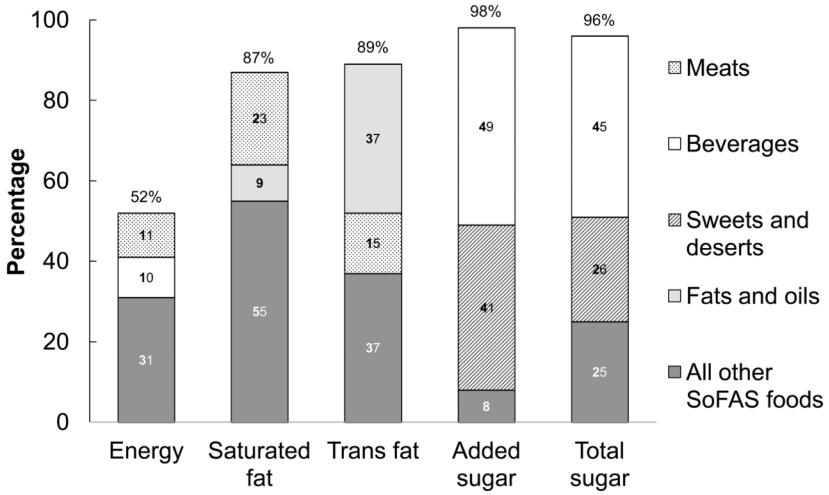

Figure 1.
Contribution (%) of top SoFAS food groups to total intake of energy, and energy provided by saturated fat, *trans*-fat, added and total sugar. Brazil, 2008–09

Table 1

Cut-off limits applied to classify excessive saturated fat, *trans*-fatty acids and added sugar content in foods[1,2]

Criteria	Energy	Saturated fat (in 100g)	*Trans* fatty acids (in 100g)	Added sugar (in 100g)
		Generic		
	NA[3]	**9.1% of total energy**	**1.3% of total energy**	**13% of total energy**
		Specific		
Beverages	20kcal (84 kJ)	0.78g	0.1g	NA
Cheeses	NA	15g	0.1g	NA
Fats, oils and fat containing spreads	NA	30% of total fat	1.3% of total energy	NA
Fried potatoes and savory snacks	NA	0.78g	0.1g	NA
Milk and milk/soy/yogurt beverages	NA	1.4g	0.1g	5g
RTE cereals		0.78g	0.1g	20g

[1] The criteria were not applied to alcoholic beverages, fresh fruits, legumes, and unprocessed potatoes, roots and tubers

[2] based on Roodenburg *et al*. (21)

[3] NA = do not apply

Table 2

Population sociodemographic characterization and means for total energy intake, energy provided and contribution to total energy intake from high saturated fat, *trans*-fatty acids, and added sugar foods. Brazil, 2008–09

	%	Mean total energy intake[1,2] kJ (kcal)	Mean energy from SoFAS[1,3] foods kJ (kcal)	Mean contribution of SoFAS foods to total energy intake [1,4,5] (%)
Brazil (total)		8,037 (1,921)	4,188 (1,001)	52
Male	48	8,912 (2,130)	4,481 (1,071)	49
Female	52	7,222 (1,726)	3,916 (936)	52
Adolescent (10–19 yo)	21	8,611 (2,058)	4,862 (1,162)	54
Adult (20–64 yo)	69	8,029 (1,919)	4,096 (979)	50
Elder (≥65 yo)	9	6,770 (1,618)	3,301 (789)	48
Urban	83	8,025 (1,918)	4,305 (1,029)	52
Rural	17	8,113 (1,939)	3,590 (858)	43
Region[6]				
North	8	8,891 (2,125)	4,033 (964)	45
Northeast	28	7,920 (1,893)	3,761 (899)	46
Southeast	43	8,012 (1,915)	4,347 (1,039)	53
South	15	7,962 (1,903)	4,611 (1,102)	56
Central-West	7	7,891 (1,886)	4,167 (996)	50
Years of education				
< 8 years	51	7,740 (1,850)	3,728 (891)	47
≥ 8 years	49	8,355 (1,997)	4,674 (1,117)	55
Per capita family income[7]				
Quartile 1	25	7,627 (1,823)	3,397 (812)	43
Quartile 2	25	8,104 (1,937)	4,058 (970)	49
Quartile 3	25	8,134 (1,944)	4,418 (1,056)	53
Quartile 4	25	8,284 (1,980)	4,883 (1,167)	57
Location of consumption				
Household only	40	7,594 (1,815)	3,728 (891)	48
Household + away-from-home	60	8,699 (2,079)	4,870 (1,164)	55

[1] difference tested by univariate linear regression models: dependent variables: energy intake and proportion of total energy intake from SoFAS; independent variables: age group, sex, urbanicity, geographic region, education, income, location of consumption;

[2] $p<0.01$ for comparisons between categories of gender, age groups, urban vs. rural, education, and location of consumption

[3] SoFAS: high saturated fat, *trans*-fatty acids, and added sugar foods (see Table 1)

[4] Contribution of SoFAS foods to total energy intake = (energy from high SoFAS foods/total energy intake) * 100

[5] $p<0.01$ for all comparisons, except Central-Western region vs. Southeastern region

[6] mean energy intake in Northern region lower than all other regions ($p<0.01$)

[7] mean energy intake in Quartile 1 < Quartile 2, Quartile 3, and Quartile 4 with $p<0.01$; Quartile 2 = Quartile 3 = Quartile 4 ($p>0.05$)

Table 3

Top food groups[1] according to the contribution (%) to total intake of energy, and energy provided by saturated fat, *trans*-fatty acids, added and total sugar. Brazil, 2008–09

Food group	Energy	SAFA[2]	TFA[3] % (ranking)	Added sugar	Total sugar
Rice, corn, and other cereal dishes	15 (1)	6 (6)	2 (10)	1 (6)	2 (5)
Beverages	13 (2)	5 (8)	2 (10)	37 (2)	46 (1)
Meats	11 (3)	23 (1)	15 (2)	1 (6)	1 (7)
Legumes	10 (4)	3 (10)	NA4	NA	1 (7)
Breads	9 (5)	3 (10)	7 (4)	1 (6)	1 (7)
Sweets and desserts	7 (6)	11 (2)	13 (3)	41 (1)	27 (2)
Poultry	5 (7)	6 (6)	5 (5)	NA	NA
Milk and dairy	4 (8)	8 (4)	3 (9)	10 (3)	14 (3)
Fresh fruits and vegetables	4 (8)	NA	NA	NA	NA
Pasta and noodles	3 (10)	NA	NA	NA	1 (7)
Starchy vegetables	3 (10)	NA	NA	NA	NA
Fats and oils	NA	9 (3)	36 (1)	NA	NA
Processed meat	NA	7 (5)	4 (7)	1 (6)	NA
Cheeses	NA	5 (8)	2 (10)	NA	1 (7)
Burgers and sandwiches	NA	3 (10)	4 (7)	1 (6)	1 (7)
Savory snacks	NA	NA	5 (5)	3 (5)	2 (5)
Sugar, syrups, preserves	NA	NA	NA	5 (4)	3 (4)
All other foods (%)	15	18	7	1	4

[1] includes allowable and SoFAS foods (high saturated fat, *trans*-fatty acids, and added sugar foods; see Table 1)

[2] SAFA, saturated fat

[3] TFA, *trans*-fatty acids

[4] NA = Not applied

Table 4

Prevalence of intake of allowable and high saturated fat, *trans*-fatty acids and added sugar foods (SoFAS), for total sample and adolescents, adults and elders. Brazil, 2008–09.

Food groups[4]	Total Sample		Adolescents[1]		Adults[2]		Elders[3]	
	Allowable[5]	SoFAS[6]	Allowable	SoFAS	Allowable	SoFAS	Allowable	SoFAS
Beverages	59	71	46	73	63	72	64	65
Breads	61	8	60	6	61	8	58	10
Burgers and sandwiches	-	9	-	11	-	9	-	4
Cereal bars	<0.1	1	0	<1	<0.1	1	0	<0.1
Cheeses	<0.1	14	0	9	<0.1	15	<1	18
Eggs	-	17	-	19	-	16	-	12
Fat or sugar added and processed fruits	2	<0.1	2	<0.1	2	<0.1	2	0
Fat or sugar added and processed vegetables	4	2	2	1	4	2	6	3
Fats and oils	1	38	1	36	2	39	1	38
Fish and seafood	8	<1	7	<0.1	8	<0.1	8	0
Fried potatoes	<0.1	6	<0.1	6	<0.1	6	0	4
Legumes	77	<1	76	<1	78	<1	76	<0.1
Meat substitutes	<1	-	<1	-	<1	-	<1	-
Meats	2	55	1	52	2	56	2	50
Milk and dairy	2	28	1	37	2	26	5	26
Nuts, seeds, coconut	<1	<1	<1	1	<1	<1	1	<1
Pasta and noodles	18	4	19	4	18	3	14	2
Pizzas	-	2	-	3	-	2	-	1
Poultry	7	22	5	23	7	22	6	21
Processed meat	<1	20	<0.1	21	<1	21	0	14
Ready-to-eat cereals	1	1	<1	1	1	<1	2	1
Rice, corn, and other cereal dishes	91	10	91	13	91	9	91	10
Sauces, condiments and seasonings	1	<1	<1	<1	1	1	<1	<0.1
Savory snacks	0	19	0	22	0	18	<0.1	19
Soups	2	9	1	9	2	9	3	15
Starchy vegetables	16	4	16	3	16	5	16	4

Food groups[4]	Total Sample		Adolescents[1]		Adults[2]		Elders[3]	
	Allowable[5]	SoFAS[6]	Allowable	SoFAS	Allowable	SoFAS	Allowable	SoFAS
Sugar and syrups	<0.1	4	0	3	<0.1	4	<1	6
Sweets and desserts	1	38	1	51	1	34	1	34

[1] adolescents=10 to 19 years old

[2] adults=20 to 64 years old

[3] elders =65 years old and older

[4] A detailed description of the foods included in each group is presented in Appendix 1

[5] Allowable foods: providing less than 9.1% of energy from saturated fat, 1.3% of energy from *trans*-fatty acids, and 13% of energy from added sugar

[6] SoFAS, high in saturated fat, *trans*-fatty acids, and added sugar (See Table 1)

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