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Research Article

Nutritional Evaluation of Lunches Consumed In Community Restaurants in Brazil

Alinne de Paula Carrijo, Raquel Braz Assunção Botelho*, Rita de Cássia Coelho de Almeida Akutsu and Karin Eleonora de Oliveira Savio

Nutrition Department, University of Brasilia, Brasilia- DF, Brazil

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***Corresponding author**

Raquel Braz Assunção Botelho, Nutrition Department, University of Brasilia, Brasilia- DF, Brazil, zip: 70832070; Tel: 556131071778; E-mail: raquelbabotelho@gmail.com

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Abstract

This work aims to evaluate the nutritional adequacy of meals consumed by those who have lunch at Community Restaurants (CRs) in Brazil. This is an exploratory cross-sectional study that evaluated 1771 adult and elderly individuals distributed in 36 CRs in all geographic regions of Brazil. The study evaluated the nutritional status of participants and the lunch food intake during three consecutive days, by direct observation and weighing the meals. The usual consumption was estimated, and descriptive analyzes, correlations, non-parametric tests, and the Tukey test by ANOVA were performed. It was observed that 36.9% of the population is overweight and 16.9% is obese. Lunch energy intake was 880 calories, with adequate consumption of fiber and iron. The energetic consumption of saturated fat was adequate, but the consumption of essential fatty acids was below the recommended level. Sodium intake showed high inadequacy (41%). A high prevalence of overweight/obesity in this population was observed. Lunch consumed in the CRs provides adequate amounts of energy, fiber and iron, but it is necessary to adequate the sodium and the quality of fats.

Introduction

The Brazilian government has social programs that aim to meet the food demands of the vulnerable population. Among the existing programs, the "Community Restaurants" (CRs), a program of the Brazilian Federal Government, stands out. It has the goal of offering healthy meals at low prices to the population, especially to low-income urban workers. CR units have been implemented across the country since 2004, in places where there is a great movement of people, coming to a total of 198 units in operation, which provide 123,000 meals daily [1].

The last decades have shown major changes in the population dietary patterns, decreased physical activity, increased prevalence of overweight/obesity and consequently the development of chronic noncommunicable diseases [2,3]. Contemporary life style, mainly caused by urbanization, is mostly responsible for the dietary changes. Due to the lack of available time for meal preparation and consumption, the consumption of processed foods and meals away from home has increased [4].

In Brazil, the data from the Household Budget Survey (HBS) carried out in 2008-2009 showed an accelerated growth of the eating-out habit. The expenditure regarding eating-out corresponds to 31.1% of the family budget, which reflects an increase of seven percentage points when compared to data from the HBS carried out in 2003 [5].

Meals that are had away from home often do not provide a healthy choice, because they can represent a risk for high energy and fat intake, as well as low micronutrients intake [6]. In Brazil, Bezerra and Sichieri [7] study showed that eating out represents a high consumption of soft drinks, candy, fried and baked snacks and fast foods that in general are energy-dense, rich in sodium and poor in important micronutrients.

Aware of the complications related to eating outside the home, the Federal Government, through the No Hunger Program, implemented CRs throughout the country, whose range reach a considerable portion of the population. Among its objectives, there is the need to provide a healthy option for those who eat out on a low budget, from US$ 0.30 to US$0.60 per person. Each CR has a nutritionist that plans the menus according to regional habits. Therefore, it is important to know the population the program embraces, and to evaluate if the nutrient input offered in meals served by those units is consistent with the needs of these individuals. Thus, this study aims to evaluate the nutritional lunch intake consumed by individuals eating in CRs in Brazil.

Methods

Study design

This is a cross-sectional study entitled "Nutritional Evaluation of Lunches Consumed at CRs in Brazil", that is a result of a cooperation agreement signed between the Ministry of Social Development and Combat against Hunger (MDS) and the University of Brasilia (UNB). The individuals were assessed during four consecutive days. The first day was reserved to the collection of sociodemographic and anthropometric data and the other three days to the development of Technical Preparation File (TPFs) [8,9] and to the direct observation of the consumption during lunch [10].

Participants

The unit selection was performed through a simple random sample of the largest CRs identified in 2009 in all regions of Brazil. The final sample included 36 restaurants of the 65 existing in the MDS Community Restaurants Program, respecting the stratification criteria according to the Brazilian regions. The selected CRs distribution was proportional to the number of units in each region and represented in the end, four units in the North region, 10 units in the Northeast region, one unit in the Midwest region, 15 units in the Southeast region, and 6 units in the South region.

The original project design agreed upon by the MDS included several observation units, which represent the individual user, the CR and the Brazilian geographical regions. For this paper, the individual frequenter during lunch was considered as a unit sample of the research, distributed in five geographical regions of the country.

Thus, a simple random sample was calculated, based on the total number of users of the Popular Restaurants Program in the country (55,350). In order to respect the proportionality of frequenters for each region, the survey was conducted in at least 20% of the CRs in each region.

Because the research in the Midwest Region was held in only one restaurant (25% of the regional sample), there was a sampling error impairment (error estimated at 15%) when the sampling unit was the individual. Therefore, the data of the Midwest region will be presented, but should not be used for inference purposes. At the end of the collection, 1,771 people were surveyed, representing a sampling error of less than 3% in terms of national representation.

For sampling purposes, users were addressed systematically, that is, 1 out of every 15 who entered the restaurant on the data collection day. They were replaced by the subsequent user when they refused to participate or did not fulfill the assiduity requirement, remaining the 30th, the 45th consecutively.

As for the inclusion criteria, all users who had lunch a minimum of three times a week at the CR were considered eligible for being regulars. Pregnant women were excluded from the sample, because a differentiated anthropometry would be required, as well as those under 18 years of age, because they would require parental authorization.

Variables

The evaluation of sociodemographic data was developed by questionnaire by a trained researcher. The evaluated variables were gender, age, level of physical activity, marital status, education and income. The anthropometric measurements of weight and height were taken and, from this data, the Body Mass Index (BMI) was calculated. In addition to that, in order to find out their nutritional needs, for individuals with low weight and normal weight (BMI <25) the Estimated Energy Requirement (EER) was calculated, and for overweight and obesity (BMI ≥25) the Total Energy Expenditure (TEE) was calculated.

The nutritional variables analyzed were energy intake, macronutrients, cholesterol, fiber and fiber density, iron, sodium and energy percentage relative to the Daily Energy Intake (DEI) of linolenic acid, linoleic acid and saturated fat. Iron was also analyzed since the Brazilian population still presents a great percentage of deficiency of such nutrient. Furthermore, sodium is a major problem worldwide, especially for Brazilians, who consume three times the recommended by WHO [11].

Assessment of food intake

The food consumption evaluation was conducted by direct weighing of the meal for three consecutive days for individuals selected in the sample, for which the procedures are described by Sávio et al. and Silva et al. [10,12]. This evaluation adopts the following steps: Step 1 - portions were established as small (S), medium (M) and large (L) for each preparation and their respective weights; Step 2 - a trained researcher accompanied each client, observed and noted the size of the portion served, previously established in step 1; Step 3 - the meal and complements (drink, dessert, soup and bread) were weighed; Step 4 - The leftovers of each dish were weighed individually. In order to provide higher reliability of data, TPFs were developed for all meals served in each of the 36 units, according to the methods proposed by Camargo and Botelho [9].

When the individual served oneself more than once, this data was computed for the analysis of that client consumption. When there were leftovers on the client's plate, this content was weighed and subtracted from the meal weight, in proportion to the preparations served.

Nutritional and dietary assessment

The participants considered for the analysis had at least two days of lunch consumption measurement. The DEI meal was evaluated according to the inter-ministerial Decree n° 6,610 [13], which recommend 30% to 40% of the daily DEI at lunch. The references used by the Institute of Medicine [14] were used for the assessment for the percentage of nutrients distribution, linolenic acid, and linoleic acid. The adequacy of iron and sodium intake was assessed using the Estimated Average Requirement (EAR), Adequate Intake (AI), Tolerable Upper Intake Level (UL) and Dietary Reference Intakes (DRI) and methods as cutoff points, according to sex and age. For the evaluation of saturated fat and cholesterol, USDA - United States Department of Agriculture and HHS - United States Department of Health and Human Service [15] parameters were used.

Statistical analysis

Nutritional information was corrected by intra and interpersonal variability using the MSM software in order to estimate the usual intake of nutrients by the population [16,17]. The statistical analysis of this study was processed by the SPSS 20® software, using descriptive statistics, correlations, parametric tests and the T test and Tukey Test for ANOVA to verify statistical differences of data between regions. It was established that $p < 0.05$ was statistically significant.

Table 1: Distribution of socio-economic data of the Community Restaurants customers in Brazil.

		Female		Male		TOTAL		
		N	%	N	%	N	%	*P*
Sex		709	40	1062	60	1771	100	
Age group	18-59 Years	522	74	799	75	1321	75	0.725
	≥60 Years	187	26	263	25	450	25	
Education	Illiterate	26	4	47	4	73	4	0.066
	IPE[a]	202	29	321	30	523	30	
	CPE[b]	118	17	224	21	342	19	
	High school	294	42	386	36	680	38	
	Under-graduate degree	48	7	69	7	117	7	
	Technician course	8	1	7	1	15	1	
	Graduate School	13	2	8	1	21	1	
Marital status	Single	261	37	399	38	660	37	0.126
	Stable union	266	38	464	44	730	41	
	Widowed	87	12	58	6	145	8	
	Separated	95	13	141	13	236	13	
Income	No income	36	5	74	7	110	6	**0.019**
	Up to ¼ of MW[c]	70	10	75	7	145	8	
	¼ a ½ of MW	163	23	202	19	365	21	
	½ a 1 MW	255	36	378	36	633	36	
	1 a 2 MW	136	19	237	22	373	21	
	> 2 MW	49	7	96	9	145	8	
Occupation	Unemployed	162	23	175	17	337	19	0.066
	Employed	403	57	680	64	1083	61	
	Retired	142	20	202	19	344	19	

a.IPE= Incomplete Primary Education; b.CPE= Complete Primary Education; c.MW= Minimum Wage (US$ 175,86* per month); *Calculation basis 1 real = US$ 2,90

Ethical considerations

This research was approved by the Research Ethics Committee of the Health School of the University of Brasilia, under No. 0372/2010.

Results

The sample was composed by 1,771 customers, distributed in five geographical regions. The distribution of socioeconomic variables according to sex is displayed in Table 1. The majority of the sample was composed of males (60%; n = 1,062), the average age was 45 ± 17.39 years, with 25.4% (n = 450) of the total sample being elderly. Regarding education, the illiterate represented 4.1% (n = 73) of the individuals, and 38.4% (n = 680) were high school graduates. Individuals who declared being in a stable relationship were 41.2% (n = 730) of the sample. Regarding income, about one third of the sample (35.7%; n = 633) earned between 1/2 and 1 minimum wage per capita. For the variables age (p = 0.725), education (p = 0.66), marital status (p = 0.126) and occupation (p = 0.066) there was no difference between the sexes. There was a statistical difference only for the income variable (p = 0.019).

The classification of the nutritional status of the sample, considering BMI, is shown in Table 2. The sample revealed a prevalence of more than 50% of overweight or obese. However, it also showed that 3.8% of this sample is affected by low weight. There was statistical difference between the sexes regarding the classification of nutritional status, where females had a higher percentage of individuals classified as underweight (4.4%; n = 31) and obese (22.1%; n = 157), when compared to males (p = 0.034).

Table 2: Nutritional Status Classification of the Community Restaurants customers in Brazil according to BMI by gender.

	Female		Male		TOTAL	
	N	%	N	%	N	%
Low weight	31	4	36	3	67	4
Eutrophic	288	41	462	44	750	42
Overweight	233	33	421	40	654	37
Obesity	157	22	142	13	299	17

Regarding the food consumption of this sample, the energy percentage from carbohydrates represented an average of 57% of the DEI of the meal, followed by lipids and proteins, with 24% and 19%, respectively. The energy distribution of macronutrient intake is shown in Figure 1.

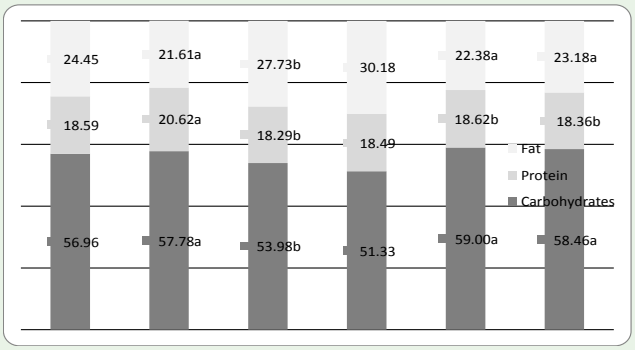

Figure 1: Percentage macronutrient intake at lunch consumed in CRs in Brazil, by regions 2012.
*Different letters indicate significantly statistical differences (p <0.05) between the regions.
**The Midwest region was not considered in ANOVA.

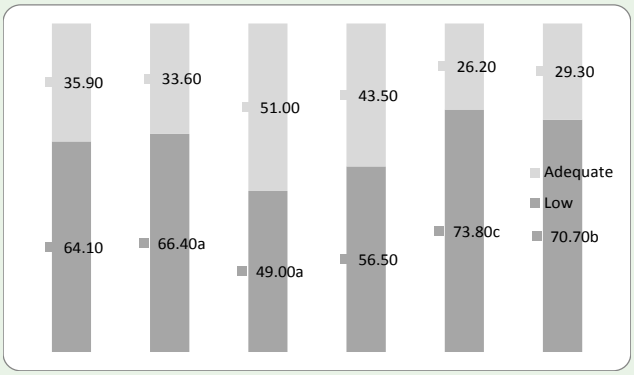

Figure 2: Adequacy percentage of linoleic acid intake at lunch served at CRs in Brazil, according to daily intake values of the Dietary Reference Intakes (DRIs) (2012).
*Different letters indicate significantly statistical differences (p <0.05) between the regions.
**The Midwest region was not considered in ANOVA.

The Midwest region showed the lowest percentage of carbohydrate contribution (51.33%), followed by the Northeast (53.98%). However, these regions also showed a higher contribution of lipids in relation to other regions.

Table 3 shows the average and standard deviations of energy intake, macronutrients, cholesterol, fiber, fiber density, iron density, and sodium, as well as the relative percent average of DEIs energy from saturated fat, linolenic acid (*n*-3) and linoleic acid (*n*-6), according to geographical regions.

The average energy consumption for lunch was 881 kcal ± 222.02 for all samples. There was no statistical difference between the sexes (p = 0.145), the female consumption average was 811 kcal ± 195.87 and the male 927kcal ± 226.32. The average lunch energy intake of CRs represented 42.38% of the daily energy needs calculated for the underweight and eutrophic population (EER). As for individuals who were overweight and obese, this coverage represented a total of 39.60% of the energy requirement (TEE). There was a statistical difference between the coverage, considering the EER and the TEE (p <0.01).

The average cholesterol intake of the sample was 100.77 mg± 9.56, where the Northeast region offered a greater amount of this nutrient (103.48mg ± 7.28). There were significant differences between the four regions considered (p <0.00; F = 145.560). The average cholesterol intake, according to sex, was 100.38mg ± 9.44 for women and 101.03mg ± 9.64 for men, with no significant difference (p = 0.621).

Regarding fibers, the average national intake was 12.96g ± 4.12, where the Northeast region (14.09g ± 4.03) had the highest consumption when compared to other regions (p <0.05: F = 18.167).

Table 3: Mean and standard deviation of customer nutrient intake of theCommunity Restaurants in Brazil, according to geographical regions.

Nutrients	Brazil (n=1771)	North (n=168)	Northeast (n=538)	Midwest** (n=46)	Southeast (n=722)	South (n=297)
Energy (kcal)	880 ± 222	800^{a} ± 210,33	962^{b} ± 214,69	804 ± 158,83	861^{c} ± 227	806^{a} ± 184
Carbohydrate (g)	126 ± 35	107^{a} ± 37	140^{b} ± 36	118 ± 25	119^{c} ± 31	119^{c} ± 33
Protein (g)	40 ± 9	43^{a}± 9	44^{a} ± 9	41± 8	37^{b} ± 8	38^{b}± 7
Lipid (g)	24 ± 11	22^{a}± 4	25^{a} ± 10	19 ± 5	26^{b} ± 14	20^{a} ± 5
Cholesterol (mg)	100 ± 10	102^{a} ± 7	107^{b} ± 10	100 ± 13	97^{c} ± 8	98^{c} ± 7
Fiber (g)	13 ± 4	11^{a}± 5	14^{b}± 4	15 ± 4	12^{a} ± 3	13^{a} ± 5
Fiber (g/1000kcal)	15 ±3	14^{a}± 3	15^{b}± 3	18 ± 3	14^{ab} ± 3	15^{d} ± 4
Saturated Fat (g)	7 ± 2	6^{a} ± 1	7^{b} ± 2	7 ± 1	7^{c} ± 1	6^{c} ± 2
Sat. Fat (%DEI)	7	7^{a}	7^{b}	8	7^{c}	6^{b}
Linolenic A. (g)	1 ± 0	1^{a} ± 0	1^{a} ± 0	1± 0	1^{a} ± 0	1^{a} ± 0
n-3 (%DEI)	1	1^{a}	1^{b}	1	1^{a}	1^{d}
Linoleic A (g)	5 ± 1	5^{a} ± 1	4^{a}±2	5± 1	5^{b} ± 1	4^{c} ± 1
n-6 (%DEI)	5	5^{a}	4^{b}	5	5^{a}	5^{c}
Iron (mg)	6 ± 2	6^{a} ± 2	7^{b} ± 1	6± 1	6^{a} ± 2	5^{c} ± 1
Sodium (mg)	2284 ± 654	2081^{a} ± 469	2086^{a} ± 5110	2241 ± 464	2489^{b} ± 709	2265^{a} ± 707

*Different letters indicate significant statistical difference (p<0,05) between regions.
** The Midwest region was excluded from ANOVA.

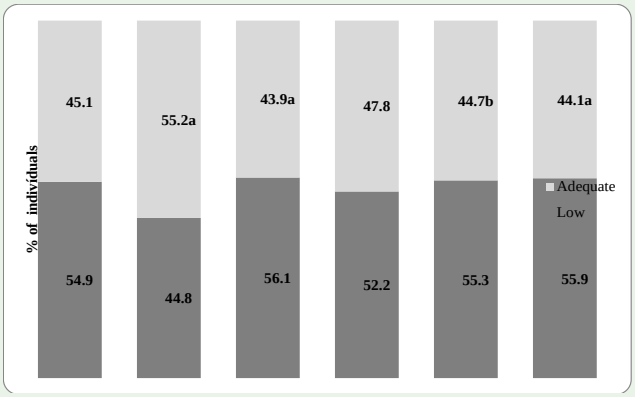

Figure 3: Adequacy percentage of linoleic acid intake at lunch served at CRs in Brazil, according to DRIs 2012.
Different letters indicate significantly statistical differences (p <0.05) between the regions.
**The Midwest region was not considered in ANOVA.

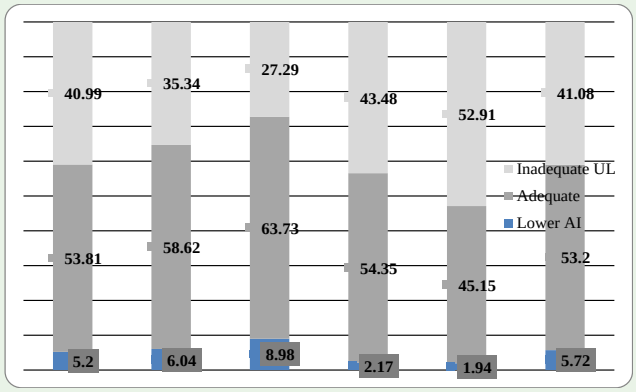

Figure 4: Adequacy percentage of sodium intake at lunch served at CRs in Brazil, according to DRIs 2012.

There was a statistical difference in fiber intake between the sexes, with males (13.87g ± 4.29) showing higher intake when compared to females (11.59g ± 3.44) (p <0.01). When fiber density was calculated (grass fibers/1,000kcal), it was observed that the average for all samples was 14.76g ± 3.08 in 1,000kcal, where the Midwest region reached the highest average among the regions (18.19g ± 2.74), and the North region (13.76g ± 2.58) the lowest.

For a better analysis of the lipid profile of the meal, the energy average percentage was calculated in relation to the energy consumption of the DEI from the consumption of linolenic acid (*n*-3), linoleic acid (*n*-6) and saturated fat from the meal (Table 3). In relation to saturated fat, the South region had the lowest consumption in grams of saturated fat (5.65g ± 1.66) when compared to the other regions (p <0.00: F = 37.178). As for the percentage contribution of saturated fat in relation to energy, the Midwest and South regions had the lower percentages. From the percentage contribution of energy of linolenic and linoleic acids, the adequacy of these nutrients intake was calculated, according to IOM[11] recommendations. Figures 2 and 3 show, respectively, the percentage of the consumption adequacy of linoleic acid (*n*-3) and linoleic acid (*n*-6) of lunch served in the CRs.

Observing national data, the average linolenic acid intake was 0.66 g ± 0.17, and 64.1% of subjects had adequate intake of this nutrient. The Northeast (49%) and Midwest regions (56.5%) had the lowest adequacy percentage of all regions, and when average intake was observed, these regions also had the lowest averages, 0.60 g ± 0.15 and 0.59g ± 0.15, respectively (p <0.000; F = 17.524).

The average intake percentage of linoleic acid was 4.93% ± 1.23 DEI, and the percentage adequacy of the CR population was 45.10%. The percentage of individuals with adequate intake intra-regions showed that the highest percentages were in the North region (55.2%) and Midwest region (47.8%) (p <0.00; F = 40.701).

The average intake of iron of all CRs was 6.03mg ± 1.62. The regional comparison showed that the Northeast region had the highest intake (6.74mg ± 1.50) and that the South region had the smallest (5.34mg ± 1.21). The average of iron intake for males (6.35mg ± 1.68) was statistically higher when compared to females (5.56mg ± 1.40) (p <0.01). Analysis by groups shows that for women of childbearing age(1), the average iron intake was 5.60 mg and for menopausal women the average was 5.49mg. According to the daily recommendation intake assessed by the EAR method, the lunch meal alone provided a consumption adequacy to 51.97% of men, and 56.55% for menopausal women.

The sodium intake was high in all regions (Figure 4). Only 5.2% of all subjects consumed less than 2300 mg at lunch, and over 40% of the subjects showed consumption above that. It is noteworthy that the assessment parameter for sodium intake is a recommendation for a full day of consumption and these high levels of intake correspond solely to the lunch intake.

Discussion

The CRs that participated in this study are located in urban centers, where there is a large traffic of people, which facilitates people access to the units [18]. The analysis of the client profile of these urban centers, which tend to have lunch in the CRs, revealed in this study that it is predominantly made up of adult males that practice professional activities.

It was evidenced that over 70% of individuals live on less than one minimum wage per capita. Godoy et al. [19] held a study with a part of the same CRs population and estimated that about 40.6% of this population is in food insecurity. Velasquez-Melendez et al. [20], in their study with a sample of Brazilian women, found a prevalence of 40.9% food insecurity and reported the association between obesity and moderate food insecurity. In addition to these findings, there is evidence that food insecurity is associated with cardiovascular risk [21,22].

The data concerning the nutritional status of the sample reflects the current trend of overweight progression, revealing that more than half of the sample (53.8%; n = 953) was diagnosed as overweight or obese. Although it affects a significant portion of the population, this data is below those shown in HBS [5], in which overweight and obesity represented 63.8% of the population.

The weight deficit in the studied sample has a higher prevalence (3.8%; n = 67) when compared to the HBS (2.7%) data. Still, the data found in this study is far from that observed in the world, considering that today there are 870 million undernourished people, i.e., 12.5% of the population consumes insufficient amounts of energy relative to their needs [23].

There was a difference between the prevalence of obesity between genders, showing that more than a fifth of the female population is obese (22.1%; n = 157), while in the male population the percentage is 13.4% (n = 142) (p = 0.026). Silva's et al. [10] work assessed food consumption and nutritional status of 267 attendees of community restaurants at the Brazilian Federal District and showed a very similar framework, in which women had a 20% obesity rate, while 12.3% of men were obese. Savio et al. [12] evaluated the lunch food intake of 1,044 clients served by the Worker Food Program (PAT) at the Federal District, and noted that 33.7% of the sample studied was overweight, 9.3% were obese and, unlike the present study, overweight was higher for males.

The rapid growth of obesity is a challenge, as billions of dollars are spent each year to treat this disease and the various associated comorbid conditions, which include type 2 diabetes, hypertension, hypercholesterolemia, hypertriglyceridemia and non-alcoholic hepatic steatosis [24].

According to the recommendations of the Acceptable Macronutrients Distribution Ranges (AMDR), the percentage of energy from carbohydrates should range between 45-65%, 10-35% for protein and 20-35% for lipids [8]. The analysis of the meals served by CRs revealed that the energy distribution of macronutrients is adequate for all regions.

The Midwest region had the lowest calorie percentage of carbohydrate among all regions, but offered, as well as the Northeast region, the largest energy percentage of lipids. The lower carbohydrates concentration in the Midwest region is associated with a higher offer of garnish containing vegetables, and no offer of pasta or tubers. The high contribution of fats in the Midwest region is related to the offer of protein dishes rich in that nutrient, such as beef ribs, pork, industrialized hamburger and beef pot, in addition to peanut based candy, also high in lipid density.

The Northeast region had the second lowest percentage of carbohydrates offered per meal. Similarly, the Midwest region also had the highest lipid contribution. This high offer of lipids is due to the high fat content of protein dishes, and the presence in the offered menu of cassava flour crumb (dish prepared with cassava flour), typically high in fat.

In relation to protein intake, the data are adequate according to the AMDR recommendation.

It is important to clarify that, in all the evaluated units, the main course was not served by the customer, i.e., the preparation was served by the clerk of each CR and, in general, the side dishes rice and beans were served by the customer itself. Ginani [25], in his evaluation study of CRs menus, showed that the average portion of main course offered in these units was 123.2g ± 44.4. There was also a large protein contribution arising from the consumption of beans in the studied units, in which the average portion served, according Ginani [24], was 140.7g ± 52.1, which also contributed to the large participation in the meal DEI of energy from protein. Regarding the meal DEI, the average consumed during the lunch at the CRs was 881 kcal, a figure close to the 900 kcal found by Silva et al. [10]. In Savio's et al. [12] study, the energy consumption average was below the averages found in this study, 515kcal for females and 737kcal for males, and a significant difference between genders (p <0.001). In that study, a positive correlation between BMI and the intake of lipids was found, which did not occur in this study (r = -0.15; p = 0.518). It should be noted that, for their work, Savio et al. [12] used for the energy consumption and nutrient analysis data from food composition tables, which may have influenced the differences in consumption found in this study.

It is important to highlight the relevance of using TPFs this study. Significant differences were observed on the centesimal nutritional composition and energy value of preparations between regions. As an example, under a regional vision, the beans energy amount in 100g ranged from 68 kcal (Midwest) region to 134 kcal (North region), and rice varied in terms of sodium concentration, from 370mg (Northeast region) to 534mg (Midwest region) in 100g of preparation. In addition, the development of TPFs was essential to understand the different ways to cook the same preparation, and the insertion of the customs and habits of each region. Therefore, it is recommended that the CRs develop the TPFs of preparations served and that this information should be used as a tool for the proper planning of a healthy menu, which preserves the culture and eating habits of the population.

According to the ministerial Ordinance No. 66 of 2006, the main meals - lunch, dinner and supper - should contain 30-40% of the daily DEI calories [13]. In this study, 881kcal consumed at lunch represented 42.38% of daily energy requirements calculated for the underweight and normal weight sample (EER), which exceeds the recommendations of the Ordinance. As for individuals who are overweight and obese, this coverage amounted to 39.60% of the Total Energy Requirement (TEE), and there was statistical difference between the coverages (p <0.01). This difference shows that individuals presenting overweight and obesity obtained an energy intake that meets the recommendation, and that possibly it is not this meal that is contributing to the weight excess of this group.

In relation to cholesterol intake, epidemiologic studies analyzed by Santos et al. [26] show a strong association between an increased incidence of atherosclerosis and the intake of large amounts of cholesterol. The USDA [15] recommends that the daily cholesterol intake should be less than 300mg, thus, considering the contribution of 40% by the lunch meal, this intake should be less than 120mg. In this study, the sample average of cholesterol intake was lower, and all regions of Brazil showed an average intake below this recommendation.

Sávio et al. [12] showed that for females, the median cholesterol intake was 66.6mg, while for the male population it was 93.5mg, with a significant difference between genders(p <0.001). The present study showed a higher consumption of cholesterol when compared to Sávio et al. [12], especially for women, and did not see differences between cholesterol intakes by gender. The high consumption appearing in this study can be explained by the existing DEI differences between the two studies.

On the other hand, a nutrient whose consumption is quite encouraged is the fiber [15,27], since its proper intake is associated with low cholesterol blood levels, the normalization of serum glucose and insulin levels, an improved intestinal transit and a lower risk for colon cancer [28,29]. The average concentration of fibers in meals served by the CRs was 12.96g ± 4.12, with a significant difference between sexes.

Savio et al. [12] estimated the average of fiber consumption at 6g and 8.3g, for females and males, respectively, also presenting a statistical difference. However, in general, fiber consumption by the CR sample proved to be much higher than that found by Savio et al [12].

According to the American Dietetic Association [30], fiber intake should be 20 to 35g of fiber per day or 10 to 14g of fibers/1,000 kcal. The total average fiber intake of meals offered by the CR exceeds the recommendation of 14g/1000kcal, except for the northern region, where the average fiber intake was 13.76g ± 2.58 kcal in 1,000, a value that still exceeds the recommended minimum of 10g of fiber per 1000 kcal.

The Midwest region showed the highest fiber density among all regions (18.19g ± 2.74/1000kcal) for, in addition to the consumption of large servings of beans, similarly to other regions, this unit presented the garnish only in vegetable form, which is often sources of this nutrient, contributing to the increased availability of fibers. Furthermore, the consumption of salads had a significant presence of leafy vegetables that have expressive concentrations of this nutrient.

Mattos and Martins [31] estimated the fiber intake from a sample of 559 adults over the age of 20 years in the city of Cotia, São Paulo (Brazil), and showed that lunch and dinner meals had the highest fiber content. This study also revealed that beans were the only food with high fiber content found in the analysis. In this perspective, it is observed that most of the fiber contribution in the meals offered by the CRs came from the consumption of beans, for as mentioned before, the average portion served was 140.7g ± 52.1, which represents an average of fiber intake of 7.7 g ± 4.6 for this preparation alone.

The findings of this work in relation to fiber consumption show a satisfactory intake of such nutrient considering the lunch meal alone, mainly due to the massive bean presence for the meals compositions. For a more accurate assessment regarding the suitability of the daily fiber intake of this sample, an investigation of eating habits during the meals had away from these institutional food services is necessary.

Regarding the consumption of fats, the intake of high saturated fats is associated with elevated plasma cholesterol concentration and increased of cardiovascular risk [26]. As recommended by the HHS [15], the energy contribution percentage from saturated fat should be less than 10% of the DEI. The sample average in this study was 6.77% ± 1.44, an appropriate value according to the said recommendation. For all regions of Brazil, the average percentage of energy from saturated fat was below the recommended 10%, where the North and Midwest regions presented a higher energy offer provided by saturated fat.

In what concerns the polyunsaturated fatty acids intake, such as linolenic and linoleic acids, it was found that the consumption of these nutrients is required, because they are not synthesized by the human [15] body. The consumption of linolenic acid in appropriate amounts can have effects on metabolism associated with cardiovascular protection. The consumption of linoleic acid is associated with decreased cholesterol and pro-inflammatory action [26].

According to IOM [14], the recommended intake of linoleic acid is that the amount in which the energy from this nutrient represents 0.6 to 1.2% of the DEI. As for linoleic acid, this percentage is from 5 to 10% of the daily energy intake. National data show that the average consumption of linolenic acid is 0.65 g ± 0.23, and there was no statistical difference in consumption in grams among the analyzed regions. The intake adequacy of this nutrient in the meals was 64.10% of the sample, i.e., more than one third of individuals consumes less energy from this nutrient than the recommended level.

The average energy percentage attributed to linoleic acid intake was 4.93% ± 1.23%, a value that does not reach IOM's [14] recommendation. The intake adequacy of this nutrient was shown in 45.1% of individuals, where there was a statistic difference between regions.

It is noticed that, despite the saturated fat intake being appropriate for this population, the essential fatty acid intake is still below the recommendations, as the analysis of the menus shows evidence of a low intake of food sources of these nutrients, such as watercress, cabbage, cauliflower, corn and sardines. Therefore, it is recommended the introduction of these foods on the CRs menus in order to adapt the quality of fat intake.

Concerning mineral intake, iron is considered an essential micronutrient that has a vital role in oxygen transport to the cells, also being a part of many other physiological processes. The evaluation of iron intake is complex due to differences in recommendation between genders, in addition to the difference of recommendation between ages, once women of childbearing age need a higher intake of this micronutrient. It was observed in this study a high adequacy in iron intake for men and for women in menopause since more than half of these groups presented adequate intake for the whole day, with the lunch meal alone. For women of childbearing age, less than 5% of this sample consumed at lunch the recommendation for the entire day, which is not necessarily an inadequacy.

The EAR for the women's group of childbearing age is 8.1mg / day, and it is observed that the average consumption of the sample was 5.60mg, with the lunch meal alone. In other words, this meal provides, on average, more than 50% of the daily intake recommendation. Considering that it should provide 40% of daily nutrient requirements, it can be inferred that this lunch is a good source of iron, but complementary studies to evaluate daily eating habits are needed to verify the adequacy of iron consumption, especially for the female population of childbearing age.

Another important mineral analyzed in this work was sodium. This is an essential nutrient for the human body metabolism and small amounts are sufficient to provide the physiological needs [15]. On the other hand, a high intake of this nutrient has been associated to the development of hypertension, cardiovascular diseases, gastric cancer, renal lithiasis and diabetes [31]. The present study showed that approximately 41% of the sample of CRs consume sodium levels above the safe recommendation intake for a whole day.

Sarno et al. [32] analyzed HBS's 2002-2003 data and found that the sodium intake in Brazil is far beyond the recommended, showing that the per capita sodium availability in Brazilian households was 4.500mg/day. In the present study, the situation found regarding the sodium intake at lunch served in CRs was not different: the average intake was 2,283.84mg, which almost reaches the maximum tolerated intake, which is 2,300mg/ day [33]. Souza et al. [34] evaluated the sodium intake of Brazilian people using HBS 2008-2009 and also found high levels of sodium consumption with an average of 3,190 mg per day.

Other studies, such as Salas et al. [35], that analyzed the sodium and lipid content of meals served for workers in the city of Suzano (São Paulo – Brazil), found an average of 2,435mg of this micronutrient for lunch. Silva et al. [10] obtained the average sodium consumption of 2,180mg. Together, these studies reiterate that sodium intake in meals served by Food and Nutrition Units contribute to extremely high sodium consumption, generating the need to adopt positions to reduce the content of this nutrient in meals served by these establishments.

The high sodium intake at lunch offered by CRs requires actions to reduce the concentration of this nutrient in meals. It is suggested a reduction on the amount of salt added, and recommended the use of herbs and spices to give more flavor and aroma to preparations.

The results found in this study point to a high prevalence of overweight of the CRs regular customers, as in the epidemiological profile of the Brazilian population. The distribution of macronutrients, fiber and iron intake are suitable for lunch consumption. However, the technicians responsible for these units should be aware of the importance of implementing and/or revising the TPFs, mainly to improve the quality of the offered fats and in particular, to reduce the excessive sodium intake of meals served by CRs. It is also recommended that studies be developed on the daily food habits of this population, to visualize a better assessment of the impact of meals offered by CRs regarding energy and nutrients intake. It is important to highlight that the CRs are an important feeding place out of home, and that they offer meals with adequate energy and lipid value, helping to combat obesity and to search for a healthier way to eat away from home.

References

1. Aranha AV. Fome Zero: uma história brasileira. Brasília: Ministério do Desenvolvimento Social e Combate à Fome. In: Inclusão social; 2010.
2. Monteiro CA, Moura EC, Conde WL, Popkin BM. Socioeconomic status and obesity in adult populations of developing countries: a review. Bulletin of the World Health Organization .2004; 82: 940-946.
3. Popkin BM, Adair LS, Ng SW. Global nutrition transition and the pandemic of obesity in developing countries. Nutrition reviews. 2012; 70 :3-21.
4. Diez Garcia RW. Effects of globalization on food culture: considerations on urban food changes. Revista de Nutrição. 2003; 16: 483-492.
5. Estatística I-IBdGe. Pesquisa de Orçamentos Familiares. POF 2008-2009. Análise do consumo alimentar pessoal no Brasil. In: Instituto Brasileiro de Geografia e Estatística Rio de Janeiro; 2010.
6. Lachat C, Nago E, Verstraeten R, Roberfroid D, Van Camp J, Kolsteren P. Eating out of home and its association with dietary intake: a systematic review of the evidence. Obesity Reviews. 2012; 13: 329-346.
7. Bezerra IN, Sichieri R. Characteristics and spending on out-of-home eating in Brazil. Revista de saude publica. 2010; 44: 221-229.
8. Akutsu RdCCdA, Botelho RBA, Camargo EB, Oliveira KESd, Araújo WMC. A ficha técnica de preparação como instrumento de qualidade na produção de refeições. Revista de Nutrição. 2005; 18: 277-279.
9. Camargo EB, Botelho RBA. Técnica Dietética: Pré-preparo e Preparo de Alimentos. São Paulo: Editora Atheneu; 2012.
10. Silva AB, Oliveira KESd, Akutsu RdC, Silva EFd. Salud y perfil. Sócio-demográfico de la clientela de restaurantes vinculados a programa social brasileño. Revista chilena de nutrición. 2015; 42: 14-22.
11. Zandonadi RP, Botelho RB, Rita de Cássia C, de Oliveira Savio KE, Araújo WM. Sodium and health: New proposal of distribution for major meals. Health. 2014.
12. Savio KEO, Costa THMd, Miazaki É, Schmitz BdAS. Assessment of lunch served in the Workers' Food Program, Brazil. Revista de Saúde Pública. 2005; 39: 148-155.
13. Health B-Mo. Portaria interministerial n° 66, 25 de agosto de 2006. Altera os parâmetros nutricionais do Programa de Alimentação do Trabalhador – PAT. In; 2006.
14. Medicine Io. Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein and Amino Acids. In: Panel on Macronutrients Panel on the Definition of Dietary Fiber, Subcommittee on Upper Reference Levels of Nutrients, Subcommittee on Interpretation and Uses of Dietary Reference Intakes, and the Standing Committee on the Scientific Evaluation of Dietary Reference Intakes, Food and Nutrition Board: ; 2005.
15. Committee DGA. Report of the dietary guidelines advisory committee on the dietary guidelines for Americans, 2010, to the Secretary of Agriculture and the Secretary of Health and Human Services. In: Agricultural Research Service; 2010.
16. Haubrock J, Nöthlings U, Volatier J-L, Dekkers A, Ocké M, Harttig U, et al. Estimating usual food intake distributions by using the multiple source method in the EPIC-Potsdam Calibration Study. The Journal of nutrition. 2011; 141: 914-920.
17. Harttig U, Haubrock J, Knüppel S, Boeing H. The MSM program: web-based statistics package for estimating usual dietary intake using the Multiple Source Method. European journal of clinical nutrition. 2011; 65: 87-91.
18. Henriques cmp. Manual de procedimentos do programa de restaurantes populares. In; 2013.
19. Godoy KC, Sávio KEO, de Cássia Akutsu R, Gubert MB, Botelho RBA. Perfil e situação de insegurança alimentar dos usuários dos Restaurantes Populares no Brasil Socio-demographic and food insecurity characteristics of soup-kitchen users in Brazil Perfil y situación de seguridad alimentaria en. Cad. Saúde Pública 2014; 30: 1239-1249.
20. Velásquez-Melendez G, Schlüssel MM, Brito AS, Silva AA, Lopes-Filho JD, Kac G. Mild but not light or severe food insecurity is associated with obesity among Brazilian women. The Journal of nutrition. 2011; 141: 898-902.
21. Seligman HK, Laraia BA, Kushel MB. Food insecurity is associated with chronic disease among low-income NHANES participants. The Journal of nutrition. 2010; 140: 304-310.
22. Kohn MJ, Bell J, Grow H, Chan G. Food insecurity, food assistance and weight status in US youth: new evidence from NHANES 2007–08. Pediatric obesity. 2014; 9:155-166.
23. FAO W. IFAD. "The State of Food Insecurity in the World. Economic Growth Is Necessary but Not Sufficient to Accelerate Reduction of Hunger and Malnutrition," FAO, Rome, 2012. In: ISBN 978-92-5-107316-2. http://www.fao. org/docrep/016/i3027e/i3027e. pdf.
24. Hurt RT, Kulisek C, Buchanan LA, McClave SA. The obesity epidemic: challenges, health initiatives, and implications for gastroenterologists. Gastroenterology & Hepatology. 2010; 6: 780.
25. Ginani VC. Avaliação da qualidade nutricional, sensorial e cultural de cardápios populares. 2012.
26. Santos RD GA, Xavier HT, Magnoni CD, Cassani R, Lottenberg AM Casella Filho A, et al. I Guidelines on consumption of fats and cardiovascular healt. Arq. Bras. Cardio. 2013;100:1-40.
27. Policy B-MoHSoHCGCoFaN. Food Guide for the Brazilian population: promoting healthy eating. In: MS Brasília; 2006.
28. Campbell N, Correa-Rotter R, Neal B, Cappuccio FP. New evidence relating to the health impact of reducing salt intake. Nutrition, Metabolism and Cardiovascular Diseases. 2011; 21: 617-619.
29. D'Elia L, Rossi G, Ippolito R, Cappuccio FP, Strazzullo P. Habitual salt intake and risk of gastric cancer: a meta-analysis of prospective studies. Clinical Nutrition. 2012; 31: 489-498.
30. Organization WH. Reducing salt intake in populations: report of a WHO forum and technical meeting, 5-7 October 2006, Paris, France. In; 2007.

31. Mattos LLd, Martins IS. Dietary fiber consumption in an adult population. Revista de Saúde Pública. 2000; 34: 50-55.

32. LevyII RB, BandoniI DH, Gouvêa SR. Estimated sodium intake by the Brazilian population, 2002-2003. Rev Saúde Pública. 2009; 43.

33. Sawka M. Dietary Reference Intakes for Water, Potassium, Sodium, Chloride, and Sulfate. Chapter 4-Water: DTIC Document; 2005.

34. de Moura Souza A, Bezerra IN, Pereira RA, Peterson KE, Sichieri R. Dietary sources of sodium intake in Brazil in 2008-2009. Journal of the Academy of Nutrition and Dietetics. 2013; 113: 1359-1365.

35. Salas CKTS, Spinelli MGN, Kawashima LM, Ueda AM. Sodium and lipid contents of lunch meals consumed by workers of a company in Suzano, SP, Brazil. Revista de Nutrição. 2009; 22: 331-339.