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Factors associated with the consumption of food according to the degree of processing in the Primary Health Care

Fatores associados ao consumo de alimentos segundo o grau de processamento na Atenção Primária à Saúde

Abstract

Introduction: The consumption of a population can be related to socioeconomic, demographic and lifestyle factors, and its quality can be assessed according to the degree of food processing proposed by the NOVA Classification. ***Objective:*** Assess food consumption according to the degree of processing among users of primary health care in relation to socioeconomic, demographic and lifestyle conditions. ***Methods:*** Cross-sectional study conducted between September 2019 and March 2020, with adults and elderly users of primary health care in the city of Guidoval-MG. We elaborated a structured questionnaire with socioeconomic and demographic variables and a qualitative food frequency questionnaire, in which foods were classified according to the NOVA classification. We made Poisson regression with robust variance, remaining in the final model as variables with a significance level of less than 5%. We used the prevalence ratio with a 95% confidence interval as measure of effect. ***Results:*** We took 361 requests. We found a higher prevalence of regular consumption of ultra-processed foods among black individuals, living in urban areas, single and with higher socioeconomic status. Higher regular consumption of in natura or minimally processed foods was associated with white skin color, higher educational level and the practice of physical activity. ***Conclusions:*** Individual and contextual factors studied influence the consumption of in natura or minimally processed and ultra-processed foods, suggesting the need for greater intervention in specific population groups and emphasizing the importance of adopting a healthy diet.

Keywords: Primary Health Care. Food consumption. Industrialized Foods. Social Class. Socioeconomic Factors. Whole Foods.

Resumo

Introdução: O consumo alimentar de uma população pode estar relacionado a fatores socioeconômicos, demográficos e de estilo de vida, podendo sua qualidade ser avaliada de acordo com o grau de processamento de alimentos proposto pela Classificação NOVA. ***Objetivo:*** Avaliar o consumo de alimentos de acordo com o grau de processamento entre usuários da atenção primária à saúde em relação às condições socioeconômicas, demográficas e de estilo de vida. ***Métodos:*** Estudo transversal realizado entre setembro de 2019 e março de 2020, com adultos e idosos usuários da atenção primária à saúde no município de Guidoval-MG. Foi aplicado um questionário estruturado com variáveis socioeconômicas e demográficas e um questionário de frequência alimentar qualitativo, no qual os alimentos foram classificados conforme a classificação NOVA. Foi realizada regressão de Poisson com

variância robusta, permanecendo no modelo final as variáveis com nível de significância menor que 5%. A medida de efeito utilizada foi a razão de prevalência com intervalo de confiança de 95%. ***Resultados:*** Foram avaliados 361 indivíduos. Foi encontrada maior prevalência de consumo regular de alimentos ultraprocessados entre indivíduos negros, residentes em localidades urbanas, solteiros e com maior nível socioeconômico. O maior consumo regular de alimentos *in natura* ou minimamente processados foi associado à cor de pele branca, maior escolaridade e a prática de atividade física. ***Conclusões:*** Fatores individuais e contextuais estudados influenciaram o consumo de alimentos *in natura* ou minimamente processados e de ultraprocessados, sugerindo a necessidade de maior intervenção em grupos populacionais específicos e ressaltando a importância de se adotar uma alimentação saudável.

Palavras-chave: Atenção Primária à Saúde. Consumo de Alimentos. Alimentos Industrializados. Classe Social. Fatores Socioeconômicos. Alimentos Integrais.

INTRODUCTION

Dietary patterns in Brazil and in the world have changed in recent decades, marked by the reduction in the consumption of *in natura* or minimally processed foods, such as vegetables and fruit. On the other hand, there is an increase in the consumption of ultra-processed foods, such as processed meat, soft drinks and frozen foods.[1]

Due to this change in dietary patterns, the classification of food according to their degree of processing becomes an essential tool for verifying factors relevant to this transition process.[2] Thus, Monteiro and collaborators proposed the NOVA classification, which categorizes food and food products into four groups, according to the extent and purpose of the industrial processing to which they are submitted.[3]

Foods are classified into four groups: *in natura* or minimally processed foods, processed culinary ingredients, processed foods and ultra-processed foods.[3] *In natura* foods are obtained directly from plants or animals and acquired without being altered after leaving nature.[2,3] Minimally processed are *in natura* foods submitted to procedures such as cleaning, removal of unwanted parts, crushing and packaging.

The group of processed culinary ingredients includes substances extracted directly from *in natura* or minimally processed foods and consumed as items of culinary preparations, such as salt, sugar, oils and butter.[2,3]

Processed foods are formulated with the addition of salt, sugar or other culinary ingredient to a *in natura* or minimally processed food, and usually have two or three ingredients in their composition.[2,3]

Ultra-processed foods, in turn, are industrial formulations, often ready-to-eat, which have five or more ingredients in their composition.[3] They are typically rich in sugar, salt and refined cereals, having little or no wholefood in their formulation.[2]

Hyperpalatability, attractive packaging, aggressive advertising, health claims and long shelf life are some of the common characteristics of ultra-processed foods linked to their increased consumption over the years.[4,5]

Due to unfavorable nutritional characteristics, such as high energy density, high content of sugar, sodium, saturated and trans fats; low fiber and micronutrient content, the high consumption of ultra-processed foods is associated with a generalized aggravation of the nutritional profile, contributing to the occurrence of several noncommunicable chronic diseases, including obesity, cardiovascular diseases, diabetes and others.[6-8] Considering this scenario, the Dietary Guidelines for the Brazilian Population recommends avoiding the consumption of ultra-processed foods, giving preference to *in natura* or minimally processed foods.[4]

According to the latest edition of the Household Budget Survey (Pesquisa de Orçamentos Familiares – POF), held in 2017/2018, the evolution of household food availability in Brazil estimated in recent years indicates a reduction in the purchase of *in natura* or minimally processed foods and an increase in availability of ultra-processed food. In addition, we observed that the participation of *in natura* or minimally processed foods was inversely proportional to the increase in income, while processed and ultra-processed foods are more present in the total calories of families with higher income.[9]

Despite the importance of investigating food consumption according to the NOVA classification and the socioeconomic and demographic factors involved, we found few studies in Brazil that investigated this relationship.[10-12] Some studies were conducted with children in Primary Health Care (Atenção Primária à Saúde - APS), but to the best of our knowledge, we did not observe studies reporting such associations

between adults and elderly users of APS.[13-15] Thus, it is really important to study the socioeconomic and demographic profiles of the population served by APS, as this constitutes the gateway to the Brazilian Unified Health System (Sistema Único de Saúde - SUS) and has a fundamental role in the prevention and management of chronic noncommunicable diseases.[16]

Therefore, APS has the following attributes: access of the individual's first contact with the health system, care longitudinality, comprehensive attention and attention coordination within the system, family-centered health care considering the relevance of the family context, community orientation and cultural competence.[17,18]

In this sense, the aim of this article was to assess food consumption according to the degree of processing among primary health care users in relation to socioeconomic, demographic and lifestyle conditions.

METHODS

This is a cross-sectional study conducted from September 2019 to March 2020, with adults and elderly users of the Basic Health Unit (Unidade Básica de Saúde - UBS) and Family Health Strategies (Estratégias Saúde da Família - ESF) in the city of Guidoval, Minas Gerais, Brazil.

We used the online program OpenEpi version 3.01 for sample calculation. We considered a population of 5,735 individuals aged 18 years or over, according to the last IBGE census,[19] estimated prevalence of 50% for multiple outcomes, confidence level of 95% and desired accuracy of 5%, totaling 361 individuals. At recruitment, for each refusal, the next patient on the list of attendance was invited, until reaching the desired number of 361 people.

Research participants were recruited from the waiting rooms of the UBS or ESF, where they attended through spontaneous demand. The selection occured according to established criteria of age greater than or equal to 18 years old, belonging as a user of UBS and ESF services in the period of data collection, and not including people with physical disabilities, pregnant women, postpartum women and women up to one year after childbirth.

We collected data through a structured questionnaire, applied by the researcher and a trained intern. We assesseed socioeconomic and demographic variables, lifestyle and food consumption.

The socioeconomic and demographic variables of interest were sex (male and female); age (adults and elderly), dwelling place (urban or rural), marital status (single, married / stable union, divorced / widow[er]), skin color (white, brown , black, yellow and indigenous) analyzed separately in these categories, occupation (work or do not work), education (illiterate or incomplete elementary school; complete elementary school or incomplete middle school; complete elementary school or incomplete middle school; complete middle school or incomplete high school; complete high school or incomplete higher education; and complete higher education). In addition, we classified the participants' dwelling into strata A, B1, B2, C1, C2, D-E, according to the socioeconomic and family classification of the Brazilian Association of Research Companies (Associação Brasileira de Empresas e Pesquisa - ABEP) - Critério Brasil 2016.

Regarding lifestyle, the participant was asked about current alcohol consumption (yes or no), smoking (yes, no or former smoker, regardless of the number of cigarettes, frequency and duration of the smoking habit), and about the practice of physical activity (yes or no, regardless of frequency, intensity and duration).

In order to assess food consumption, we used the qualitative Food Frequency Questionnaire (FFQ), adapted from Ribeiro et al.,[20] built from the questionnaire validated by Sichieri & Everhart.[21] The consumption frequency options were: rarely/ never; 1-3 times a month; 1-4 times a week; 2-4 times a week; 5-6 times a week and daily (at least once a day). Subsequently, for analysis purposes, we grouped the frequencies into 2 categories: < 5 times a week, considered non-regular consumption and ≥ 5 times a week, indicating regular consumption, according to the methodology adopted by the Brazil Surveillance System of Risk Factors for Chronic Diseases by Telephone Interviews (VIGITEL).[22] For this study, we analyzed the regular consumption of only ultra-processed and *in natura* or minimally processed food groups, identified according to NOVA Classification. [3,23]

For each individual, foods belonging to the ultra-processed category and those belonging to *in natura* or minimally processed category were identified in the FFQ. Then, we verified in each of the categories, how many food items were consumed and their frequency, seeking to identify the regularity of consumption. Non-regular consumption was coded as "0" and regular consumption as "1".

For the analysis of the relationship between the consumption of *in natura* or minimally processed foods and ultra-processed foods and socioeconomic, demographic and lifestyle variables, the variable consumption considered for the analyses comprised the sum values of food items above the 50th percentile.

We made the statistical analyzes using SPSS® version 20.0 and STATA version 13.0 softwares. We adopted a statistical significance of 5%. We assessed and presented socioeconomic, demographic and lifestyle characteristics in relative and absolute values.

We used Poisson regression with robust variance to investigate how regular consumption of *in natura* or minimally processed foods or regular consumption of ultra-processed foods, both above the 50th percentile, could be influenced by explanatory variables.

First, we made Poisson regression with bivariate analysis. We included variables with p-value less than 0.20 using the backward method in the regression model. Variables with a significance level lower than 5% remained in the final model. As a measure of effect, we used a prevalence ratio (PR) with a 95% confidence interval (95%CI).

This study was approved by the Ethics Committee for Research with Human Beings of the Federal University of Viçosa (Universidade Federal de Viçosa – UFV), according to opinion No. 3.189.427. All participants were informed about the purpose of the study and signed the Informed Consent Form (ICF), in accordance with Resolution No. 466/2012 of the National Health Council (Conselho Nacional de Saúde).[24]

RESULTS

The study included 361 participants, with a mean age of 48.47 ± 16.0 years old, with a minimum age of 19 years old and a maximum age of 86 years old

Table 1 shows the socioeconomic, demographic and lifestyle data of the studied sample. Of the total number of participants, there was a predominance of females (77.6%), adults (74.2%) and living in the urban area (81.7%). As for marital status, most were married or in stable union (60.1%). In the sample, 41% were brown and 41% white.

In relation to occupation, 51.8% worked and 35.7% had incomplete elementary school. As for the economic classification, 37.4% belonged to D-E class. Regarding lifestyle, 70.6% were non-smokers, 73.4% did not consume alcoholic beverages and 65.7% did not practice any type of physical activity.

Table 1. Distribution of the sample of primary health care users according to socioeconomic, demographic and lifestyle variables. Guidoval-MG, 2020 (n=361).

Sample characteristics	N	%
Sex		
Female	280	77,6
Male	81	22,4
Age		
Adults	268	74,2
Elderly	93	25,8
Dwelling		
Urban	295	81,7
Rural	66	18,3
Marital status		
Single	88	24,4
Married/ Stable union	217	60,1
Divorced	25	6,9
Widower	31	8,6
Occupation		
Work	188	51,8
Do not work	172	47,6
Skin color		
White	148	41,0
Brown	148	41,0
Black	65	18,0
Education		
Iliterate/ Incomplete elementary school	59	16,3
Incomplete middle school	129	35,7
Incomplete high school	51	14,1
Complete high school/ Incomplete higher education	93	25,8
Complete higher education	29	8,0
Economic classification		
A	0	0,0
B1	7	1,9
B2	31	8,6
C1	66	18,3
C2	122	33,8
D-E	135	37,4
Smoking		
Yes	39	10,8
No	255	70,6
Former smoker	67	18,6
Alcohol		
Yes	96	26,6
No	165	73,4
Physical Activity		
Yes	124	34,3
No	237	65,7

As for the frequency of consumption of ultra-processed foods, 64% of the population reported that they do not regularly consume these foods. Among those who did so regularly, 26% reported consuming one type of ultra-processed food and 6.4% two types. For *in natura* or minimally processed foods, 100% of the sample participants consumed one or more types of these foods, with higher frequencies for the consumption of four types (36%), three types (24.1%) and five types (20.2%), as shown in table 2.

Table 2. Prevalence of regular food consumption according to the NOVA classification and sum of food items. Guidoval-MG, 2020 (n=361).

In natura or minimally processed foods		Ultra-processed foods	
Sum of food items	N (%)	Sum of food items	N (%)
1	3 (0,8)	0	231 (64,0)
2	14(3,9)	1	94 (26,0)
3	87 (24,1)	2	23 (6,4)
4	130 (36,0)	3	6 (1,7)
5	73 (20,2)	4	5 (1,4)
6	37 (10,2)	5	1 (0,3)
7	13 (3,6)	6	1 (0,3)
8	3 (0,8)		
9	1 (0,3)		

For *in natura* or minimally processed foods, the 50th percentile was the consumption of at least four types (items) of this food group. For ultra-processed products, the 50th percentile is represented by the consumption of no items of this group (zero).

Table 3 shows the prevalence ratio of regular consumption of one or more types of ultra-processed foods according to socioeconomic and demographic variables in simple and multivariate models. The variables that remained in the final model were dwelling, marital status, socioeconomic class and skin color. Individuals from urban areas (PR: 1.09; CI: 1.01-1.19) had a higher prevalence of regular consumption of ultra-processed foods compared to those from rural areas, and black individuals (PR: 1.17; CI: 1.06-1.30) in relation to white ones. On the other hand, married individuals (PR: 0.90; CI: 0.83-0.98) and widowed (PR: 0.87; CI: 0.74-0.98) had lower prevalence when compared to single individuals, and members of socioeconomic class B2 (PR: 0.74; 0.58-0.96), when compared to those belonging to class B1.

Table 3. Prevalence ratio of regular consumption of ultra-processed foods† according to socioeconomic, demographic and lifestyle variables of users of Primary Health Care. Guidoval-MG, 2020 (n=361).

Age				
Under 60	1.0			
Over 60	0,93 (0,85-1,01)	0,097		
Sex				
Female	1.0			
Male	0,97 (0,89-1,06)	0,567		
Work				
Yes	1,0			
No	0,99 (0,92-1,06)	0,837		
Dwelling				
Rural	1.0		1.0	
Urban	1,08 (0,98-1,19)	0,091	1.09 (1.01-1.19)	**0.040**
Skin color				
White	1.0			
Black	1,20 (1,09-1,32)	**≤ 0,001**	1,17 (1,06-1,30)	**0,001**
Brown	1,06 (0,98-1,15)	0,104	1,06 (0,98-1,15)	0,122
Education				
Iliterate/ Incomplete elementary school	1.0			
Incomplete middle school	1,03 (0,92-1,14)	0,588		
Incomplete high school	1,01 (0,88-1,15)	0,878		
Complete high school/ Incomplete higher education	1,02 (0,91-1,15)	0,640		
Complete higher education	0,95 (0,81-1,11)	0,545		
Marital Status				
Single	1.0			
Married/ Stable union	0,87 (0,80-0,95)	**0,002**	0,90 (0,83-0,98)	**0,018**
Divorced	0,99 (0,85-0,95)	0,939	1,05 (0,89-1,20)	0,647
Widower	0,86 (0,75-0,99)	**0,049**	0,85 (0,74-0,98)	**0,027**
Dwelling classification				
B1	1.0			
B2	0,78 (0,59-1,01)	**0,064**	0,74 (0,58-0,96)	**0,023**
C1	0,83 (0,65-1,07)	0,166	0,80 (0,63-1,01)	0,066
C2	0,86 (0,67-1,09)	0,224	0,82 (0,65-1,04)	0,108
D-E	0,89 (0,70-1,13)	0,370	0,85 (0,67-1,07)	0,187
Smoking				
Yes	1.0			
No	0,93 (0,82-1,05)	0,264		
Former smoker	1,04 (0,90-1,19)	0,555		
Alcoholism				
Yes	1.0			
No	1,01 (0,93-1,10)	0,696		
Physical Activity				
Yes	1.0			
No	1,09 (1,01-1,17)	**0,023**		

† Representation of the sample with regular consumption of 1 or more types of ultra-processed foods (n=130)
* Final model: Variables that remained significant, explanatory of the model p<0.05

According to the multivariate model shown in table 4, the explanatory variables for the regular consumption of *in natura* or minimally processed foods above the 50th percentile (5 or more foods) were: education, skin color and practice

of physical activity. Thus, black individuals had a lower prevalence of regular consumption (PR: 0.81; CI: 0.74-0.90) compared to white ones, and those who did not practice physical activity (PR: 0.89; CI: 0.82-.96) compared to the practitioners. As for education, individuals with complete higher education had a higher prevalence of regular consumption (PR: 1.16; CI: 1.01-1.33), when compared to illiterate or incomplete elementary school.

Table 4. Prevalence ratio of regular consumption of *in natura* or minimally processed foods above the 50th percentile† according to socioeconomic, demographic and lifestyle variables of Primary Health Care users. Guidoval-MG, 2020 (n=361).

	Gross Analysis		Final model*	
Variables	PR (95%CI)	P value	RP (IC95%)	P value
Age				
Under 60	1.0			
Over 60	1,00 (0,92-1,09)	0,943		
Sex				
Female	1.0			
Male	0,98 (0,90-1,07)	0,692		
Work				
Yes	1,0			
No	0,95 (0,88-1,02)	0,223		
Dwelling				
Rural	1.0			
Urban	1,06 (0,96-1,16)	0,219		
Skin color				
White	1.0		1.0	
Black	0,79 (0,72-0,87)	**≤0,001**	0,81 (0,74-0,90)	**≤0,001**
Brown	0,92 (0,85-0,99)	**0,042**	0,93 (0,86-1,01)	0,103
Education				
Iliterate/ Incomplete elementary school	1.0		1.0	
Incomplete middle school	1,04 (0,93-1,16)	0,406	1,06 (0,95-1,17)	0,268
Incomplete high school	1,09 (0,96-1,24)	0,171	1,07 (0,95-1,22)	0,236
Complete high school/ Incomplete higher education	1,01 (0,90-1,13)	0,865	0,98 (0,88-1,10)	0,844
Complete higher education	1,20 (1,03-1,39)	**0,013**	1,16 (1,01-1,33)	**0,034**
Marital Status				
Single	1.0			
Married/ Stable union	1,12 (1,02-1,22)	**0,010**		
Divorced	1,08 (0,93-1,27)	0,290		
Widower	1,03 (0,89-1,19)	0,665		
Dwelling classification				
B1	1.0			
B2	0,86 (0,68-1,08)	0,216		
C1	0,79 (0,64-0,98)	**0,035**		
C2	0,77 (0,63-0,95)	**0,017**		
D-E	0,76 (0,62-0,93)	**0,010**		

Table 4. Prevalence ratio of regular consumption of *in natura* or minimally processed foods above the 50th percentile† according to socioeconomic, demographic and lifestyle variables of Primary Health Care users. Guidoval-MG, 2020 (n=361).

	Gross Analysis		Final model*	
Variables	PR (95%CI)	P value	RP (IC95%)	P value
Smoking				
Yes	1.0			
No	1,03 (0,91-1,16)	0,604		
Former smoker	1,06 (0,92-1,22)	0,400		
Alcoholism				
Yes	1.0			
No	1,05(0,96-1,14)	0,228		
Physical Activity				
Yes	1.0		1.0	
No	0,87 (0,80-0,93)	≤0,001	0,89 (0,82-0,96)	0,004

† Sample representation according to the consumption of five or more types of *in natura* or Minimally Processed foods (n=127)

*Final model: Variables that remained significant, explanatory of the model p<0.05

DISCUSSION

In the present study, we found an association between higher prevalence of regular consumption of ultra-processed foods with the urban dwelling place, black skin color, and lower regular consumption of these foods among married individuals belonging to economic classification B. Regarding regular consumption of *in natura* or minimally processed foods, there was an association between higher consumption of this food group among individuals with higher education and lower consumption among black-skinned individuals who did not practice physical activity.

In general, the highest percentage of participants in this study reported not consuming ultra-processed foods on a regular basis, that is, with a frequency equal to or greater than five times a week. All respondents consumed at least one type of *in natura* or minimally processed food on a regular basis.

In relation to the dwelling place, we found that residents of the urban area had a higher prevalence of regular consumption of ultra-processed foods, compared to individuals in the rural area, which can be explained by the greater ease of access to industrialized products in the urban area, due to the availability of commercial establishments.[25] A similar result was found in a study conducted in Colombia, in which individuals living in urban areas and with a high socioeconomic status revealed higher consumption of ultra-processed foods compared to those living in rural regions and with lower socioeconomic status.[26]

Still reinforcing our findings, another study conducted with rural farmers in the Southeast region showed a lower consumption of ultra-processed foods in relation to the consumption of *in natura* or minimally processed foods.[1] In this sense, both the POF data for the years 2008/2009 and 2017/2018 revealed greater consumption of various ultra-processed foods in urban areas compared to rural areas, such as soft drinks, pizzas, chocolates, instant noodles, among others.[9]

Skin color was associated with both the consumption of ultra-processed and *in natura* or minimally processed foods. Black individuals had a higher prevalence of regular consumption of ultra-processed foods and a lower prevalence of regular consumption of *in natura* or minimally processed foods compared to white

ones. In recent years, there has been a tendency to reduce the prices of ultra-processed foods and the difference in the cost between *in natura* or minimally processed foods.[27] Although there may be a link between ethnicity and purchasing power, studies are contradictory regarding the price of ultra-processed and *in natura* foods, and that is why we cannot affirm the relationship between higher consumption of a food group and purchasing power.[28-31]

Another point to be considered is the relationship between food environment and race. In this sense, associations between race and food deserts, that is, neighborhoods with limited access to healthy foods, have been observed. This fact may be linked to the situation of the Brazilian population, according to which black individuals often have lower income and education.[32,33]

Corroborating our findings, another study conducted with VIGITEL data from previous editions showed that black individuals had lower consumption of *in natura* foods, such as fruit and vegetables, compared to white ones.[34] A possible justification for this fact is that black skin color is related to unfavorable socioeconomic conditions, due to worse working conditions, lower salaries and restrictions on access to information and services. These factors are linked to historical, cultural and structural issues of a society with explicit marks of racism.[28,35]

Also in relation to race, a study conducted in the United States found that the consumption of ultra-processed foods was associated with black skin color,[36] and according to data from the Ministry of Health (Ministério da Saúde), the black population had a lower prevalence of regular consumption of fruit and vegetables (29.5%) compared to white individuals (39.1%).[37] Ternus et al.,[11] in a study conducted with adult and elderly women in Rio Grande do Sul, found that adherence to a healthy dietary pattern, represented by higher consumption of fruit, vegetables and wholefood, was more prevalent in white women.

In addition, there was a lower prevalence of consumption of ultra-processed foods by married people and widows compared to single people, a result also found in the study by Cattafesta et al.[1] and which may be linked to the practicality of these foods, interfering with the preference of single people, who often eat alone. A study on the perception of difficulties in having a healthy diet among APS users found a higher prevalence of difficulties in having a healthy diet among individuals without a spouse when compared to those with a spouse. The main reasons indicated for this were: insufficient willpower and knowledge and the high cost of healthy foods.[38]

Regarding the economic classification, members of class B2 had lower consumption of ultra-processed foods when compared to those belonging to class B1, that is, there was a higher consumption of ultra-processed foods in individuals with higher income. This result is in line with the finding by Simões et al.,[12] who used data from the Elsa-Brasil study of 2008 and 2010, in which individuals with higher socioeconomic status had a higher consumption of ultra-processed foods.

We also found a lower prevalence of regular consumption of *in natura* or minimally processed foods in non-practitioners of physical activity when compared to practitioners. Generally, people who practice physical activity are more concerned about eating healthily, which may explain our result.[39] In this sense, the study by Silva et al.[39] observed greater consumption of ultra-processed foods among inactive individuals when compared to active ones.

On the other hand, in this study, participants with higher education, representing the highest education, had a higher consumption of *in natura* or minimally processed foods when compared to individuals with low education, which may be related to the fact that more knowledgeable individuals have better access to information about the health benefits of diet.[38,40,41] In agreement with our findings, a study conducted in Norway, with adults, reported that participants with higher education had a high consumption of ultra-

processed foods, such as snacks, soft drinks and fast food, compared to those with low educational level.[42] Similarly, the study by Bielemann et al.,[43] conducted with young adults from Pelotas in 2004-2005, corroborates these results, as it shows greater consumption of ultra-processed foods in individuals with higher educational levels.

However, in contradiction to our findings, another author observed that higher education was related to high adherence to both the healthy dietary pattern and the ultra-processed pattern.[11] Similarly, a study by Berti et al.[10] conducted from the Pró-Saúde study, with civil servants from a higher education institution, did not find an association between education and food consumption according to the degree of processing.

A limitation of our study was the fact that it was conducted in a single municipality, which implies the difficulty of generalizing the results. However, our findings contribute to a better understanding of the studied population and are useful for formulating health promotion actions.

CONCLUSION

Changes in eating habits across the world are influenced by socioeconomic, demographic and lifestyle factors. In this sense, our results indicate that individual and contextual factors, such as dwelling place, skin color, marital status, socioeconomic status, education and practice of physical activity influenced the consumption of ultra-processed foods and *in natura* or minimally processed foods, what suggests the need for greater intervention in specific population groups and emphasizes the importance of adopting a healthy diet.

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Contributors

Almeida PP participated in the conception and design of the study, conducted the data collection, analyzed and interpreted the data and prepared the manuscript; Pereira GA participated in the analysis, data interpretation and preparation of the manuscript. Silva MA participated in the analysis and interpretation of data. Araújo RMA participated in the preparation and critical review of the manuscript. Lima LM participated in the study design. Henriques BD participated in the conception, study design and critical review of the manuscript.

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