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Globalization and Food Processing: Food Consumption in Northeastern Brazil

Globalização e Processamento de Alimentos: Consumo Alimentar no Nordeste Brasileiro

Abstract

Introduction: The current globalized model of food production leads to the homogenization of diet, with a reduction in the consumption of unprocessed foods and the considerable participation of ultra-processed foods. **Objective:** Investigate factors associated with food consumption among adults considering the degree of food processing. **Methods:** A cross-sectional study was conducted with adults in the state of Pernambuco involving the assessment of food consumption. Data were also collected on sociodemographic characteristics, food insecurity and aspects related to food acquisition. A food frequency questionnaire was used to investigate food intake, with the categorization of foods according to the degree of processing and the subsequent analysis of consumption scores. Associations between food consumption and explanatory variables were evaluated using the Mann-Whitney U test and Kruskal-Wallis test, the latter of which was complemented with the post hoc Mann-Whitney U test. Associations with a p-value <0.05 were considered statistically significant. **Results:** One thousand sixty-six adults were interviewed. Most had a low level of schooling and low income, were beneficiaries of the income transfer program and were in a situation of food insecurity. These variables were associated with the consumption of particular food groups. Differences in consumption were found according to place of residence, sex, age group, mode of food acquisition, place of purchase and the habit of reading food labels. **Conclusions:** In the globalized context that stimulates the consumption of industrialized foods, aspects such as sex, economic status, place of residence and food purchasing environment and practices can serve as protective factors that ensure the greater consumption of minimally processed foods or risk factors for the consumption of ultra-processed foods products.

Keywords: Food consumption. Food processing. Food acquisition. Eating.

Resumo

Introdução: O atual modelo globalizado de produção de alimentos acarreta homogeneização na alimentação, com diminuição no consumo de alimentos *in natura* e grande participação de ultraprocessados. **Objetivo:** Investigar os fatores associados ao consumo alimentar de adultos, considerando os níveis de processamento de alimentos. **Métodos:** Estudo transversal com adultos no estado de Pernambuco que avaliou o consumo alimentar e variáveis socioeconômicas, demográficas, segurança alimentar e outras relacionadas ao modo e prática de aquisição de alimentos. Foi utilizado questionário de frequência alimentar para investigação do consumo, com divisão dos alimentos conforme o nível de processamento, com posterior análise através de escores. Avaliou-se a associação entre consumo alimentar e variáveis

explicativas através dos testes “U” de Mann Whitney e Kruskal Wallis, com aplicação, neste último caso, do teste “U” de Mann Whitney a *posteriori*. Foram consideradas estatisticamente significantes associações com valor de $p < 0,05$. **Resultados:** Foram entrevistados 1.066 adultos, cuja maioria possuía baixa escolaridade, baixa renda, com participação em programa de transferência de renda e em situação de insegurança alimentar. Essas variáveis mostraram associação com o consumo de determinados grupos alimentares. Também foram observadas diferenças no consumo conforme características como local de moradia, sexo, faixa etária, modo de aquisição de alimentos, local de compra e hábito de leitura do rótulo. **Conclusões:** Diante do contexto globalizado de estímulo aos industrializados, aspectos como gênero, condições econômicas, local de moradia, ambiente e práticas de compra de alimentos podem se mostrar como protetores para maior consumo de alimentos minimamente processados ou de risco para o consumo de ultraprocessados.

Palavras-chave: Consumo alimentar. Processamento de alimentos. Aquisição de alimentos. Alimentação

INTRODUCTION

Human beings have been involved in food production since the beginning of humanity in the form of planting, hunting and gathering as well as in the act of cooking. The kitchen can be considered the first laboratory in history due to the transformations that take place in this environment, as the discovery of fire enabled the conversion of raw foods into cooked foods, which, according to Lévi-Strauss, also represents a change in the biological condition of humans as social beings.¹

Over the centuries, technological and industrial transformations altered the lifestyle of the population, including the relationship between humans and food. The production, conservation and preparation of foods – once restricted to the realm of the kitchen – were transferred to the industrial sector and the prevalent consumption of foods *in natura* (unprocessed) or “real foods” gave way to food products manufactured mainly by large multinationals.²

Industrial food production is currently centered on market issues, requiring the use of complex technologies for large-scale production. Thus, food, which is internationally recognized as a human right, took on the aspect of merchandise and large industries began to define what and how people eat.^{2,3} The result of this process has been an increase in the consumption of ultra-processed foods rich in sugars, fats and sodium as well as diverse additives and conservatives.^{4,5} Besides the inadequate nutritional composition with its consequences for the health status of individuals, such as high rates of obesity and chronic noncommunicable diseases, these products also exert an impact on dietary culture, social life and the environment through their forms of production, distribution and sales.^{4,6}

Considering the social, economic and environmental unsustainability, one can state that the hegemonic food system centered on this industrial production threatens the food and nutrition sovereignty and security of populations. This was all-the-more evident during the pandemic of the new coronavirus (Covid-19), which revealed that many Brazilians are denied the right to adequate, healthy food.^{7,8} Moreover, the results of the most recent Family Budget Survey (2017-2018) showed historic regional inequities regarding food and nutrition security, mainly affecting the northern and northeastern regions of the country.⁹

The act of eating goes beyond biological and physiological aspects. It has symbolic and cultural meaning for each society but is currently affected by the globalized model of consumption. Therefore, the aim of the present study was to analyze factors associated with food consumption among adults in a state located in northeastern Brazil.

METHODS

A cross-sectional study was conducted using data from the 4th State Health and Nutrition Survey – Chronic Noncommunicable Diseases in the State of Pernambuco: prevalence, associated factors, actions and health services. The study population was male and female adults between 20 and 59 years of age residing in private homes in 13 municipalities of the four regions of the state of Pernambuco in northeastern Brazil.

The sample size was calculated considering the prevalence of obesity to be 20%, a 95% confidence interval, 2.5% sampling error rate and a design effect of 1.5, with a 20% increase to compensate for possible dropouts, resulting in a sample of 1,768 individuals to ensure representativeness for the population aged 20 to 59 years. Two thousand thirty adults from urban and rural areas were interviewed. However, the population of interest for the present study comprised only those who answered the food consumption questionnaire, which totaled 1,066 individuals.

Probabilistic, stratified sampling was conducted in three stages. The primary units were municipalities, the secondary units were census sectors and the tertiary units were homes, from which information was collected on adult residents using questionnaires. Pregnant women and individuals with debilitating diseases (advanced stage of cancer, acquired immunodeficiency syndrome, nephropathy with kidney failure, gastroplasty and radical gastrectomy) were excluded.

Data collection occurred in 2015-2016. For the purposes of comparison, the questionnaire was based on the model used in the second and third State Health and Nutrition Surveys (1997 and 2006) with additional items necessary to meet the objectives of the present study. Data on food consumption, socioeconomic characteristics, food security and aspects related to practices associated with eating were used in this study.

A food frequency questionnaire (FFQ) adapted from Furlan-Viebig and Pastor-Valero¹⁰ was used to investigate food consumption, with the addition of some regional foods. The frequency of consumption (one to ten times) in five time periods (daily, weekly, monthly, annually or never) was recorded.

Food consumption was analyzed using a scoring system so that the consumption frequency of each food was treated as a quantitative variable. The categories of the FFQ were transformed into scores that represented consumption per day in one year. For each food, the number of times consumed was divided by the quantity of days (day = 1; week = 7; month = 30; year = 365). For example, the score was 1 if a given food was eaten once per day, 2 if eaten twice per day, 0.428 if eaten three times per week, 0.1 if eaten three times per month, 0.016 if eaten six times per year, and so on.

After the calculation of the consumption frequency scores, foods were classified into three groups according to the degree of processing based on the NOVA system: unprocessed or minimally processed foods (Group 1), processed foods (Group 2) and ultra-processed foods (Group 3).^{11,12} As the groups were composed of different numbers of foods, the mean score was calculated for each group to characterize food consumption.

Group 1 (unprocessed or minimally processed foods) corresponds to food extracted directly from plants or animals and those that are submitted only to cleaning process and the physical removal of inedible or undesirable parts for the fractioning or conservation of foods, not including the industrial addition of salt, sugar, fats or other substance to the original food.⁴ This group includes fruits, vegetables, roots, tubers, beans, beef, poultry, fish, eggs, rice, pasta, cassava meal, corn meal, milk, coffee and fruit juice.

Group 2 (processed foods) comprises products to which salt, sugar or other culinary substances are added to unprocessed foods during the fabrication process to increase palatability and shelf life.⁴ This group includes cheese, bread rolls, canned tuna, canned sardines and jerky.

Group 3 (ultra-processed foods) comprises industrial formulations composed entirely or mainly of substances extracted from foods, derivatives of food constituents or formulated in the laboratory, such as dyes, flavoring and additives, to make the product sensorially more attractive to the consumer.⁴ This group is composed of processed meats, sliced bread, hamburger/hotdog buns, chips, cookies, crackers, instant pasta, candy, ketchup, whole-fat sweetened flavored yogurt, chocolate milk, carbonated soft drinks (soda) and artificial juices.

The sociodemographic characteristics evaluated were place of residence, sex, age, skin color/ethnicity, schooling, income per capita and benefits from the Family Grant Program. Food-related practices were evaluated through questions addressing the acquisition of foods (purchased; purchased and produced; donations), place of purchase of most foods consumed by the family (supermarket or minimarket/farmer's market/greengrocery) and the practice of reading food labels (always/sometimes or rarely/never).

The food security situation (dimension related to access to food) was evaluated using the Brazilian Food Insecurity Scale, which contains 14 questions. Each affirmative answer is awarded one point and the sum of the points corresponds to the final score, which is classified based on the presence or absence of individuals younger than 18 years of age in the home. Food security was recorded for homes that answered negatively to all ten questions (0 points). Food insecurity (FI) was categorized as mild (1-5 points for homes with individuals < 18 years of age or 1-3 points for homes without individuals < 18 years of age), moderate (6-9 points for homes with individuals < 18 years of age or 4-5 points for homes without individuals < 18 years of age) or severe (10-14 points for homes with individuals < 18 years of age or 6-8 points for homes without individuals < 18 years of age).¹³

Data analysis was performed with the aid of the IBM SPSS® package, version 13.0. Descriptive analysis involved the calculation of absolute and relative frequencies of the categorical variables. As the food consumption frequency scores were on an ordinal scale, these variables were expressed as median and interquartile range.

With the exception of the food security variable, a statistical resource (multiple imputation) was used for variables with missing values (schooling, income per capita, receiving benefits from Family Grant Program and place of purchase of most foods consumed by family).

Associations between food consumption and explanatory variables were evaluated using the Mann-Whitney U test (two medians) and Kruskal-Wallis test (more than two medians), the latter of which was complemented with the post hoc Mann-Whitney U test. Associations with a p-value <0.05 were considered statistically significant.

This study received approval from the institutional review board of the Centro de Ciências da Saúde [Center for Health Sciences] of Universidade Federal de Pernambuco [Federal University of Pernambuco] in accordance with the norms governing research involving human subjects stipulated in Resolution 466/2012 of the Conselho Nacional de Saúde [National Board of Health] (certificate number: 07803512.9.0000.5208).

RESULTS

Among the 1,066 interviewees, 40.2% resided in the metropolitan region of the city of state capital (Recife), 62.9% were women, 63.3% were between 20 and 39 years of age and 66% had self-declared brown skin color. The majority had less than 11 years of schooling (66.9%); 75.9% received up to only one-half of the monthly minimum wage per capita and 55% were beneficiaries of the Family Grant Program (Table 1).

Table 1. Sociodemographic characteristics of adults from state of Pernambuco, 2015-2016

Variáveis	Total	
	N=1066	%
<i>Área de residência</i>		
Região Metropolitana do Recife	429	40,2
Interior urbano	348	32,7
Interior rural	289	27,1
<i>Sexo</i>		
Masculino	395	37,1
Feminino	671	62,9

Table 1. Sociodemographic characteristics of adults from state of Pernambuco, 2015-2016. (Continues)

Variáveis	Total	
	N=1066	%
<i>Idade (anos)</i>		
20-29	330	31,0
30-39	344	32,3
40-49	211	19,7
50-59	181	17,0
<i>Cor/Raça</i>		
Branca	254	23,8
Preta	100	9,4
Parda/Amarela/indígena**	712	66,8
<i>Escolaridade (anos)</i>		
< 4 anos	263	24,7
4 a 7 anos	266	25,0
8 a 10 anos	184	17,2
≥ 11 anos	353	33,1
<i>Renda per capita (SM)</i>		
Até 1/4	421	39,5
>1/4 a <1/2	388	36,4
1/2 a < 1	189	17,7
>1	68	6,4
<i>Recebe Bolsa Família</i>		
Sim	586	55,0
Não	480	45,0

* monthly minimum wage: R\$788 in 2015; R\$880 in 2016

** yellow and indigenous: 8 cases (0.8%)

Table 2 displays data on food insecurity and food acquisition practices. A total of 70.9% of the individuals experienced some degree of FI, with 45% in situations of moderate to severe FI. The vast majority (82.7%) acquired foods only through purchases; 49.7% purchased foods at supermarkets and 50.3% purchased foods from other neighborhood establishments. Regarding purchasing practices, the majority (76.3%) did not have the habit of reading the ingredients in the products acquired.

Table 2. Características antropométricas, de composição corporal, clínicas e bioquímicas de pacientes com doença renal crônica em hemodiálise, no Oeste da Bahia, 2020

Variables	Total	
	N = 1066	%
<i>Food insecurity (FI) (n = 1056)</i>		
Food security	307	29.1
Mild FI	273	25.9
Moderate FI	351	33.2
Severe FI	125	11.8
<i>Mode of food acquisition for consumption</i>		
Purchased	882	82.7
Purchased and produced	67	6.3
Donations (besides purchasing and/or producing)	117	11.0
<i>Place of purchase of most foods for family</i>		
Supermarket	530	49.7
Minimarket/famer's market/greengrocery	536	50.3
<i>Reading of food labels</i>		
Always/sometimes	252	23.7
Rarely/never	814	76.3

Table 3 displays the associations between sociodemographic variables and food consumption. Residents of metropolitan Recife consumed more processed foods ($p < 0.001$), whereas residents of rural areas consumed fewer processed foods and ultra-processed foods ($p < 0.001$). Men had a higher median consumption of minimally processed foods compared to women ($p = 0.001$). Younger individuals (20 to 29 years) consumed fewer minimally processed foods compared to other age groups ($p = 0.04$). Moreover, the consumption of ultra-processed foods decreased with the increase in age ($p < 0.001$). Individuals with less than four years of schooling consumed fewer processed foods and ultra-processed foods ($p < 0.001$). Individuals with a lower family income ($\leq \frac{1}{4}$ the monthly minimum wage) consumed fewer minimally processed foods and processed foods ($p < 0.001$). Beneficiaries of the Family Grant Program consumed fewer processed foods than those who were not beneficiaries ($p < 0.001$).

Table 3. Median and interquartile range of food consumption scores according to sociodemographic variables of adults from state of Pernambuco, 2015-2016

Variables	Food groups (consumption scores)					
	Unprocessed or minimally processed foods		Processed foods		Ultra-processed foods	
	Med	IQR	Med	IQR	Med	IQR
<i>Place of residence</i>						
Metropolitan region of Recife	0.30	0.24-0.37	0.31 ^a	0.20-0.46	0.15 ^a	0.09-0.22
Urban instate area	0.31	0.24-0.38	0.23 ^b	0.14-0.35	0.14 ^a	0.08-0.23
Rural instate area	0.29	0.22-0.38	0.16 ^c	0.09-0.26	0.12 ^b	0.07-0.18
<i>p</i> -value**	0.52		<0.001		<0.001	
<i>Sex</i>						
Male	0.31	0.25-0.40	0.26	0.14-0.37	0.14	0.08-0.21
Female	0.29	0.23-0.36	0.24	0.12-0.40	0.13	0.08-0.22
<i>p</i> -value*	0.001		0.39		0.73	
<i>Age (years)</i>						
20-29	0.28 ^a	0.23-0.36	0.25	0.14-0.37	0.18 ^a	0.12-0.27
30-39	0.30 ^b	0.24-0.39	0.25	0.14-0.35	0.14 ^b	0.09-0.21
40-49	0.31 ^b	0.25-0.38	0.24	0.12-0.39	0.11 ^c	0.07-0.17
50-59	0.31 ^b	0.24-0.40	0.23	0.12-0.43	0.09 ^d	0.04-0.13
<i>p</i> -value**	0.04		0.91		<0.001	
<i>Skin color/Ethnicity</i>						
White	0.30	0.23-0.37	0.29 ^a	0.18-0.41	0.13	0.08-0.22
Black	0.28	0.23-0.36	0.23 ^b	0.14-0.34	0.12	0.07-0.21
Brown/yellow/indigenous	0.30	0.24-0.38	0.23 ^b	0.12-0.37	0.14	0.08-0.21
<i>p</i> -value**	0.33		0.001		0.59	
<i>Schooling</i>						
< 4 years	0.28	0.22-0.37	0.16 ^a	0.09-0.31	0.10 ^a	0.05-0.16
4 to 7 years	0.30	0.23-0.39	0.24 ^b	0.14-0.40	0.13 ^b	0.08-0.22
8 to 10 years	0.30	0.25-0.37	0.26 ^b	0.17-0.40	0.17 ^c	0.10-0.26
≥11 years	0.31	0.24-0.38	0.28 ^c	0.17-0.41	0.15 ^{b,c}	0.10-0.22
<i>p</i> -value**	0.06		<0.001		<0.001	
<i>Family income per capita *</i>						
<1/4 x monthly min. wage*	0.28 ^a	0.22-0.36	0.21 ^a	0.10-0.34	0.13	0.08-0.21
>1/4 to <1/2 x monthly min. wage	0.31 ^b	0.25-0.39	0.26 ^b	0.14-0.37	0.14	0.09-0.21
>1/2 to <1 x monthly min. wage	0.31 ^b	0.24-0.38	0.28 ^c	0.19-0.44	0.14	0.08-0.24
> monthly min. wage	0.32 ^b	0.28-0.39	0.29 ^{b,c}	0.20-0.40	0.11	0.05-0.18
<i>p</i> -value**	<0.001		<0.001		0.15	
<i>Family Grant beneficiary</i>						
Yes	0.30	0.23-0.38	0.22	0.11-0.34	0.13	0.08-0.21
No	0.30	0.24-0.37	0.26	0.17-0.41	0.13	0.08-0.21
<i>p</i> -value*	0.67		<0.001		0.96	

Med: median; IQR: interquartile range. * Mann-Whitney U test; ** Kruskal-Wallis test. Post hoc test: Mann-Whitney U test.

^{a,b,c,d} different letters denote significant difference between categories.

Food security was significantly associated with all consumption categories. A reduction in the consumption score of all food groups was found as the severity of FI increased (Table 4).

Table 4. Median and interquartile range of food consumption scores according to food insecurity and food acquisition practices of adults from state of Pernambuco, 2015-2016

Variables	Food groups (consumption scores)					
	Unprocessed or minimally processed foods		Processed foods		Ultra-processed foods	
	Med	IQR	Med	IQR	Med	IQR
<i>Food Insecurity (FI)</i>						
Food security	0.31 ^a	0.25-0.39	0.29 ^a	0.18-0.40	0.14 ^a	0.08-0.23
Mild FI	0.31 ^a	0.25-0.38	0.26 ^a	0.15-0.38	0.14 ^a	0.09-0.22
Moderate FI	0.29 ^b	0.23-0.38	0.22 ^b	0.11-0.35	0.13 ^a	0.08-0.21
Severe FI	0.26 ^c	0.20-0.36	0.20 ^b	0.09-0.34	0.11 ^b	0.06-0.19
<i>p</i> -value**	<0.001		<0.001		0.003	
<i>Mode of food acquisition for consumption</i>						
Purchased	0.30	0.24-0.38	0.26 ^a	0.14-0.40	0.13	0.08-0.21
Purchased/produced	0.32	0.25-0.40	0.18 ^b	0.10-0.27	0.11	0.07-0.18
Donations (besides purchasing/producing)	0.29	0.21-0.37	0.23 ^a	0.11-0.40	0.14	0.07-0.21
<i>p</i> -value**	0.12		<0.001		0.39	
<i>Place of purchase of most foods for family</i>						
Supermarket	0.31	0.25-0.39	0.26	0.14-0.40	0.14	0.09-0.23
Minimarket/famer's market/greengrocery	0.29	0.22-0.36	0.23	0.12-0.36	0.13	0.07-0.21
<i>p</i> -value**	<0.001		0.02		0.01	
<i>Reading of food labels</i>						
Always/sometimes	0.32	0.26-0.40	0.27	0.17-0.40	0.14	0.09-0.21
Rarely/never	0.23	0.23-0.37	0.23	0.12-0.37	0.13	0.08-0.21
<i>p</i> -value**	<0.001		0.004		0.16	

Med: median; IQR: interquartile range. * Mann-Whitney U test; ** Kruskal-Wallis test. Post hoc test: Mann-Whitney U test. ^{a,b,c,d} different letters denote significant difference between categories.

Individuals who reported producing foods had a lower consumption of processed foods ($p < 0.001$). Individuals who purchased most foods that the family consumed from supermarkets had higher consumption of all three food categories. Individuals who had the habit of reading food labels consumed more minimally processed foods ($p < 0.001$) and processed foods ($p = 0.004$) (Table 4).

DISCUSSION

The act of processing foods has occurred since Antiquity. The use of fire and salt to prepare and cook foods enabled humans to advance in the development of food preservation methods. The current problem regards the global phenomenon of industrialization, which has led to changes in the purpose and extent of food processing, resulting in the creation of products with high palatability and a long shelf life produced from ingredients and additives that are profitable for the industry, but unhealthy for the population.⁶

This capitalistic mindset regarding the production of food as merchandise occurs on a large scale throughout the world and multinationals currently exercise considerable influence over food systems,

leading to a homogenized characteristic of food consumption in most societies. Moreover, multinationals of the food industry (“Big Food” and “Big Soda”) have placed increasing pressure on agencies of the United Nations in charge of drafting and implementing public food and nutrition policies to avoid the regulation of their activities.¹⁴ Food globalization (or dietary modernity) promotes a decline in cultural eating patterns and distances the consumer from the producer, causing confusion at the time of choosing and consuming foods.¹⁵

The set of demographic, socioeconomic and food acquisition variables analyzed in the present study enables a reflection on this aspect. Greater consumption of ultra-processed foods was found in urban populations, which is in agreement with data described by Canella et al.,¹⁶ who found greater family purchasing and individual consumption of ultra-processed foods in urban areas. Residents of rural areas may have limited access to ultra-processed food products due to sociodemographic, economic and cultural issues related to the environment in which they live, which may favor the maintenance of traditional eating patterns.

Reflections are needed regarding the sociological aspect of eating in the perspective put forth by Bourdieu, who addresses the occurrence of social distinctions in eating practices according to sex and level of education.¹⁵ In the present study, men consumed minimally processed foods more than women, which is in agreement with data from the 2017-2018 Family Budget Survey.¹⁷ This finding suggests that men in the population analyzed have greater access to healthy foods that offer protection from the development of chronic noncommunicable diseases. The lower consumption of healthy foods by women may be related to the traditional context of the domestic role assigned to women in the lower classes, which may impede them from being concerned with their own health due to the fact that their priority is to care for the family.¹⁸ Regional and cultural aspects may be related to this issue, as northeastern Brazil preserves the belief, especially among men, that meals that truly strengthens individuals should be based on beans, rice, meat, flour and other products in the category of minimally processed foods.

Older individuals tended to preserve traditional eating patterns and consume fewer ultra-processed foods. In contrast, the younger population had the lowest score in the present study regarding the consumption of minimally processed foods. These findings are compatible with the consumption profile reported in the 2017-2018 Family Budget Survey¹⁷ as well as the previous 2008-2009 Family Budget Survey, in which an increase in age was directly associated with the consumption of vegetables and inversely associated with the consumption of ultra-processed foods.¹⁶

Regarding socioeconomic aspects, the lower consumption scores among individuals with a lower income and beneficiaries of the Family Grant Program are related to the limited access to food due to situations of poverty and extreme poverty, as the price of food is a determinant factor of acquisition and consumption. Evaluating food consumption among beneficiaries of the Family Grant Program, Sperandio et al.¹⁹ found a lower percentage of the consumption of processed food products compared to non-beneficiaries in the northeastern and southeastern regions of Brazil.

The characteristics of the population studied, most of whom had a low income and low level of schooling and were beneficiaries of the Family Grant Program, underscore the importance of this income transfer program as a strategy for combating poverty and promoting food and nutrition security. Studies have shown that beneficiary families tend to spend a significant portion of the amount received on the purchase of food.^{19,20} However, the increase in access to foods in quantity and variety does not necessarily mean a reduction in FI, as one must consider the qualitative-nutritional aspects of the food acquired.^{20,21}

Overall, an increase has occurred in the acquisition of ready-to-eat products, even among the poorer strata of the Brazilian population, due to the increase in purchasing power related to the increase in income.²²

Food choices go beyond reasoning related to the nutritional aspects of products, as particular foods have symbolic value and representations of status, exerting an influence on their acquisition.²¹

Restrictions regarding access to healthy food due to financial issues, information or the dietary environment in which individuals find themselves lead to a scenario of food insecurity (FI) and, consequently, the violation of the human right to adequate food and nutrition. This was shown in the present study, as reductions were found in all good groups with the increase in the severity of FI.

Regarding the acquisition of foods, lower consumption of processed foods was found among food producers. Two hypotheses may be put forth to explain this finding: 1) as producers of food, most resided in rural areas, which may lead them to follow the consumption pattern of the surrounding population and 2) the act of producing food for subsistence leads to less need to purchase processed food products. Being involved in the production of unprocessed foods may lead to less interest in particular processed and ultra-processed products.²³ In a study involving family farmers in the state of Minas Gerais, Brazil, Batista et al.²⁴ found that 77.6% reported consuming the foods that they produced due to its quality, relating the consumption of these foods to health benefits.

Just as whole foods from the earth are known to be healthier, there is also the recognition that the main places for the sale of processed and ultra-processed foods are supermarket chains.²⁵ This occurs because supermarkets invest highly in advertising through mass communication and ultra-processed food products are publicized within these establishments as a strategy for financial gains. The variety and availability of brands and the possibility of offering lower prices are aspects that promote sales and the consumption of these products.^{25,26} In the present study, individuals who purchased foods more at supermarkets had greater consumption of all food categories, which may be due to the greater number of deals offered by this sector.

Individuals who had the habit of reading food labels consumed more minimally processed foods and processed foods. A higher income, higher level of schooling, knowledge about nutrition and concerns with eating may be associated with this habit.²⁷ The concern for better quality food may lead individuals who read food labels to consume more unprocessed foods. Many of these individuals also have a better socioeconomic status (greater purchasing power to acquire foods), which leads them to acquire more processed food products. It should be mentioned that the current Brazilian labeling norm does not favor knowledge regarding the actual nutritional value of products. Thus, clearer information is needed to reach a larger part of the population, including those with a lower level of schooling, and contribute to better food choices. Strategies such as front-of-pack nutrition information and warnings may be helpful in this regard.²⁸

This study has limitations inherent to the analysis of consumption using a scoring system with no cutoff points for adequacy/inadequacy established for each food group. Further studies are needed to investigate associations between consumption and other variables, such as those related to the dietary environment, with an analysis of the occurrence of "food deserts, swamps and oases",^{29,30} and also considering aspect of food culture.

The findings of the present study lead to a reflection on the complexity of factors associated with food consumption. In a globalized context that stimulates the consumption of industrialized foods, aspects such as sex, economic status, place of residence and food purchasing environment and practices can serve as protective factors that ensure the greater consumption of minimally processed foods or risk factors for the consumption of ultra-processed foods products. It is necessary to consider the socioeconomic and demographic contexts of populations, but analyses of the food system (from production to the distribution mode and acquisition) are also necessary and should consider the surrounding dietary environment. Public policies for the regulation of the food industry and the strengthening of strategies that promote adequate,

healthy eating are indispensable to ensuring the human right to adequate food and nutrition as well as promoting food and nutrition sovereignty and security, considering the context of inequalities, which became more evident during the current pandemic.

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Contributors

Silva CS contributed to the conception and design, analysis and interpretation of the data, writing, revision and approval of the final version of the manuscript. Lima MC contributed to the revision and approval of the final version of the manuscript. Curioni CC and Cabral PC contributed to the analysis and interpretation of the data. Villareal VIH and Valente FLS contributed to the revision and approval of the final version of the manuscript. Lira PIC and Batista Filho M contributed to the conception and design as well as the revision and approval of the final version of the manuscript.

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