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CONSUMPTION OF ULTRA-PROCESSED FOODS BEFORE, DURING, AND AFTER THE COVID-19 PANDEMIC ACCORDING TO THE REGIONS OF BRAZIL

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Luciane Peter Grillo[1], Tatiana Mezadri[2] and Eloisa Cristina Pereira[3]

ABSTRACT

The objective of this study was to verify the prevalence of consumption of ultra-processed foods before, during, and after the Covid-19 pandemic according to the regions of the country. The study design was ecological, using secondary data from the telephone survey on surveillance of risk and protective factors for chronic diseases, in the public domain and freely accessible in the electronic environment from the Integrated Health Surveillance Platform. The variable evaluated was consumption of ultra-processed foods by capitals of Brazilian states and after calculating the averages for the regional (Midwest, Northeast, North, Southeast and South) and national (Brazil) strata and pre-pandemic (2019), pandemic (2020 to 2022) and post-pandemic (2023) periods. Considering the three periods evaluated, there was an increase in the consumption of ultra-processed foods in all regions of Brazil and in its entirety between the pre-pandemic and pandemic periods, and the opposite was observed in the pandemic and post-pandemic periods, with the exception of the North region. In the pre-pandemic and pandemic periods, the South region had the highest prevalence of consumption of ultra-processed foods (21.6% and 22.2%, respectively) and in the post-pandemic period it was the North region (22.2%). Between the pre-pandemic and pandemic periods, the Northeast region recorded the highest percentage of change (22.3%) and the South region the lowest (2.8%). When comparing the pre-pandemic period with the post-pandemic period, the North Region had the highest percentage (10.4%) and the South Region the lowest (-4.3%).

Keywords: Food Consumption. Ultra-processed foods. Pandemic. Covid-19.

[1] Postdoctoral Fellow in Epidemiology at the Center for Epidemiological Research at UFPEL
Professor, Professional Master's Program in Health and Work Management, University of Vale do Itajaí – UNIVALI, Itajaí, Brazil
E-mail: grillo@univali.br
[2] Doctor in Food Science
University of Seville, US, Spain
Professor, Professional Master's Program in Health and Work Management, University of Vale do Itajaí – UNIVALI, Itajaí, Brazil
E-mail: mezadri@univali.br
[3] Student of the Professional Master's Program in Health and Work Management at the University of Vale do Itajaí – UNIVALI, Itajaí, Brazil
E-mail: eloisa.pereira@edu.univali.br

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INTRODUCTION

The nutritional transition describes a global trend towards the consumption of ultra-processed foods that are low in fiber and high in added sugars and fats. In recent decades , there have been changes in the eating habits of the world population, impacted by the growth in the process of industrialization and urbanization, its high prevalence has aroused the interest of the scientific community in studying the excessive consumption of foods of this nature that have brought changes in the health profile of the world population (MOURA *et al.,* 2018).

Hyperpalatability, convenience, the use of intensive marketing, changes in economic, demographic, and social parameters have contributed to the greater popularization of ultra-processed foods (SANTANA, 2020). The formulation and ingredients of these products are attractive, practical, ready-to-eat, low-cost ingredients, highly competitive in relation to naturally ready-to-eat foods (RAUBER *et al*., 2018).

The NOVA classification emerged as an alternative to traditional approaches that focus on the nutritional composition of foods, classifying according to the degree of industrial processing applied during their production and the purpose of such processes. In this classification, foods are divided into four categories, fresh or minimally processed, processed culinary ingredients, processed foods, and ultra-processed foods (MONTEIRO *et al*., 2018).

Ultra-processed foods or beverages are defined as industrial formulations typically made with five or more ingredients, including substances and additives used in the manufacture of processed foods such as sugar, oils, fats, and salt, as well as antioxidants, stabilizers, and preservatives. Such additives have an aesthetic purpose, in addition to imitating sensory attributes of natural foods or even disguising undesirable attributes, as they may contain little or no natural foods and high caloric density, are able to remain on store shelves or in the kitchen cabinet at home for months or even years without deteriorating (MONTEIRO *et al*., 2019).

In March 2020, the Covid-19 pandemic, a disease caused by the new coronavirus Sars-Cov-2, caused changes in several aspects in the lives of Brazilians and the world. Due to the lack of preventive measures at the beginning of the pandemic, the World Health Organization (WHO) recommended the adoption of non-pharmacological interventions, including social distancing, with the aim of reducing physical contact between people and the risk of transmission (WHO, 2020; CRODA and GARCIA, 2020). Schools, universities,

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public leisure areas, gyms, restaurants, including bars and other businesses that served food or meals for local consumption were closed (DOMINGUES, 2021). As a result, there was a strengthening of supermarket chains with virtual sales and ready-to-eat food delivery apps, expanding the acquisition of fast food or *fast food* (BOTELHO; CARDOSO; CANELLA, 2020; SCHNEIDER *et al*., 2020).

Being at home for longer, there was a reduction in physical activity practices, increasing television time and sedentary lifestyle, the eventual reduction in family income due to job loss or impossibility of exercising certain occupations, limited the purchase of higher-priced foods, such as fruits and vegetables for many families (CHEVAL *et al*., 2021).

Among some of the obstacles to the adoption of healthy habits is the advertising of ultra-processed foods, categorical marketing strategies that influence the food choices and behavior of the population, unhealthy foods that often convey incorrect or incomplete information, focus on ease, convenience and lower cost, contributing to the increase in consumption. Overcoming the obstacle of advertising involves regulatory actions by the State, through the imposition of rules and restrictions for these ads, but it also involves a collective effort from inside and outside the home (RODRIGUES; MATOS; HORTA, 2021; BRAZIL, 2023a).

On the other hand, in social isolation the population consumed fewer meals on the street, there was an increase in time at home, for some people the greater availability made it possible to rescue culinary skills and prepare their own food as a possible concern to consume healthier foods as a way to increase immune defenses against a disease for which at the time there was no vaccine or effective treatment (UGGIONI *et al.,* 2020; LEMES *et al.,* 2023).

The influence of all these factors on eating behavior can be observed in the short, medium and long term in individual and collective health. Therefore, the objective of the present study was to verify the prevalence of consumption of ultra-processed foods before, during, and after the Covid-19 pandemic, according to the regions of the country.

METHODOLOGY

The study is ecologically designed, using consolidated, secondary data in the public domain and freely accessible in the electronic environment from the Integrated Health Surveillance Platform (IVIS) (BRASIL, 2022). The time series under analysis includes the pre-pandemic (2019), pandemic (2020 to 2022) and post-pandemic (2023) period of Covid-

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19. Data were collected from the Surveillance System of Risk and Protective Factors for Chronic Diseases by telephone survey (VIGITEL).

The variable evaluated was consumption of ultra-processed foods ("percentage of adults over 18 years of age of both sexes who consumed five or more groups of ultra-processed foods on the day before the interview"). Afterwards, the data from the capitals were grouped into the five regions of the country: South, Southeast, Northeast, North and Midwest.

For data analysis, descriptive statistics were used by calculating the prevalence of the sum of the averages of the capitals grouped in the five regions of Brazil and compared with the proportions of the pre-pandemic period, with the average prevalence of the pandemic period and the post-pandemic.

The percentage changes were calculated:

- ✓ [(prevalence during the pandemic - pre-pandemic prevalence) *100]/(pre-pandemic prevalence);
- ✓ [(post-pandemic prevalence - pandemic prevalence) *100]/(post-pandemic prevalence);
- ✓ [(post-pandemic prevalence - pre-pandemic prevalence) *100]/(post-pandemic prevalence). The t-test was used between two proportions.

Significant values were considered when $p < 0.05$. The analyses were performed using *the Stata* 13.0 program.

Because it was a study with information from a public database, linked to the Ministry of Health, it was not necessary to submit the present study to the Research Ethics Committee.

RESULTS

The average prevalence of ultra-processed food consumption by individuals over 18 years of age in the five Brazilian geographic regions during the pre-pandemic (2019), pandemic (2020 to 2022), and post-pandemic (2023) periods can be seen in Graph 1. In the pre-pandemic and pandemic periods, the South region had the highest prevalence of consumption of ultra-processed foods (21.6% and 22.2% respectively) and in the post-pandemic period it was the North region (22.2%). Considering the three periods evaluated, there was a significant increase in the consumption of ultra-processed foods in all regions of Brazil and in its entirety between the pre-pandemic and pandemic periods, and the opposite

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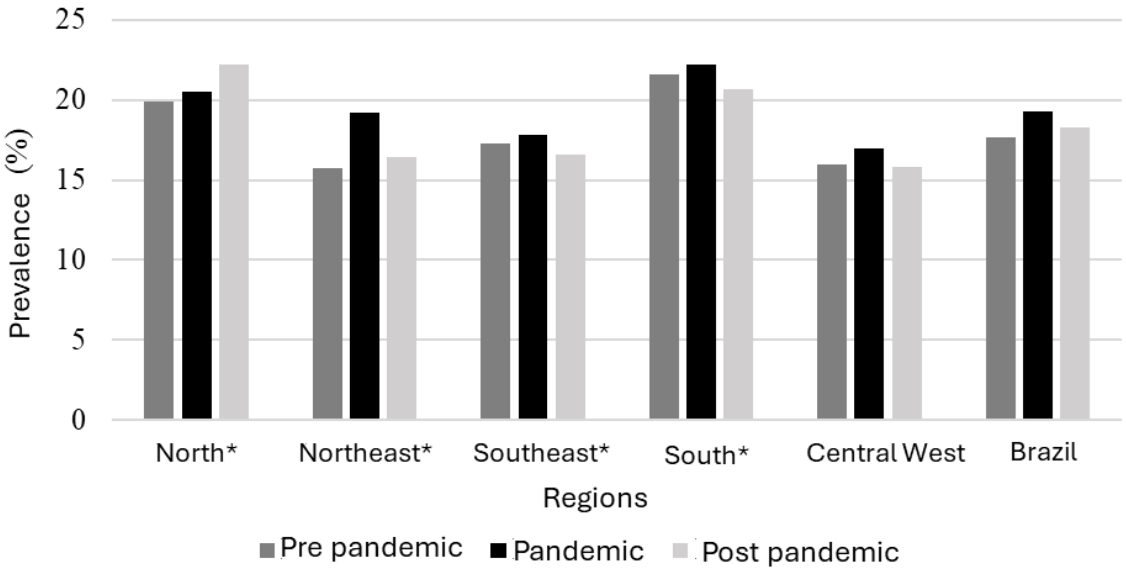
was observed in the pandemic and post-pandemic periods, with the exception of the North region. When comparing the two pre-pandemic and post-pandemic periods, there was no difference in the consumption of ultra-processed foods in the Midwest region and in Brazil as a whole (Graph 1).

Graph 1 – Prevalence of consumption of ultra-processed foods in the pre-pandemic, pandemic, and post-pandemic periods of the total population sampled in the capitals and Federal District of the five regions of Brazil and in its entirety in the period from 2019 to 2023. *p<0.05



The percentage of change in the consumption of ultra-processed foods in the five Brazilian geographic regions during the three periods evaluated can be seen in Table 1. Between the pre-pandemic and pandemic periods, the Northeast region recorded the highest percentage of change (22.3%) and the South region the lowest (2.8%). When comparing the pre-pandemic period with the post-pandemic period, the North Region had the highest percentage (10.4%) and the South Region the lowest (-4.3%) (Table 1).

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Table 1. Percentage of change in the consumption of ultra-processed foods in adults, according to regions of Brazil in the three periods evaluated, 2019-2023

Regions	Percentage of change (%)		
	Pre-pandemic and Pandemic	Pandemic and Post-pandemic	Pre-pandemic and Post-pandemic
North	3,0	7,7	10,4
Northeast	22,3	-17,1	4,3
Southeast	2,9	-7,2	-4,2
South	2,8	-7,2	-4,3
Central-West	6,3	-7,6	-1,2
Brazil	9,0	-5,5	-3,3

Source: Prepared by the authors based on data obtained from the integrated health surveillance platform (VIGITEL, 2023)

The percentage of consumption of ultra-processed foods by sex in the five Brazilian geographic regions during the three periods evaluated can be seen in Table 2. During the pandemic, females had the highest consumption of ultra-processed foods in the Southeast (25.2%), Northeast (24.8%) and Central-West (25.7%) regions. When comparing the pre-pandemic period with the post-pandemic period, males prevailed in all regions, with the exception of the Northeast Region in the pre-pandemic period. In the post-pandemic period, the North region had the highest percentage (25.7%) and the Central-West region the lowest (18.1%) (Table 2).

Table 2. Percentage of ultra-processed food consumption by sex by regions of Brazil in the three periods evaluated, 2019-2023

	Percentage of sex by regions (%)					
Regions	Pre-pandemic		Pandemic		Post-pandemic	
	Male	Female	Male	Female	Male	Female
On	25,6	18,2	27,6	17,6	24,1	17,8
Southeast	21,0	14,1	20,3	25,2	20,6	13,1
Northeast	19,5	21,2	22,5	24,8	19,6	13,8
North	20,9	15,0	23,9	17,3	25,7	18,8
Central-West	19,3	13,1	19,9	25,7	18,1	13,8
Brazil	21,3	16,3	22,8	22,1	21,6	15,5

Source: Prepared by the authors based on data obtained from the integrated health surveillance platform (VIGITEL, 2023)

The consumption of ultra-processed foods according to the regions of Brazil in the three periods, he evaluates, can be seen in figure 1 (figure 1).

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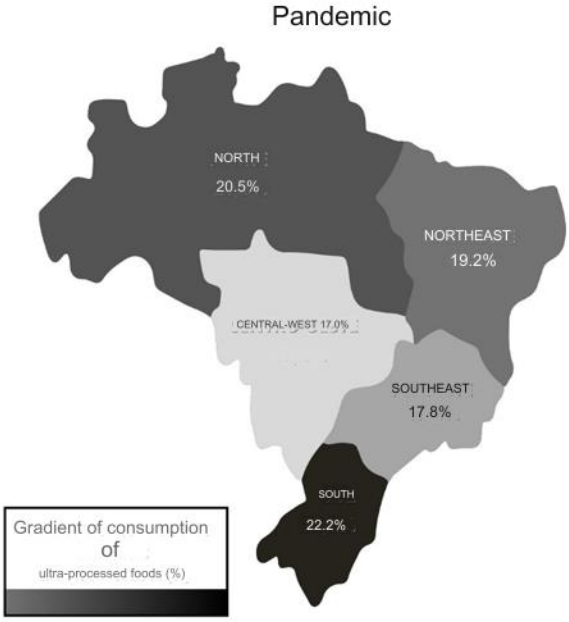
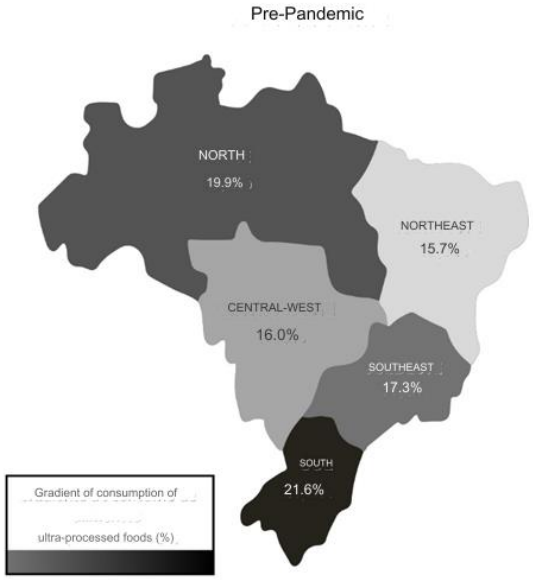


Figure 1 – Prevalence of consumption of ultra-processed foods in the population over 18 years of age, sampled in the capitals and the Federal District of the five regions of Brazil in the pre-pandemic, pandemic and post-pandem ic periods



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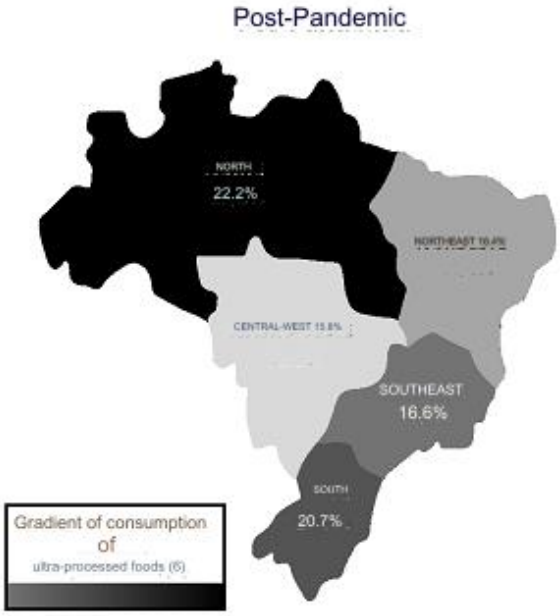

DISCUSSION

The increase in the consumption of ultra-processed foods during the pandemic, observed in Brazil, reflects a global pattern. Studies carried out in Italy during the Covid-19 pandemic have observed changes in the population's diet with an increase in the consumption of high-calorie and less healthy foods (SCARMOZZINO and VISIOLI, 2020; VERTICCHIO and VERTICCHIO, 2020). Similarly, McAtamney *et al.* (2021) assessed the impact of the pandemic on the eating behaviour of individuals in the UK and reported an increase in the consumption of unhealthy foods, as well as eating more than usual during the pandemic.

A cross-sectional study on changes in the lifestyle of Brazilians showed that during the pandemic, the prevalence of consumption of processed and ultra-processed foods in a period of two days or more per week increased among frozen foods (from 10.0% to 14.6%), snacks (from 9.5% to 13.2%), chocolates, sweet cookies and pieces of pie (from 41.3% to 47.1%). The frequency of consumption of frozen foods and snacks increased in both sexes, while that of chocolates, sweet cookies, and pieces of pie showed a greater increase among women (MALTA *et al.,* 2020).

The NutriNet Brazil study identified an increase in the consumption of ultra-processed foods in the North region, increasing the number of individuals who consumed ultra-processed foods at least once a day before the pandemic (77.6%) and during the

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pandemic (81.7%), but the same study showed a favorable evolution in the indicators of consumption of healthy foods, which showed growth of small magnitude with statistical significance for the markers vegetables (from 87.3% to 89.1%), fruits (from 78.3% to 81.8%) and beans (from 53.5% to 55.3%). The best rates were found in the Southeast and Northeast regions, specifically in the groups with intermediate and higher education. The authors concluded that the increase in the consumption of ultra-processed foods in the North region may be associated with the lower category of education, and may be a trigger for social inequalities in the response of eating behavior during the pandemic (STEELE *et al*., 2020).

Souza *et al.* (2021) evaluated 1,368 adult volunteers from all over Brazil, through self-reported online questionnaires and found an increase in the frequency of consumption of bakery products, instant meals, *fast food*, in contrast to the decrease in the consumption of fruits and vegetables and an increase of 10.5 hours per day of screen, including televisions, computers, tablets, and cell phones, due to remote work among adults during quarantine.

Analyzing the determinants of the food choices of 629 Brazilian women in the age group of 18 to 72 years, 60.4% had a normal body mass index, 79.3% were white, 56.9% were single and 69.8% had a high level of education. Women who reported healthier food choices reported being motivated by weight control, which showed a reduction in energy and carbohydrate intake with increased protein and a preference for natural and minimally processed foods. The reverse was found in women who reported eating for the taste of the food and the habit of snacking. The high consumption of ultra-processed foods was also found in the groups that signaled replacing the main meals with snacks, frequent use of *delivery*, symptoms of compulsive eating, eating for the visual appeal of the food and for seeking affective regulation (SMAIRA *et al.,* 2021).

In the South of Brazil, in the municipality of Joinville, SC, the authors found that 51% of men consumed ultra-processed foods three times a week, 38.8% once or twice a week, and 10.2% never consumed these types of foods during the pandemic (CATARINA *et al.,* 2023).

Divergences between the studies are probably a reflection of different methodologies applied, collection instruments used, time period selected and populations analyzed, but the results are worrying as the consumption of ultra-processed foods has been associated with an increase in obesity and other chronic diseases.

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A study carried out with about 11 thousand people, recruited in six Brazilian cities (Belo Horizonte/MG, Porto Alegre/RS, Rio de Janeiro/RJ, Salvador/Bahia, São Paulo/SP and Vitória/ES) and followed for an average period of eight years showed that people who consume more than 20% of the total energy of ultra-processed foods daily may have a higher risk of suffering marked cognitive decline (GOMES *et al*., 2023).

The National Health Council published Recommendation No. 011, of July 20, 2023, regarding the inclusion of ultra-processed foods and beverages in the category of harmful to health in the Tax Reform, considering that 6 out of 10 adults and 1 out of 3 children were overweight and that, in 2019, 57 thousand premature deaths, in Brazil, they were attributable to the consumption of ultra-processed foods; considering the recommendations recommended by the *Food Guide for the Brazilian Population*, its relevance and the international recognition of the pioneering spirit in the theme of adequate healthy eating as a reference element for public policies, also considering that, between 2008 and 2018, there was an increase in the consumption of ultra-processed foods among people of black (from 16.39% to 18.44%) and indigenous (from 14.79% to 20.75%), but not among white and Asian people, that the consumption of ultra-processed foods increased significantly in the lowest three-fifths of household income (from 13.3% to 16.8% in the 1st, from 16.6% to 18.2% in the 2nd, and from 18.1% to 19.6% in the 3rd), reducing significantly in the highest fifth of income (from 24.7% to 23.1%) and among those with higher schooling (from 25.5% to 22.2%) and that the average consumption of sweetened beverages is 61 liters per capita, being responsible for 12,748 deaths/year and spending of 2,995 billion reais/year in the care of diseases caused by the consumption of this product (BRASIL, 2023b).

Kim and Sum (2020), reinforce the fact that in addition to a balanced diet in nutrients, physical activity, good sleep quality and good relationships with people are conceived as great habits for maintaining and enhancing immunity, thus helping considerably in the prevention of diseases.

Among the strengths of this study, the following stand out: the character of the sample studied and the national representativeness, ensured with the study of more than 50 thousand people in the pre-pandemic and Covid-19 pandemic period and more than 20 thousand people in the post-pandemic period residing in the capitals of the various regions of the country.

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This study has limitations arising from potential biases determined by the lack of universal coverage of the fixed telephone network and the probable underestimation of the consumption of ultra-processed foods.

CONCLUSION

The results of this study indicate the negative effect of home confinement on the eating behavior of Brazilians, which resulted in an increase in the consumption of ultra-processed foods during the pandemic period. These observations have potential implications that may help in the development of nutritional recommendations according to sociodemographic determinants, since after the pandemic the North region maintained the consumption of ultra-processed foods.

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