DOI: 10.1590/1413-81232022272.37322020

Association between dietary patterns and socioeconomic factors and food environment in a city in the South of Brazil

Caroline Marques de Lima Cunha (https://orcid.org/0000-0002-0529-1498) [1]
Raquel Canuto (https://orcid.org/0000-0002-4042-1913) [1]
Priscila Bárbara Zanini Rosa (https://orcid.org/0000-0002-1774-073X) [1]
Luana Schimmelpfennig Longarai (http://orcid.org/0000-0002-9692-7286) [2]
Ilaine Schuch (https://orcid.org/0000-0001-6861-4365) [1]

Abstract *The aim of this study was to investigate the association between dietary patterns and demographic and socioeconomic factors and the food environment among adults and older persons in a city in the south of Brazil. We conducted a cross-sectional study with people of both sexes aged between 20 and 70 years. Dietary patterns were identified using principal component analysis. Poisson regression was used to estimate crude and adjusted prevalence ratios and 95% confidence intervals. Four dietary patterns were identified: Healthy; Traditional; Refined Carbs and Sugars; and Fast Food. Positive associations were found between being female and higher income and the Healthy dietary pattern; being black or brown and living in a household with at least six members and the Traditional and Refined Carbs and Sugars patterns; and higher education and the fast-food dietary pattern. Having main meals at home was associated with the Traditional pattern and having lunch or dinner away from home was the associated with Refined Carbs and Sugars and fast-food patterns. Lower socioeconomic status leads to higher consumption of the Traditional and/or Refined Carbs and Sugars dietary patterns, while higher socioeconomic status appears to enable individuals to choose between healthy or fast-food patterns.*

Key words *Food patterns, Socioeconomic factors, Socio-spatial health inequalities*

[1] Programa de Pós-Graduação em Alimentação, Nutrição e Saúde, Departamento de Nutrição, Universidade Federal do Rio Grande do Sul. R. Ramiro Barcelos 2.400, Santa Cecília. 90035-003. Porto Alegre RS Brasil. ischuch@hcpa.edu.br
[2] Curso de Graduação em Nutrição, Universidade Federal do Rio Grande do Sul. Porto Alegre RS Brasil.

Introduction

Dietary patterns represent a broad picture of food and nutrient consumption and are characterized on the basis of usual eating behavior[1]. Over recent decades, in various countries, including Brazil, dietary patterns have undergone important changes, characterized mainly by an increase in the intake of fats, sugars and ultra-processed foods and reduction in the consumption of nutrient-rich foods, such as fruits and vegetables. These changes are associated with chronic non-communicable diseases (CNCDs)[2,3].

International and Brazilian studies have shown consistent associations between dietary patterns and social, economic and life-style characteristics and other factors that can also influence eating patterns, such as household size, marital status and skin color[4-7].

More recently, studies have shown that the food environment is an important social determinant of individual food consumption. Food environments have four dimensions: physical (availability, quality, and promotion), economic (cost), policy (rules), and sociocultural (norms and beliefs of an individual or group regarding foods)[8].

The food environment influences dietary patterns through access, the availability, price and quality of foods, and other individual factors, such as culture, preferences, acceptability and knowledge of the food[9,10]. The distance between food purchase locations and homes and the form of transport used when purchasing food are therefore also factors that make up the food environment.

Socioeconomic and environmental characteristics are not uniformly distributed across big cities. People from poorer and socially vulnerable areas such as *favelas* share sociodemographic characteristics and social environments that are different to those of individuals living in more affluent areas[11] and may be more likely to have less healthy dietary patterns.

Studies that seek to identify dietary patterns and their association with socioeconomic factors and the food environment are scarce in Brazil, especially when it comes to people living in poor areas. The aim of this study was therefore to investigate the association between dietary patterns and demographic and socioeconomic factors and the food environment in a city in the south of Brazil.

Methodology

We conducted a cross-sectional population-based study in the catchment area of a primary care unit (PCU) in the center of Porto Alegre, Rio Grande do Sul. The study is part of a research project entitled "A study of the social and environmental determinants of diet and nutrition: an ecosocial approach", approved by Rio Grande do Sul Federal University's research ethics committee (approval number CAAE 46934015.3.0000.5347). The center of Porto Alegre has around 260,000 inhabitants[12] and three primary care units. The population within the catchment area of the PCU included in this study consists of approximately 12,000 families. Part of the population live in four poorer areas or *favelas* (per capita income of R$1,700.00), while the rest live in more affluent neighborhoods (per capita income of R$4,000.00)[13].

To ensure a representative sample, we used proportional sampling to include the same proportion of individuals from the poor and affluent areas. In the poor areas (around 250 families), all eligible participants that accepted the invitation to participate in the study were included. To maintain the same proportion of individuals, we included the same number of participants from the affluent areas. Participants included men and women aged between 20 and 70 years. Individuals with physical or mental impairments that made it impossible to collect data and pregnant women were excluded. Only one person per household was included and we sought to alternate the sex of the respondent between households.

The data were collected between October 2018 and June 2019. First, with the help of community health workers, the areas were mapped and the households were identified using maps and addresses. The research team then visited the areas, identifying individuals who met the inclusion criteria and inviting them to participate in the study. The interviews were conducted during the initial visit or scheduled for a later date, preferably at the respondent's home, or at the PCU when requested by the participant.

We used a standardized questionnaire devised to obtain information on the following socioeconomic and demographic characteristics: sex (female/male); age (years); self-declared race/skin color; classified according to the 2010 census categories[12] (white/black/brown/yellow/indigenous); level of education (no schooling/junior high school completed or not completed/high school completed or not completed/

completed higher education/post-graduation); marital status (single/living in stable union/married/widowed/separated/divorced); monthly family income in minimum wages (< 1 MW/1 to 2 MWs/2 to 3 MWs/3 to 4 MWs/4 to 5 MWs/> 5 MWs); benefits (not received/*Bolsa Família*/pension/Continuous Cash Benefit – CCB/other); and number of household members (≤ 3 to ≥ 6).

Food environment was assessed using a questionnaire with the seven most commonly consumed food items in Brazil: industrialized products (biscuits, soft-drinks and instant noodles), fruits, vegetables and legumes, meats, bread, rice and beans)[9]. The instrument investigated the purchase location for each item (growers' market/fruit and vegetable markets, supermarket, market, public market, warehouse store, delicatessen/bakery, bar, grocery store, butcher, home vegetable garden, community vegetable garden, donations - family, neighbors, organizations, other) and form of transport (on foot, bicycle, car/motorbike, public transport). In addition, eating place was identified using a question that first inquired whether the respondent ate lunch and dinner and then went on to ask the eating place (at home, at work, snack bar, restaurant, other).

Food consumption was assessed using a food frequency questionnaire (FFQ) consisting of 65 foods and adapted to 85 typical items in the local food culture. The food list was devised based on consumption data from the dietary records of adults in Niterói, Rio de Janeiro[14]and validated for the population of the metropolitan region of Porto Alegre[15]. The questionnaire investigated daily, weekly, monthly or annual frequency of consumption (zero to seven times).

The data were entered into a data collection form in EpiData version 3.1 using double entry. Data analysis was carried out using Stata version 12.0 (StataCorp, College Station, United States) and SPSS (Statistical Package for the Social Sciences) version 18.0.

Dietary patterns were analyzed using the *a posteriori* method, dividing the collected empirical food data into clusters on the basis of statistical analysis. This method uses multivariate techniques to identify similarities in eating habits or consumed food groups based on their interrelations[16-18].

Before identifying the dietary patterns, the different frequencies of consumption of food items (including seasonal foods) were transformed into annual consumption frequencies. The frequency of consumption of each item was then determined and items with a frequency of consumption below 5% were excluded[19]. The food items were then divided into 48 groups based on the statistical correlations between the dietary items ($p \leq 0.05$) and nutritional and cultural similarities. Other foods were not clustered, either because it made no sense to group them (artificial sweetener, for example), or because they may have been indicative of a certain dietary pattern, such as rice and beans, for example[20].

The dietary patterns were theoretically derived using principal component analysis (PCA). The applicability of the method was verified using the Kaiser-Mayer-Olkin (KMO) test, which measures the strength of the relationship between variables, where a value of ≥ 0.60 is considered adequate. Bartlett's test of sphericity was used to test the null hypothesis (no relationship between the variables), adopting a p-value of < 0.05 to indicate that the dataset was suitable for analysis. To calculate the sample power needed to identify dietary patterns, we followed the criteria proposed by Hair *et al*.[21] (five individuals per food item included in the principal component analysis).

Varimax rotation was used to examine the structure exploratory factors represented in the FFQ. The number of factors to extract was determined using a scree plot graph – where the steepest points indicated the appropriate number of components to retain – and the Kaiser criterion, where eigenvalues above 1 were accepted. The food items with absolute factor loadings of ≥ 0.30 were considered to make a significant contribution to a given factor. The dietary patterns were named according to the foods loaded most on each factor and to cultural aspects. Each of the derived patterns were divided into terciles and dichotomized as follows: tercile 3 (high consumption) vs. terciles 1 and 2 (low consumption)[22,23].

Crude and adjusted prevalence ratios and95% confidence intervals (95% CI) were obtained using Poisson regression with robust variance. Variables with a significance level of up to 20% in the crude analysis were included in the multivariate model. For the multivariate analysis, we used a conceptual model (first level, demographic variables; second level, socioeconomic variables). Only variables with a p-value of < 0.20 were retained in the second level. After adjustment, all variables with a p-value of ≤ 0.05 were considered to be associated with the dietary patterns.

Results

The total sample comprised 400 participants. First, all residents of poorer areas that accepted the invitation to participate in the study were included (n = 201), followed by 199 residents selected from the more affluent areas.

Table 1 shows the general characteristics of the study population by area. Most of the respondents were women and the mean age of the sample was 47 years (SD = 13.98). Most of the sample did not live with a partner, were white, had completed high school, had a family income of three to five minimum wages, and lived in households with up to three members. Half of the respondents received some kind of welfare benefit. The respondents from poorer areas were younger, more likely to be brown or black and receive welfare benefits, had a lower level of education and income, and lived in households with a higher number of members.

Table 2 shows the four dietary patterns identified in the analysis (Healthy, Traditional, Refined Carbs and Sugars, and Fast Food) and their respective components, factor loadings and level of explained variance. Both the KMO coefficient and Bartlett's test of sphericity indicate that the correlations between the items were sufficient and the variables were suitable for factor analysis. The dietary pattern with the highest explained variance was Healthy (10.84%), meaning it is the pattern that best represents the consumption of the study population.

Table 3 shows the prevalence of high consumption of each dietary pattern according to demographic and social characteristics. High consumption of the Healthy dietary pattern was associated with being female, receiving or living with someone who received a pension, CCB or other welfare benefit, and living in more affluent areas. High consumption of the Traditional dietary pattern was associated with being young and brown, lower levels of income and education, receiving or living with someone who received benefits from the family benefit program (*Programa Bolsa Família* – PBF), living in poorer areas, and living in households with at least six members. High consumption of the Refined Carbs and Sugars dietary pattern was associated with being younger and black, lower levels of income and education, receiving or living with someone who received benefits from the PBF, living in more vulnerable areas, and living in households with at least six members. Finally, high consumption of the fast-food dietary pattern was associated with being young and white, higher levels of education, family income above five minimum wages, and living in more affluent areas.

After adjustment, the Healthy dietary pattern was directly associated with being female and having a monthly family income above five minimum wages, and inversely associated with living in a household with four to five members. The Traditional dietary pattern was directly associated with being black or brown and living in a household with at least six members, inversely associated with living in more affluent areas, and showed an inversely proportional association with age and level of education. The Refined Carbs and Sugars dietary pattern was directly associated with being brown and black and livening in a household with at least six members, and inversely associated with being older and living in affluent areas. Finally, the fast-food dietary pattern was directly associated with higher levels of education and inversely associated with older age and being brown or black (Table 4).

Table 5 shows the frequency distribution of the food environment variables and their association with dietary patterns. Individuals who showed greater adherence to the Traditional dietary pattern were more likely to purchase fruits, vegetables and legumes in a supermarket, market or warehouse store and went on foot or by bicycle to purchase industrialized products, meats and bread. The most frequent places of purchase for bread among individuals with higher consumption of the Refined Carbs and Sugars dietary pattern were delicatessen/bakery, bar or grocery store. Individuals with higher consumption of the fast-food dietary pattern went by car/motorbike or public transport to purchase the majority of food items. Having main meals at home was associated with the Traditional dietary pattern, while eating lunch or dinner away from home was associated with the Refined Carbs and Sugars and fast-food patterns.

Discussion

Being female and higher income were associated with consumption of the Healthy dietary pattern, while being younger, brown or black, lower level of education, larger number of household members, and living in poorer areas were associated with consumption of less healthy patterns or a smaller dietary share of fruits and vegetables. In addition, buying foods in supermarkets, go-

Table 1. Sociodemographic variables by area in a city in the south of Brazil. Porto Alegre. RS. 2018-2019 (n = 400).

Variáveis	n (%)	Área de moradia Menor condição socioeconômica n (%)	Área de moradia Maior condição socioeconômica n (%)	Valor de p
Sex				
Male	100 (25.0)	46 (22.9)	54 (27.1)	*0.32
Female	300 (75.0)	155 (77.1)	145 (72.9)	
Age (years)				
20 - 36	105 (26.3)	68 (33.8)	37 (18.6)	
37 - 49	97 (24.3)	56 (27.9)	41 (20.6)	*< 0.001
50 - 59	110 (27.5)	53 (26.4)	57 (28.6)	
≥ 60	88 (22.0)	24 (11.9)	64 (32.2)	
Skin color				
White	249 (62.3)	95 (47.3)	154 (77.4)	
Black	78 (19.5)	55 (27.4)	23 (11.6)	*< 0.001
Brown	73 (18.3)	51 (25.4)	22 (11.1)	
Marital status				
With a partner	149 (37.3)	77 (38.3)	72 (36.2)	*0.66
Without a partner	251 (62.8)	124 (61.7)	127 (63.8)	
Level of education				
JHS not completed	73 (18.5)	63 (32.1)	10 (5.0)	
JHS completed	73 (18.5)	53 (27.0)	20 (10.1)	*< 0.001
HS completed	146 (37.0)	70 (35.7)	76 (38.2)	
HE + post-graduation	103 (26.0)	10 (5.1)	93 (46.7)	
Income (MW)				
< 1	22 (5.5)	19 (9.5)	3 (1.5)	
1 to 2	112 (28.1)	83 (41.5)	29 (14.6)	*< 0.001
3 to 5	193 (48.4)	91 (45.5)	102 (51.3)	
> 5	72 (18.0)	7 (3.5)	65 (32.7)	
Welfare benefits				
Not received	201 (50.3)	99 (49.3)	102 (51.3)	
Bolsa Família	39 (9.8)	36 (17.9)	3 (1.5)	*< 0.001
Pension/CCB + Other	160 (40.0)	66 (32.8)	94 (47.2)	
Nº household members				
≤ 3	261 (65.3)	116 (57.7)	145 (72.9)	
4-5	102 (25.5)	58 (28.9)	44 (22.1)	*< 0.001
≥ 6	37 (9.3)	27 (13.4)	10 (5.0)	

Legend: JHS = junior high school; HS = high school; HE = higher education; MW = minimum wage; CCB = Continuous Cash Benefit. *Pearson's chi-squared test.

Source: Authors.

ing on foot or by bicycle to purchase foods, and having main meals at home were associated with consumption of the Traditional dietary pattern, while going by car or bus to purchase foods and eating main meals away from home were associated with dietary patterns including ultra-processed foods that are related to risk of CNCDs.

With regard to composition, the Healthy dietary pattern was rich in fruits, vegetables and whole-grain cereals, while the Traditional dietary pattern was composed of staple foods such as rice, beans, pasta, potatoes and red meat. At the same time, we identified two dietary patterns composed predominantly of ultra-processed foods. The results corroborate the findings of previous studies in Brazil reporting an increase in the consumption of foods rich in carbohydrates, sugar and fats, while at the same time identifying a dietary pattern based on foods traditionally consumed in the country such as rice and beans[59].

With regard to composition, despite having different names, the patterns found in the pres-

Table 2. Dietary patterns and components, factor loadings and percentage of explained variance among individuals in a city in the south of Brazil. Porto Alegre, RS, 2018-2019 (n = 400).

Dietary patterns	Food items	Factor loading	% Explained variance
Healthy	Lettuce, watercress	0.678	10.84
	Broccoli, cauliflower, cabbage	0.659	
	Strawberry, carrot, beetroot, tomato	0.610	
	Vegetable soup + chayote and eggplant	0.590	
	Grape + watermelon + mango + papaya + natural juice	0.563	
	Sweet potato + soft polenta	0.523	
	Apple	0.435	
	Orange	0.410	
	Banana	0.356	
	Whole-grain rice + whole-grain bread	0.345	
	Cassava/yam	0.317	
Traditional	White rice	0.586	7.35
	Black beans	0.463	
	Fried steak + fried chicken	0.452	
	Mince	0.436	
	Roast beef	0.429	
	Farofa + fried polenta	0.419	
	Pasta	0.408	
	Boiled or roast potato	0.396	
	Dried meat/jerky + Pork + Meat balls + Beef liver	0.378	
	Smashed potato	0.323	
Refined carbs and sugars	Cakes (simple and with topping) + cookies (sweet, savory, sandwich)	0.574	4.86
		0.565	
	Bread bun + bread loaf	0.540	
	Powdered juice+ carton juice	0.501	
	Sugar + chocolate drinks + candy/gum with sugar	0.499	
	Normal soft-drink + zero-cal. soft-drink	0.471	
	Mayonnaise + margarine	0.363	
	Rapadura + spreads + fudge	0.357	
	Ice-cream	0.314	
	Yogurt + milks (full-cream, semi-skimmed, skimmed)		
Fast food	Pizza	.672	
	Hamburger + fried snack + instant noodles + hotdog	0.557	4.29
	Chocolate/candies	0.544	
	French fries or shoestring potatoes	0.541	
	Roast snack (pasty, cheese bread)	0.510	
	Beer/wine + Spirits (cachaça, whisky)	0.386	
	Other legumes (peas, soya, chickpeas)	0.362	
Total explained variance			27.34

KMO: 0.731; Bartlett's test of sphericity: < 0.001

Source: Authors.

ent study were similar to those identified in other studies conducted in Brazil – more specifically in the states of Rio Grande do Sul[24,25], São Paulo[26-28], Rio de Janeiro[29], Espírito Santo[3 0]and Ceará[31] – including the ELSA-Brazil study[32]and National Food Survey[33].

Our results show that being female and higher income were directly associated with the Healthy dietary pattern, corroborating the findings of other studies[26,28,34-37]. Women are more aware of and value the relationship between diet and health, and are mainly responsible for cooking[38]. Data from the VIGITEL survey show that the prevalence of regular consumption of fruits and vegetables is higher among women (39.2%) than men (27.7%)[39]. In addition, studies have

Table 3. Prevalence of high consumption of dietary patterns among individuals in a city in the south of Brazil. Porto Alegre, RS, 2018-2019 (n = 400).

Variable (n)	Healthy n (%)	p-value	Traditional n (%)	p-value	Carbs/ sugars (%)	p-value	Fast food n (%)	p-value
Sex								
Male (100)	20 (20.0)	*< 0.001	37 (37.0)	*0.39	40 (40.0)	*0.09	39 (39.0)	*0.17
Female (300)	114 (38.0)		97 (32.3)		93 (31.0)		95 (31.7)	
Age (years)								
20-36 (105)	32 (30.5)		43 (41.0)		42 (40.0)		42 (40.0)	
37-49 (97)	28 (28.9)		38 (39.2)		38 (39.2)		38 (39.2)	
50-59 (110)	39 (35.5)	**0.37	32 (29.1)	**0.03	32 (29.1)	**0.04	34 (30.9)	**0.04
≥ 60 (88)	35 (39.8)		21 (23.9)		21 (23.9)		20 (22.7)	
Skin color								
White (249)	90 (36.1)		64 (25.7)		65 (26.1)		98 (39.4)	
Black (78)	25 (32.1)	*0.26	36 (46.2)	*< 0.001	38 (48.7)	*<0.001	16 (20.5)	*< 0.001
Brown (73)	19 (26.0)		34 (46.6)		30 (41.1)		20 (27.4)	
Marital status								
With partner (149)	48 (32.2)	*0.67	46 (30.9)	*0.39	46 (30.9)	*0.43	47 (31.5)	*0.52
Without partner (251)	86 (34.3)		88 (35.1)		87 (34.7)		87 (34.7)	
Level of education								
JHS incompl. (73)	24 (32.9)		46 (63.0)		33 (45.2)		13 (17.8)	
JHS compl. (73)	20 (27.4)		30 (41.1)		30 (41.1)		20 (27.4)	
HS compl. (146)	46 (31.5)	**0.20	46 (31.5)	**< 0.001	54 (37.0)	**< 0.001	48 (32.9)	**< 0.001
HS + PG (103)	43 (41.7)		10 (9.7)		13 (12.6)		51 (49.5)	
Income (MW)								
≤ 1 (22)	4 (18.2)		13 (59.1)		11 (50.0)		06 (27.3)	
1 to 2 (112)	32 (28.6)		53 (47.3)		43 (38.4)		26 (23.2)	
3 to 5 (193)	66 (34.2)	**0.08	54 (28.0)	**< 0.001	65 (33.7)	**< 0.001	65 (33.7)	**< 0.001
> 5 (72)	31 (43.1)		14 (19.4)		13 (18.1)		37 (51.4)	
Welfare benefits								
Not received (201)	70 (34.8)		59 (29.4)		60 (29.9)		76 (37.8)	
Bolsa Fam. (39)	6 (15.4)	*0.04	27 (69.2)	*< 0.001	25 (64.1)	*< 0.001	12 (30.8)	*0.18
Pens. other (160)	58 (36.3)		48 (30.0)		48 (30.0)		46 (28.8)	
Area								
Poorer (201)	56 (27.9)	*0.01	106 (52.7)	*< 0.001	101 (50.2)	*< 0.001	56 (27.9)	*0.01
More affluent (199)	78 (39.2)		28 (14.1)		32 (16.1)		78 (39.2)	
Nº household members								
≤ 3 (261)	96 (36.8)		68 (26.1)		71 (27.2)		85 (32.6)	
4 - 5 (102)	29 (28.4)	**0.14	40 (39.2)	**< 0.001	39 (38.2)	**< 0.001	39 (38.2)	**0.40
≥ 6 (37)	9 (24.3)		26 (70.3)		23 (62.2)		10 (27.0)	

Legend: JHS = junior high school; HS = high school; HE= higher education; MW = minimum wage; CCB = Continuous Cash Benefit.
*Pearson's chi-squared test. **Test for linearity.

Source: Authors.

reinforced that people of higher socioeconomic status are better able to purchase food items[40].

Being older was inversely associated with the Traditional, Refined Carbs and Sugars, and fast-food dietary patterns. Authors such as Avelar and Rezende[41] have shown that increasing age is associated with being concerned about diet quality. Other studies highlight that the share of energy intake from ultra-processed foods is high among adults and adolescents because they consume large amounts of packaged foods like candies, soft-drinks and biscuits and products rich in sug-

Table 4. Crude and adjusted prevalence ratios (PR) and 95% confidence intervals (95% CI) for high consumption of dietary patterns according to socioeconomic and demographic variables among individuals in a city in the south of Brazil. Porto Alegre, RS, 2018-2019 (n = 400).

Variables	Healthy	Traditional	Refined carbs and sugars	Fast food
	Adjusted PR 95% CI	Adjusted PR 95% CI	Adjusted PR 95% CI	Adjusted PR 95% CI
Sex	*p = < 0.001		*p = 0.11	*p = 0.22
Male	1.00	-	1.00	1.00
Female	1.15 (1.06-1.24)		0.94 (0.87-1.01)	0.94 (0.87-1.02)
Age (years)	**p = 0.09	**p = <0.001	**p = < 0.001	**p = < 0.001
20-36	1.00	1.00	1.00	1.00
37-49	0.99 (0.89-1.09)	0.99 (0.90-1.09)	1.00 (0.91-1.09)	0.98 (0.89-1.08)
50-59	1.04 (0.94-1.14)	0.93 (0.85-1.03)	0.94 (0.86-1.03)	0.90 (0.82-0.99)
≥ 60	1.07 (0.97-1.18)	0.88 (0.80-0.97)	0.88 (0.80-0.97)	0.86 (0.78-0.95)
Skin color		*p = < 0.001	*p = < 0.001	*p = < 0.001
White	-	1.00	1.00	1.00
Black		1.15 (1.05-1.26)	1.17(1.07-1.27)	0.85(0.78-0.93)
Brown		1.15 (1.06-1.26)	1.10(1.01-1.21)	0.90(0.82-0.98)
Marital status				
With a partner	-	-	-	-
Without a partner				
Level of education	**p = 0.53	**p = < 0.001	**p = 0.74	**p = 0.04
JHS incompl.	1.00	1.00	1.00	1.00
JHS compl.	0.93 (0.83-1.04)	0.89 (0.80-0.98)	0.98(0.88-1.09)	1.06 (0.95-1.18)
HS compl.	0.94 (0.84-1.04)	0.87 (0.79-0.96)	1.01 (0.91-1.11)	1.07 (0.96-1.18)
HS + PG	0.95 (0.83-1.09)	0.81 (0.71-0.92)	0.94 (0.83-1.06)	1.14 (1.00-1.29)
Income	**p = 0.04	**p = 0.61	**p = 0.71	**p = 0.13
< 1 MW	1.00	1.00	1.00	1.00
1 to 2 MW	1.08 (0.91-1.28)	1.00 (0.87-1.14)	0.99 (0.85-1.17)	0.91 (0.77-1.09)
3 to 5 MW	1.14 (0.96-1.35)	0.95 (0.83-1.09)	1.03 (0.88-1.20)	0.96 (0.81-1.15)
> 5 MW	1.19 (0.98-1.44)	0.99 (0.85-1.15)	1.01 (0.85-1.21)	1.03 (0.85-1.26)
Welfare benefits				*p = 0.51
Not received	-	-	-	1.00
Bolsa Família				1.03 (0.91-1.17)
Pens. other				0.96 (0.89-1.04)
Area	*p = 0.20	* p= < 0.001	*p = < 0.001	*p = 0.72
Poorer	1.00	1.00	1.00	1.00
More affluent	1.05 (0.96-1.15)	0.83 (0.75-0.91)	0.82 (0.75-0.90)	1.01 (0.93-1.10)
Nº household members	**p = 0.04	**p = < 0.001	**p = < 0.001	
≤ 3	1.00	1.00	1.00	-
4-5	0.92 (0.85-1.00)	1.06 (0.98-1.14)	1.04 (0.96-1.12)	
≥ 6	0.93 (0.82-1.04)	1.22 (1.11-1.34)	1.17 (1.05-1.30)	

Legend: PR = prevalence ratio; 95% CI = 95% confidence interval; JHS = junior high school; HS = high school; HE = higher education; MW = minimum wage; CCB = Continuous Cash Benefit. *Wald test; **test for linearity.

Source: Authors.

ars, fats and sodium[42-44]. Data from recent studies in Brazil show that ultra-processed foods account for a large share of calorie intake (49.2%[43] and 50.6%[44]) in younger individuals. Similar results were found in Canada (51.2%)[45], the United States (57.9%)[46] and United Kingdom (50.4%)[47], where diets were made up predominantly of industrialized foods.

Table 5. Food purchase locations and form of transport, eating places and association with dietary patterns among individuals in a city in the south of Brazil. Porto Alegre, RS, 2018-2019 (n = 400).

Variables (n)	Healthy n (%)	p-value	Traditional n (%)	p-value	Carbs and Sugars n (%)	p-value	Fast food n (%)	p-value
Purchase location								
Industrialized products								
Superm.+ market + wholesale (390)	131 (33.6)		132 (33.8)		130 (33.3)		132 (33.8)	
Market/fruit and vegetable markets + Public market (1)	0 (0.0)	0.77	0 (0.0)	0.59	1 (100.0)	0.28	0(0.00)	0.59
Other1 (9)	3 (33.3)		2 (22.2)		2 (22.2)		2 (22.2)	
Fruits								
Superm.+ market + wholesale (306)	99 (32.4)		113 (36.9)		109 (35.6)		98 (32.0)	
Market/fruit and vegetable markets + Public market (71)	28 (39.4)	0.49	18 (25.4)	0.01	20 (28.2)	0.12	26 (36.6)	0.44
Other1 (23)	7 (30.4)		3 (13.0)		4 (17.4)		10 (43.5)	
Vegetables and legumes								
Superm.+ market + wholesale (304)	100 (32.9)		113 (37.2)		108 (35.5)		97 (31.9)	
Market/fruit and vegetable markets + Public market (75)	29 (38.7)	0.50	18 (24.0)	< 0.001	22 (29.3)	0.14	30 (40.0)	0.39
Other1 (19)	5 (26.3)		2 (10.5)		3 (15.8)		7 (36.8)	
Meats								
Superm.+ market + wholesale (284)	98 (34.5)		105 (37.0)		93 (32.7)		99 (34.9)	
Market/fruit and vegetable markets + public market + butcher (97)	27 (27.8)	0.47	26 (26.8)	0.11	35 (36.1)	0.77	26 (26.8)	0.14
Other2 (14)	5 (35.7)		3 (21.4)		4 (28.6)		7 (50.0)	
Bread								
Superm.+ market + wholesale (276)	96 (34.8)		84 (30.4)		81 (29.3)		100 (36.2)	
Delicatessen/bakery + bar + grocery store (112)	32 (28.6)	0.23	47 (42.0)	0.07	47 (42.0)	0.04	32 (28.6)	0.15
Other3 (12)	6 (50.0)		3 (25.0)		5 (41.7)		2 (16.7)	
Rice and beans								
Superm.+ market + Wholesale (378)	127 (33.6)		131 (34.7)		129 (34.1)		127 (33.6)	
Market/fruit and vegetable markets + public market (9)	5 (55.6)	0.06	1 (11.1)	0.15	1 (11.1)	0.28	2 (22.2)	0.64
Forrm of transport								
Industrialized products								
On foot + bicycle (235)	79 (33.6)	0.98	88 (37.4)	0.05	80 (34.0)	0.62	66 (28.1)	<0.001
Car/motorbike + Public transp. (164)	55 (33.5)		46 (28.0)		52 (31.7)		68 (41.5)	
Fruits								
On foot + bicycle (232)	78 (33.6)	0.98	84 (36.2)	0.20	79 (34.1)	0.65	67 (28.9)	0.03
Car/motorbike + Public transp. (163)	55 (33.7)		49 (30.1)		52 (31.9)		64 (39.3)	
Meats								
On foot + bicycle (189)	61 (32.3)	0.82	76 (40.2)	0.01	61 (32.3)	0.59	63 (33.3)	1.00
Car/motorbike + public transp. (204)	68 (33.3)		58 (28.4)		71 (34.8)		68 (33.3)	
Bread								
On foot + bicycle (278)	85 (30.6)	0.17	107 (38.5)	< 0.001	97 (34.9)	0.33	81 (29.1)	<0.001
Car/motorbike + public transp. (117)	44 (37.6)		26 (22.2)		35 (29.9)		52 (44.4)	
Other1(12)	1 (8.3)		2 (16.7)		3 (25.0)		5 (41.7)	
Rice and beans								
On foot + bicycle (226)	76 (33.6)	0.98	84 (37.2)	0.11	78 (34.5)	0.59	62 (27.4)	<0.001
Car/motorbike + public transp. (166)	56 (33.7)		49 (29.5)		53 (31.9)		69 (41.6)	

it continues

Table 5. Food purchase locations and form of transport, eating places and association with dietary patterns among individuals in a city in the south of Brazil. Porto Alegre, RS, 2018-2019 (n = 400).

Variables (n)	Healthy n (%)	p-value	Traditional n (%)	p-value	Carbs and Sugars n (%)	p-value	Fast food n (%)	p-value
Eating place								
Lunch								
At home (273)	92 (33.7)	0.90	103 (37.7)	< 0.001	96 (35.2)	0.23	76 (27.8)	<0.001
Away from home or doesn't have meal (127)	42 (33.1)		31 (24.4)		37 (29.1)		58 (45.7)	
Dinner								
At home (327)	110 (33.6)	0.90	108 (33.0)	0.67	101 (30.9)	0.03	112 (34.3)	0.50
Away from home or doesn't have meal (73)	24 (32.9)		26 (35.6)		32 (43.8)		22 (30.1)	

Legend: MW = minimum wage; CCB = Continuous Cash Benefit. [1] Delicatessen/bakery + bar + grocery store + butcher + home vegetable garden + community vegetable garden + donations + other. [2] Delicatessen/bakery + bar + grocery store + home vegetable garden + community vegetable garden + donations + other. [3] Market/fruit and vegetable markets + public market + home vegetable garden + community vegetable garden + donations + other. P-value: Pearson's chi-squared

Source: Authors.

Few studies have investigated the influence of race/skin color on food consumption. A study comparing the dietary patterns of white and black Americans showed that a dietary pattern based on processed meats, fried foods, refined grains, sugar, margarine, candies and fats was more common among black people[48]. In Brazil, national surveys showed that being black or brown was associated with higher consumption of beans, meat and milk with high fat content, and lower consumption of fruits and vegetables, indicating that food choices may be associated with price. In a society characterized by racism, as a category of socioeconomic status, race/skin color is a determining factor in individual life trajectories[49].

Having a higher level of education was directly associated with the fast-food dietary pattern, which is consistent with other studies[22,24], and inversely associated with the Traditional dietary pattern. In a study with women in the south of Brazil, Lenz *et al.* found that a consumption pattern associated with high risk of CNCDs, based on candies, biscuits, cheeses, mayonnaise, fried food and other items, was more common among women with a higher level of education[22]. These findings show that higher level of education is not necessarily associated with healthy food choices. A recent systematic review reinforced the complexity of the relationship between level of education and the dietary patterns of Brazilians, showing that higher level of education was directly associated with a "dual" dietary pattern, with individuals consuming both healthy products and high-sugar and high-fat foods and drinks[49].

Income was associated only with higher consumption of the Healthy dietary pattern, being the only socioeconomic variable associated with this pattern after adjustment. The foods that make up the Healthy dietary pattern (fruits, legumes, vegetables and whole-grain cereals) are usually more expensive than ultra-processed foods and the consumption of these foods is higher among individuals with higher income[49]. The literature shows that individuals of lower socioeconomic status generally live in areas lacking services, hampering access to food purchase locations such as markets, and growers' markets/fruit and vegetable markets[50,51].

In addition, availability and access to healthy foods is more restricted in vulnerable areas and, when available, these foods tend to be of lower quality and more expensive. On the other hand, exposure to unhealthy foods is greater in these areas, since foods are sold in small establishments and convenience stores[50,51]. These findings corroborate the results of the current study, which show that the Traditional and Refined Carbs and Sugars dietary patterns were more common among individuals living in poorer areas.

According to Boyle, Stone-Francisco, and Samuels[52] and Story *et al.*[53], the food environment can be characterized as follows: the physi-

cal presence of a food that affects a person's diet; a person's proximity to food store locations; the distribution of food stores, food service, and any physical entity by which food may be obtained; and a connected system that allows access to food. Our findings show that people with high consumption of the Traditional dietary pattern bought fruits and vegetables in supermarkets, markets and/or warehouse stores. In these locations, this type of food is usually more expensive than in growers' markets/fruit and vegetable markets, meaning that people place priority on basic food items, reducing purchases of fresh fruits and vegetables[50,51]. Studies in the United States show that industrialized products like snacks, desserts and soft-drinks are generally purchased in large supermarket chains[54,55]. In Brazil, studies suggest that 54% of household food expenditure was in supermarkets or hypermarkets, reaching 67% in the state of Rio Grande do Sul[10,13].

The findings show that the choice of forms of transport for food purchases may be related to socioeconomics characteristics, as individuals with high consumption of the Traditional dietary pattern went on foot or by bicycle to buy food, while those with high consumption of the fast-food dietary pattern used a car/motorbike or public transport.

One of the goals of studies investigating the relationship between food environment and health is the identification of eating places. The results of the present study show that most individuals ate main meals at home and eating lunch or dinner away from home was associated with the Refined Carbs and Sugars and fast-food patterns. Other studies in Brazil show that eating away from home is associated with an increased share of ultra-processed foods in the diet, as some of the most commonly chosen food items are soft-drinks and fast food snacks[56-58].

National survey data demonstrate that spending on eating out as a proportion of overall monthly food spending in urban areas rose from 25.7% in 2002-2003 to 33.9% in 2017-2018[59], following global trends. The increase in consumption of foods away from home may indicate that structural changes in the economy and society have restricted the amount of time available, consequently increasing the demand for ready-to-eat foods[56,60]. The World Health Organization highlights that increased consumption of this type of food is potentially associated with a rise in the incidence CNCDs such as diabetes andhypertension[61].

This study has some limitations. First, the use of a retrospective method may have led to recall errors. It is also important to highlight that the method used to assess dietary patterns is limited by the subjectivity of the decisions taken by the researchers. Furthermore, cross-sectional studies are unable to determine temporal relationship between exposure variables and outcomes. The fact that the study was conducted with a population from the catchment area of a primary care unit means that the sample is not representative of the general population. This means that caution should be taken when generalizing the findings to other groups.

However, this study is one of the first to investigate dietary patterns among adults and older persons in the center of big cities, including people living in poor areas.

Final considerations

Variables that indicate lower socioeconomic status were associated with higher consumption of less healthy but more affordable dietary patterns (Traditional and/or Refined Carbs and Sugars, which are composed predominantly of ultra-processed foods).

On the other hand, higher socioeconomic status was associated with higher consumption of the Healthy pattern, which is rich in fruits and vegetables, and/or the fast-food pattern, which is rich in fatty snacks and more expensive foods. It is therefore concluded that people of higher socioeconomic status have the opportunity to choose between healthy and unhealthy dietary patterns, while individuals of lower socioeconomic status are restricted to more affordable, monotonous and generally poor-quality dietary patterns.

The food environment influences the purchase of particular foods and thus dietary patterns. Individuals who adhered to the Traditional dietary pattern purchased food in supermarkets, markets and warehouse stores, and thus bought less fruits, vegetables and legumes, probably because they are more expensive, prioritizing staple foods such as rice and beans. Eating lunch or dinner away from home was associated with the consumption of less healthy dietary patterns (Fast Food and Refined Carbs and Sugars).

The findings of this study can contribute to improving health and food policies and reorganizing the logistic structures of food supply, thus helping to address unfair differences.

Collaborations

CML Cunha, R Canuto, PBZ Rosa participated in the study design, data collection, analysis and interpretation of data and writing of the article. I Schuch participated in the study design, organization of data collection, writing and critical review of the article, LS Longarai participated in the collection and organization of data and writing of the article.

References

1. Hu FB. Dietary patterns analysis: a new direction in nutritional epidemiology. *Curr Opin Lipidol* 2002; 13(1):3-9.
2. Martins APB, Levy RB, Claro RM, Moubarac JC, Monteiro CA. Participação crescente de produtos ultraprocessados na dieta brasileira (1987-2009). *Rev Saude Publica* 2013; 47(4):656-665.
3. Costa Louzada ML, Martins AP, Canella DS, Baraldi LG, Levy RB, Claro RM, Moubarac JC, Cannon G, Monteiro CA. Ultra-processed foods and the nutritional dietary profile in Brazil. *Rev Saude Publica* 2015; 49:38.
4. Sichieri R, Castro JFG, Moura AS. Fatores associados ao padrão de consumo alimentar da população brasileira urbana. *Cad Saude Publica* 2003; 19(Suppl. 1):S47-S53.
5. Krieger JP, Pestoni G, Cabaset S, Brombach C, Sych J, Schader C, Faeh D, Rohrmann S. Dietary patterns and their sociodemographic and lifestyle determinants in Switzerland: results from the National Nutrition Survey *menuCH*. *Nutrients* 2018; 11(1):62.
6. Chen L, Zhu H, Gutin B, Dong Y. Race, gender, family structure, socioeconomic status, dietary patterns, and cardiovascular health in adolescents. *Curr Dev Nutr* 2019; 3(11):nzz117.
7. Pérez-Tepayo S, Rodríguez-Ramírez S, Unar-Munguía M, Shamah-Levy T. Trends in the dietary patterns of Mexican adults by sociodemographic characteristics. *Nutr J* 2020; 19:51.
8. Swinburn B, Sacks G, Vandevijvere S, Kumanyika S, Lobstein T, Neal B, Barquera S, Friel S, Hawkes C, Kelly B, L'abbé M, Lee A, Ma J, Macmullan J, Mohan S, Monteiro C, Rayner M, Sanders D, Snowdon W, Walker C; INFORMAS. INFORMAS (International Network for Food and Obesity/non-communicable diseases Research, Monitoring and Action Support): overview and key principles. *Obes Rer* 2013; 14(Suppl. 1):1-12.
9. Backes V. *Ambiente alimentar urbano de São Leopoldo: identificação, descrição e relação com a obesidade* [tese]. São Leopoldo: Universidade do Vale do Rio dos Sinos, Programa de Pós-Graduação em Saúde Coletiva; 2017.
10. Herforth A, Ahmed S. The food environment, its effects on dietary consumption, and potential for measurement within agriculture-nutrition interventions. *Food Sec* 2015; 7:505-520.
11. Azevedo SJS. *Segregação e oportunidades de acesso aos serviços básicos de saúde em Campinas: vulnerabilidades sociodemográficas no espaço intra-urbano*. Campinas: Unicamp, Núcleo de Estudos de População; 2014.
12. Instituto Brasileiro de Geografia e Estatística (IBGE). *Censo Demográfico 2010. Características da população e dos domicílios: resultados do universo*. Rio de Janeiro: IBGE; 2011.
13. Programa das Nações Unidas para o Desenvolvimento (PNUD), Instituto de Pesquisa Econômica e Aplicada IPEA, Fundação João Pinheiro. *Atlas do Desenvolvimento Humano no Brasil*. 2013. [acessado 2020 Mar 19]. Disponível em: http://www.atlasbrasil.org.br/2013

14. Anjos LA, Wahrlich V, Vasconcellos MT, Souza DR, Olinto MT, Waissmann W, Henn RL, Rossato SL, Lourenço AE, Bressan AW. Development of a food frequency questionnaire in a probabilistic sample of adults from Niterói, Rio de Janeiro, Brazil. *Cad Saude Publica* 2010; 26(11):2196-2204.
15. Machado FCS, Henn RL, Olinto MTA, Anjos LA, Wahrlich V, Waissmann W. Reprodutibilidade e validade de um questionário de frequência alimentar por grupos de alimentos, em adultos da Região Metropolitana de Porto Alegre, Brasil. *Rev Nutr* 2012; 25(1):65-77.
16. Panagiotakos D. αpriori versus αposterior methods in dietary pattern analysis: a review in nutrition epidemiology. *Nutrition Bulletin* 2008; 33(4):311-315.
17. Olinto MTA. Padrões alimentares: análise de componentes principais. In: Kac G, Sichieri R, Gigante DP, organizadores. *Epidemiologia nutricional*. Rio de Janeiro: Fiocruz/Atheneu; 2007. p. 213-225.
18. Newby PK, Tucker KL. Empirically derived eating patterns using factor or cluster analysis: a review. *Nutr Rev* 2004; 62(5):177-203.
19. Hoffmann M, Mendes KG, Canuto R, Garcez AS, Theodoro H, Rodrigues AD, Dalpicolli A, Olinto MTA. Padrões alimentares de mulheres no climatério em atendimento ambulatorial no Sul do Brasil. *Cien Saude Colet* 2015; 20(5):1565-1574.
20. Hu FB, Rimm E, Smith-Warner SA, Feskanich D, Stampfer MJ, Ascherio A, Sampson L, Willett WC. Reproducibility and validity of dietary patterns assessed with a food-frequency questionnaire. *Am J Clin Nutr* 1999; 69(2):243-249.
21. Hair JF, Anderson RE, Tatham RL, Black WC. Análise de agrupamentos. In: Hair JF, Anderson RE, Tatham RL, Black WC. *Análise multivariada de dados*. Porto Alegre: Bookman; 2005. p. 380-419.
22. Lenz A, Olinto MTA, Dias-da-Costa JS, Alves AL, Balbinotti M, Pattussi MP, Bassani DG. Socioeconomic, demographic and lifestyle factors associated with dietary patterns of women living in Southern Brazil. *Cad Saude Publica* 2009; 25(6):1297-1306.
23. Alves ALS, Olinto MTA, Costa JSD, Bairros FS, Balbinotti MAA. Padrões alimentares de mulheres adultas residentes em área urbana no sul do Brasil. *Rev Saude Publica* 2006; 40(5): 865-873.
24. Ternus DL, Henn RL, Bairros F, Costa JS, Olinto MTA. Padrões alimentares e sua associação com fatores sociodemográficos e comportamentais: Pesquisa Saúde da Mulher 2015, São Leopoldo (RS). *Rev Bras Epidemiol* 2019; 22:e190026.
25. Poltronieri TS, Gregoletto MLO, Cremonese C. Padrões alimentares e fatores associados em docentes de uma instituição privada de ensino superior. *Cad Saude Colet* 2019; 27(4):390-403.
26. Gimeno SGA, Mondini L, Moraes SA, Freitas ICM. Padrões de consumo de alimentos e fatores associados em adultos de Ribeirão Preto, São Paulo, Brasil: Projeto OBEDIARP. *Cad Saude Publica* 2011; 27(3):533-545.
27. Ferreira-Nunes PM, Papini SJ, Corrente JE. Padrões alimentares e ingestão de nutrientes em idosos: análise com diferentes abordagens metodológicas. *Cien Saude Colet* 2018; 23(12):4085-4094.
28. Arruda SP, da Silva AA, Kac G, Goldani MZ, Bettiol H, Barbieri MA. Socioeconomic and demographic factors are associated with dietary patterns in a cohort of young Brazilian adults. *BMC Public Health* 2014; 14:654.
29. Aguiar OB, Vasconcelos AGG, Barreiro PLD. Identificação de padrões alimentares: comparação das técnicas de análise de componentes principais e de principais eixos fatoriais. *Rev Bras Epidemiol* 2019; 22:e190048.
30. Cattafesta M, Zandonade E, Bissoli NS, Salaroli LB. Padrões alimentares de trabalhadores bancários e sua associação com fatores socioeconômicos, comportamentais e laborais. *Cien Saude Colet* 2019; 24(10):3909-3922.
31. Nogueira VC, Arruda SPM, Sampaio HAC, Rodrigues BC, Silva EB, Farias BO, Sabóia KM. Fatores socioeconômicos, demográficos e de estilo de vida associados a padrões alimentares de trabalhadores em turnos. *Cien Saude Colet* 2019; 24(3):761-769.
32. Cardoso Lde O, Carvalho MS, Cruz OG, Melere C, Luft VC, Molina Mdel C, Faria CP, Benseñor IM, Matos SM, Fonseca Mde J, Griep RH, Chor D. Eating patterns in the Brazilian Longitudinal Study of Adult Health (ELSA-Brasil): an exploratory analysis. *Cad Saude Publica* 2016; 32(5):e00066215.
33. Massarani FA, Cunha DB, Muraro AP, Souza BSN, Sichieri R, Yokoo EM. Agregação familiar e padrões alimentares na população brasileira. *Cad Saude Publica* 2015; 31(12):2535-2545.
34. Olinto MTA, Willett WC, Gigante DP, Victora CG. Sociodemographic and lifestyle characteristics in relation to dietary patterns among young Brazilian adults. *Public Health Nutr* 2011; 14(1):150-159.
35. Assumpção D, Domene SMA, Fisberg RM, Canesqui AM, Barros MBA. Diferenças entre homens e mulheres na qualidade da dieta: estudo de base populacional em Campinas, São Paulo. *Cien Saude Colet* 2017; 22(2):347-358.
36. Lins APM, Sichieri R, Coutinho WF, Ramos EG, Peixoto MVM, Fonseca VM. Alimentação saudável, escolaridade e excesso de peso entre mulheres de baixa renda. *Cien Saude Colet* 2013; 18(2):357-366.
37. Figueiredo ICR, Jaime PC, Monteiro CA. Fatores associados ao consumo de frutas, legumes e verduras em adultos da cidade de São Paulo. *Rev Saude Publica* 2008; 42(5):777-785.
38. Baker AH, Wardle J. Sex differences in fruit and vegetable intake in older adults. *Appetite* 2003; 40(3):269-275.
39. Brasil. Ministério da Saúde (MS). *Vigitel Brasil 2018. Vigilância de fatores de risco e proteção para doenças crônicas por inquérito telefônico*. Brasília: MS; 2019.
40. Estima CCP, Philippi ST, Alvarenga MS. Fatores determinantes de consumo alimentar: por que os indivíduos comem o que comem? *Rev Bras Nutr Clin* 2009; 24(4):263-268.
41. Avelar AE, Rezende DC. Hábitos alimentares fora do lar: um estudo de caso em Lavras-MG. *Organizações Rurais & Agroindustriais* 2013; 15(1):137-152.
42. Bielemann RM, Motta JVS, Minten GC, Horta BL, Gigante DP. Consumo de alimentos ultraprocessados e impacto na dieta de adultos jovens. *Rev Saude Publica* 2015; 49:28.

43. D'Avila HF, Kirsten VR. Consumo energético proveniente de alimentos ultraprocessados por adolescentes. *Rev Paul Pediatr* 2017; 35(1):54-60.
44. Enes CC, Camargo CM, Justino MIC. Ultra-processed food consumption and obesity in adolescents. *Rev Nutr* 2019; 32:e180170.
45. Moubarac JC, Batal M, Louzada ML, Martinez Steele E, Monteiro CA. Consumption of ultra-processed foods predicts diet quality in Canada. *Appetite* 2017; 108:512-520.
46. Martinez Steele E, Baraldi LG, Louzada MLC, Moubarac JC, Mozaffarian D, Monteiro CA. Ultra-processed foods and added sugars in the US diet: evidence from a nationally representative cross-sectionalstudy. *BMJ Open* 2016; 6(3):e009892.
47. Monteiro CA, Moubarac JC, Levy RB, Canella DS, Louzana MLC, Cannon G. Household availability of ultra-processed foods and obesity in nineteen European countries. *Public Health Nutr* 2018; 21(1):18-26.
48. Judd SE, Gutiérrez OM, Newby PK, Howard G, Howard VJ, Locher JL, Kissela BM, Shikany JM. Dietary patterns are associated with incident stroke and contribute to excess risk of stroke in Black Americans. *Stroke* 2013; 44(12):3305-3311.
49. Canuto R, Fanton M, Lira PIC. Iniquidades sociais no consumo alimentar no Brasil: uma revisão crítica dos inquéritos nacionais. *Cien Saude Colet* 2019; 24(9):3193-3212.
50. Filomena S, Scanlin K, Morland KB. Brooklyn, New York foodscape 2007-2011: a five-year analysis of stability in food retail environments. *Int J Behav Nutr Phys Act* 2013; 10:46.
51. Mook K, Laraia BA, Oddo VM, Jones-Smith JC. Food security status and barriers to fruit and vegetable consumption in two economically deprived communities of Oakland, California, 2013-2014. *Prev Chronic Dis* 2016; 13:E21.
52. Boyle M, Stone-Francisco, S, Samuels SE. Environmental strategies and policies to suppor the althy eating and physical activity in low-income communities. *Journal of Hunger & Environmental Nutrition* 2007; 1(2): 3-25.
53. Story M, Nanney MS, Schwartz MB. Schools and obesity prevention: creating school environments and policies to promote healthy eating and physical activity. *Milbank Q* 2009; 87(1):71-100.
54. Stern D, Ng SW, Popkin BM. The nutrient content of U.S. household food purchases by storetype. *Am J Prev Med* 2016; 50(2):180-190.
55. Taillie LS, Ng SW, Popkin BM. Global growth of "big box" stores and the potential impact on human health and nutrition. *Nutr Rev* 2016; 74(2):83-97.
56. Queiroz PWV, Coelho AB. Alimentação fora de casa: uma investigação sobre os determinantes da decisão de consumo dos domicílios brasileiros. *Análise Econômica* 2017; 35:67-104.
57. Andrade GC. *Consumo de alimentos ultraprocessados fora de domicílio no Brasil* [dissertação]. São Paulo: Universidade de São Paulo, Faculdade de Medicina; 2017.
58. Bezerra IN, Cavalcante JB, Moreira TMV, Mota CC, Sicheiri R. Alimentação fora de casa e excesso de peso: uma análise dos mecanismos explicativos. *Rev Bras Promoç Saude* 2016; 29(3):455-461.
59. Instituto Brasileiro de Geografia e Estatística (IBGE). *Pesquisa de orçamentos familiares 2017-2018: primeiros resultados*. Rio de Janeiro: IBGE; 2019.
60. Bezerra IN, Sichieri R. Características e gastos com alimentação fora do domicílio no Brasil. *Rev Saude Publica* 2010; 44(2):221-229.
61. World Health Organization (WHO). *Diet, nutrition and prevention of chronic diseases*. Geneva: WHO; 2003.

Article submitted 22/05/2020
Approved 13/01/2021
Final version submitted 15/01/2021

Chief editors: Romeu Gomes, Antônio Augusto Moura da Silva