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Consumption of ultra-processed foods and associated factors in adults: evidence from the 2008-2009 Campinas Health Survey

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Abstract *The aim of the present study was to evaluate the consumption of ultra-processed (UP) foods and associated factors among adults. We used cross-sectional data on 947 adults from the 2008-2009 Campinas Health Survey. Food consumption data were collected using the 24-h dietary recall method and food items were classified according to NOVA classification based on the nature, extent and purpose of industrial processing. Linear regression models were run to evaluate the association between the consumption UP foods and predictor variables with a 5% significance level. The average daily energy intake per capita was 2000.6 kcal and UP foods represented 24.1% of this intake. UP food consumption was higher among women and increased with the increase in schooling. Consumption was also higher among young adults between 20 and 29 years old as well as ex-smokers and individuals who were physically active at leisure. The results show that there is still time to intervene in favor of the health of the adult population. Thus, studies dedicated to the investigation of food intake from the perspective of the NOVA classification, the possible repercussions for health and the evaluation of food and nutrition actions and policies should be prioritized in the current context of Brazil.*

Key words *Nutritional epidemiology, Health surveys, Food consumption, Industrialized foods, Ultra-processed foods*

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Introduction

The science of nutrition was historically centered on the biological aspect, involving the analysis of the effects of nutrients on health stemming from the severe nutritional deficiencies found in different countries up to the 20th Century[1]. In the contemporary scenario, the science of nutrition has broadened its vision to encompass other important dimensions, such as social, cultural, economic, environmental and, more recently, technological aspects, which involve advances in the processing of foods[2].

With the advent of industrialization, food processing developed rapidly, especially in the second half of the 20th Century, with new discoveries in science and technology. The nature and extent of industrial food processing has changed over time and, currently, nearly all foods and beverages are processed in some way. However, differences in the nature, extent and purpose of processing are relevant to human health[1,3].

In the global scenario of profound changes in the eating habits of the population and concomitant increase in the incidence of obesity and other non-communicable diseases, the need for new dietary guidelines has emerged. Monteiro et al.[4] propose classifying foods into four groups according to the nature, extent and purpose of industrial processing.

The first group consists of foods *in natura* or minimally processed foods, which are submitted to processes that do not alter the nutritional composition, such as cleaning, freezing, pasteurization, etc. The second group comprises processed foods, which are foods *in natura* with the addition of salt, sugar, oil and/or vinegar. Cooking ingredients, such as sugar, salt, oil and butter, comprise the third group and should be used in moderation in recipes. The group of ultra-processed foods is composed of formulations that contain little or no food *in natura*, with the addition of salt, fat, sugar, conservatives and additives. These are ready-to-eat or ready-to-heat foods that are highly palatable, but have low nutritional density[4].

The literature reports that the increase in the consumption of ultra-processed products has contributed significantly to the pandemic of excess weight and the increase in the prevalence of other non-communicable diseases associated with a diet of poor quality[1,3-7]. According to Martins et al.[8], the participation of ultra-processed foods in the total calorie intake in Brazilian homes has been increasing over the years, going from 20.8% in 2002-2003 to 25.4% in 2008-2009. A study conducted in 19 European countries considering the period between 1991 and 2008 reports that the availability of ultra-processed products in homes ranged from 10.2% in Portugal to 50.4% in the United Kingdom[9]. Data from the 2012 National Health and Nutrition Survey show a rate of 29.8% in Mexico[10] and a study reports a 47.7% rate in Canada in 2004[11]. A cohort study conducted from 2009 to 2017 with adults in France found that ultra-processed foods accounted for 35.9% of the total calorie energy and that the increase in the consumption of these foods was associated with a higher overall risk of mortality in the population of adults over 45 years of age[12,13].

Considering the increase in the consumption of ultra-processed products and the association with a greater incidence of obesity and non-communicable diseases[4], it is necessary to identify the most susceptible segments of the population. Therefore, the aim of the present study was to evaluate the consumption of ultra-processed foods according to sociodemographic variables, health-related behaviors and the body mass index in adults aged 20 to 59 years.

Methods

In this study, we analyzed data from the Campinas Health Survey conducted between February 2008 and April 2009. This was a population-based cross-sectional study conducted in the city of Campinas, state of São Paulo, Brazil, the aim of which was to evaluate the living conditions and health status of three subgroups of the population: adolescents (10 to 19 years old), adults (20 to 59 years old) and seniors (60 years or older). For the present study, we focused on the data referring to adults.

The sample was obtained using two-stage, probabilistic, stratified, cluster sampling. In the first stage, 50 census sectors were selected with probability proportional to size, given by the number of homes. The second stage involved the systematic selection of homes.

The number of individuals to compose the sample was defined considering the maximum variability for the frequency of the events studied (p=0.50), a 95% confidence level in the determination of the confidence intervals (z=1.96), a sampling error between 4 and 5% and a design effect of 2, resulting in 1,000 individuals. Expecting an 80% response rate, the sample size was

corrected to 1,250. To reach this sample size, 700 homes were selected independently. Interviews were held with all residents between 20 and 59 years of age in each selected home.

Trained interviewers collected the information using a questionnaire structured in 14 thematic blocks that had been tested in a pilot study. The questionnaire addressed demographic/socioeconomic characteristics, lifestyle, the use of health services, adverse health conditions and other information. Data on food intake were obtained with the 24-h dietary recall (24hR), using the step-by-step method adapted from Thompson and Byers[14]. In step 1, the interviewers recorded the times and foods/beverages ingested without interrupting the respondent; in step 2, at the end of the spontaneous report, the interviewer asked "Is there anything else you remember?"; in step 3, the name of the meal was recorded; in step 4, the interviewers collected information on the characteristics of the foods/recipes and subsequently recorded the quantities ingested in home units or measurements. Step 5 consisted of a review of the 24hR with the respondent. A nutritionist accompanied the fieldwork to minimize and correct possible errors during the filling out of the 24hR. The foods/recipes recorded in home units or measurements were transformed into grams or milliliters with the aid of home measurement tables[15,16].

The data from the 24hR were entered in the Nutrition Data System for Research (NDS-R), version 2007 (Nutrition Coordinating Center, University of Minnesota, USA), which uses the USDA National Nutrient Database for Standard Reference as the source of information to estimate the composition of foods. This software program was chosen due to its vast selection of foods (more than 18,000) and brand name products (7,000), moreover, it enables generating specific databanks that facilitate analyses on the consumption of foods, nutrients and meals per individual. Moreover, the NDS-R allows the addition of recipes into a recipe file stored separately from the database, enabling the inclusion of food/recipes specific to each culture.

The foods reported on the 24hR were organized according to the NOVA food classification[4] into four groups: *in natura* or minimally processed, cooking ingredients, processed and ultra-processed. All 457 foods mentioned were coded on an Excel® spreadsheet. For example, the number 11 was attributed to fruits, 12 to vegetables, 13 to milk, 14 to rice, 15 to red meat, and so on. For the purposes of analysis, these numbers were united under a single code that represented the group of minimally processed foods. The organization of the foods in each group was based on previous studies[8,17] to enable the comparability of the results.

The following were independent variables used for the analysis of factors associated with the consumption of ultra-processed foods: Sociodemographic: sex, age group (in years), marital status, number of children, schooling (in years of study), family income *per capita* (using the Brazilian monthly minimum wage [BMMW] as reference) and having private health insurance.

Health-related behaviors: frequency of alcohol intake, smoking and the practice of physical activity during leisure. Individuals who practiced physical activity at least 150 minutes per week distributed among at least three days were categorized as active. Those who practiced less than 150 minutes per week or practiced more but on fewer than three days a week were categorized as insufficiently active and those who did not practice physical activity were categorized as inactive.

Body Mass Index (BMI) was calculated from reported information on weight and height and classified as underweight (BMI<18.5 kg/m²), ideal range (BMI≥18.5 and <25 kg/m²), overweight (BMI≥25 and <30 kg/m²) and obese (BMI≥30 kg/m²)[18].

The statistical analysis involved the calculation of the means of the energy contribution of each food group and respective foods in relation to the total energy value. Next, we estimated the mean consumption and relative frequency of the energy contribution of the ultra-processed foods according to the categories of the independent variables. Associations with the independent variables were determined using linear regression analysis with 95% confidence intervals. All variables with a p-value<0.20 in the bivariate analysis were incorporated into the multiple linear regression model and all those with a p-value<0.05 after the adjustments were maintained in the model.

The analyses were performed using the Survey (svy) module of Stata 12.0. The 2008/2009 Campinas Health Survey received approval from the Human Research Ethics Committee of the School of Medical Sciences of Campinas State University. All interviewees signed a statement of informed consent.

Results

Nine hundred forty-nine adults (20 to 59 years of age) were interviewed. Women accounted for 53.2% of the sample and mean age was 37.5 years (95%CI: 36.6 to 38.3). Mean daily energy intake was 2002.6 kcal (95%CI: 1923.9 to 2081.2) in the overall sample, 2266.8 kcal (95%CI: 2149.8 to 2383.7) among the men and 1753.6 kcal (95%CI: 1670.2 to 1837.1) among the women.

Table 1 shows that minimally processed foods contributed 54.1% of the total energy intake and ultra-processed foods contributed 24.1%. The predominant minimally processed foods were rice and meats, respectively accounting for 15.2% and 9.8% of the total energy intake. Fruits accounted for 4.3% (n=492) and vegetables accounted for 1.5% (n=768) of the daily energy intake. Among the ultra-processed foods, sausages, margarine and carbonated soft drinks were the most consumed, contributing 5.6% (n=506), 3.4% (n=461) and 2.9% (n=323) of the total energy intake, respectively.

The data in Table 2 shows that the consumption of ultra-processed foods was significantly higher among women compared to men (25.2% vs. 22.9%; p=0.018), adults without a partner (26.9%; p=0.001) and those who had private health insurance (26.2%; p=0.007). The consumption of ultra-processed foods increased with the increase in income (p=0.003) and schooling (p<0.001) and decreased with the increase in age, reaching less than 20.0% among individuals 50 to 59 years of age (p<0.001), and with the increase in the number of children, going from 28.8% among adults with no children to 23.1% among those with one or two children and 19.2% among those with three or more children.

The data in Table 3 indicate that individuals who were insufficiently active (22.9%; p=0.004) or inactive (23.3%; p=0.004) during leisure consumed ultra-processed foods less than active individuals (27.7%).

The results of the multiple linear regression model are displayed in Table 4 and demonstrate the greater energy participation of ultra-processed foods in the diet of women (p=0.004) and ex-smokers (p=0.033). The participation increased with the increase in the level of schooling, reaching 32.9% in the segment with 12 or more years of study, and was higher among those who practiced more physical activity (25.4%) compared to those categorized as insufficiently active (21.4%; p=0.022) and inactive (22.5%; p=0.049). Moreover, the energy contribution of ultra-processed foods diminished with the increase in age, going from 25.4% in the 20-to-29-year-old age group to 16.8% in the 50-to-59-year-old age group (p<0.001).

Discussion

The analysis of the energy participation of foods according to the nature, extent and purpose of processing revealed that the percentage of ultra-processed food products among adults (24.1%) was higher than the 21.5% found in a study that evaluated information on the Brazilian population ≥10 years of age[17] but within the range found in a study that evaluated Brazilian households in general (15.4% in the lowest quartile to 39.4% in the highest quartile)[7]. Although the participation of ultra-processed foods in the total energy intake has been increasing, it remains lower than the rates described for developed countries, such as Canada (47.7%)[11], Belgium (44.6%), Germany (46.2%), the United Kingdom (50.7%)[9] and Mexico (29.8%)[10]. Although no maximum limit of participation in the daily energy intake has yet been established for ultra-processed foods, it has been recommended that consumption be as low as possible[19].

The increase in the consumption of ultra-processed foods has been related to the distancing from cooking traditions, which have become increasingly rarer in the day-to-day lives of people and families[9]. This may be explained by changes in the lifestyle driven by the participation of women in the job market, urbanization and technology. Investments of the food industry over the years to develop the characteristics of ultra-processed foods in order to make them highly palatable, ready to eat, durable, practical and available to all social strata of the population[9,19]. Data from the 2017-18[20] Family Budget Survey reveal that families with a lower income dedicate 22% of their income to food, whereas those with a higher income (>25 times the Brazilian monthly minimum wage) dedicate only 7.6%, which is nearly three time less.

Campinas is a large city with more than one million residents, according to the 2010 census. It is known as the Brazilian Silicon Valley due to the presence of more than 30 major high-tech companies. It has a human development index of 0.805, which is higher than the national average (0.754), but the unemployment rate is similar to the national average (12.34% and 12.7%, respectively) and more than 30% of the population

Table 1. Daily consumption means and relative frequency of energy contribution of minimally processed, processed and ultra-processed foods and cooking ingredients in diet of adults (20 to 59 years). 2008-2009 Campinas Health Survey.

Food groups and items	n	Kcal/day	% of total energy intake
In natura/minimally processed	947	1068.3	54.1
Rice	814	291.6	15.2
Red meat (beef, pork and innards)	492	201.9	9.8
Other grains	475	123.7	5.5
Beans and other legumes	680	108.1	5.1
Poultry meat	327	76.3	4.0
Fruits and juices	492	74.8	4.3
Milk	574	74.4	4.0
Roots and tubers	300	40.7	2.0
Eggs	401	27.4	1.4
Vegetables	768	25.7	1.5
Fish	59	14.0	0.8
Other minimally processed foods[a]	768	9.7	0.5
Processed	773	211.6	10.6
French bread	572	123.1	6.4
Cheese	341	64.1	3.1
Processed meats	99	15.8	0.7
Canned goods	242	8.6	0.4
Ultra-processed	907	502.1	24.1
Sausages	506	117.0	5.6
Margarine	461	72.4	3.4
Carbonated soft drinks	323	63.6	2.9
Sweets and desserts[b]	249	62.5	2.7
Crackers and chips	223	43.4	2.3
Sandwich, hamburger and hotdog bread	227	42.6	2.3
Other sweetened beverages	249	25.8	1.4
Vegetal and animal fat[c]	185	19.7	0.9
Other ultra-processed foods[d]	638	55.1	2.6
Cooking ingredients	942	220.6	11.2
Oils	931	163.8	8.3
Sugar	692	56.8	2.9
Total	949	2002.6	100.0

[a]Coffee and tea without added sugar, spices, herbs, oils without salt/sugar, cocoa powder and coconut water; [b]Cookies, ice cream, chocolate, cakes, pies, pudding, candies; cHydrogenated vegetable fat, cheese spread, cream cheese; [d]Vitamin and mineral supplements, vanilla extract, baking powder, bouillon cubes, meal replacements and instant soups.

Source: Elaborated by the authors based on data from the 2008-2009 Campinas Health Survey.

has an income of less than half of the minimum monthly wage[21].

In Brazil, a large portion of the population has a low purchasing power. Thus, the practicality and low cost of ultra-processed products and the influence of marketing campaigns by multinational food companies has generated considerable harm to food culture, commensality and the nutritional status of the population[3,19,22].

The present results reveal that rice and beans contributed 20.3% of the calorie intake, which is slightly lower than the rate described for the Brazilian population (22.9%) by Louzada et al.[17] Since the 1970s, data from family budget surveys indicate significant reductions in the acquisition of basic foods, such as rice and beans, among Brazilians[8,23]. According to Silva[24], Brazil has a diversity of food cultures among its regions and, regardless of social class, rice and beans constitute the basis of the diet. However, the globalization of the economy, industrialization and the new demands of urban life have led to a reduc-

Table 2. Daily consumption means and relative frequency of energy contribution of ultra-processed food products in diet of adults (20 to 59 years) according to sociodemographic variables. 2008-2009 Campinas Health Survey.

Variables and categories	Kcal/day	% total energy intake	p-value
Total	502.1	24.1	
Sex			
Male	548.9	22.9	
Female	639.8	25.2	0.018
Age group (in years)			
20-29	674.4	29.2	
30-39	504.3	24.1	<0.001
40-49	368.0	20.7	<0.001
50-59	372.1	19.6	<0.001
Schooling (in years)			
0-7	377.0	18.7	
8-11	521.6	24.5	0.001
12 or +	588.4	28.3	<0.001
Income *per capita*			
≤1 Brazilian monthly minimum wage	412.0	21.5	
>1 to ≤3 x Brazilian monthly minimum wage	559.4	25.2	0.011
>3 x Brazilian monthly minimum wage	558.6	26.9	0.003
Marital status			
Without partner	463.2	22.4	
Without partner	564.6	26.8	0.001
Number of children			
None	649.3	28.8	
1-2	470.0	23.1	<0.001
3 or +	350.8	19.2	<0.001
Private health insurance			
Yes	547.5	26.2	
No	466.5	22.4	0.007

Source: Elaborated by the authors based on data from the 2008-2009 Campinas Health Survey.

tion in the consumption *per capita* of the more traditional foods of Brazilian cooking[25].

The present findings reveal insufficient consumption of fruits and vegetable, as reported in previous studies[26,27]. Analyzing data from the 2013 National Health Survey, Jaime et al.[27] found that little more than one-third of the population (37.3%) reached the recommended ingestion of fruits and vegetables, which is very similar to the 34.6% described in the 2017 Vigitel Brazil telephone survey[28]. However, the data show a predominance of minimally processed foods in the diet (54.1%), which is desirable, although carbonated soft drinks were among the most consumed ultra-processed products. According to the 2008-2009 Family Budget Survey, carbonated soft drinks are among the most consumed items *per capita*, with 14.6% of the population consuming these products at a frequency of five or more days per week[28]. Moreover, these beverages are associated with an increase in energy intake and, consequently, the prevalence of obesity and other chronic diseases[26,29].

Considering the national scenario of the insufficient consumption of fruits and vegetables, the alarming epidemiological profile of chronic diseases (54%, 18.9%, 24.3% and 7.6% rates of overweight, obesity, hypertension and diabetes, respectively)[28] and evidence of the association between these diseases and the consumption of ultra-processed foods[4], one of the goals of the Strategic Action Plan for Combating Chronic Non-Communicable Diseases in Brazil[30] is an increase in the consumption of fruits and vegetables by 2022 through the strengthening of school meal policies and the regulation of food prices.

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Table 3. Daily consumption means and relative frequency of energy contribution of ultra-processed food products in diet of adults (20 to 59 years) according to health-related behaviors and BMI. 2008-2009 Campinas Health Survey.

Variables and categories	Kcal/day	% total energy intake	p-value
Practice of physical activity at leisure			
Active	627,2	27,7	
Insufficiently active	514,5	22,9	0,005
Inactive	463,6	23,3	0,004
BMI (kg/m²)			
Underweight	443,5	24,2	0,912
Ideal range	518,7	24,5	
Overweight	515,4	23,7	0,580
Obese	431,6	22,7	0,218
Smoking			
Non-smoker	523,8	24,5	
Smoker	425,3	21,6	0,093
Ex-smoker	509,7	26,2	0,366
Frequency of alcohol intake			
Does not drink	486,4	23,7	
Once a week	558,4	25,8	0,112
2 or more times a week	412,4	20,8	0,167

Source: Elaborated by the authors based on data from the 2008-2009 Campinas Health Survey.

Table 4. Multiple linear regression model: variables associated with consumption of ultra-processed food products among adults. 2008-2009 Campinas Health Survey.

Variables and categories	Mean (95%CI)	p-value
Sex		
Male	25.4 (21.3-29.6)	
Female	28.3 (22.3-34.3)	0.004
Age group (in years)		
20-29	25.4 (21.3-29.6)	
30-39	20.8 (13.4-28.4)	0.009
40-49	17.7 (10.6-24.9)	<0.001
50-59	16.8 (9.3-24.3)	<0.001
Schooling (in years)		
0-7	25.4 (21.3-29.6)	
8-11	29.2 (21.7-36.7)	0.029
12 or +	32.9 (25.3-40.6)	<0.001
Smoking		
Non-smoker	25.4 (21.3-29.6)	
Smoker	25.1 (17.8-32.5)	0.856
Ex-smoker	29.4 (21.6-37.3)	0.033
Practice of physical activity at leisure		
Active	25.4 (21.3-29.6)	
Insufficiently active	21.4 (13.9-29.0)	0.022
Inactive	22.5 (15.5-29.6)	0.049

Source: Elaborated by the authors based on data from the 2008-2009 Campinas Health Survey.

The Health Ministry assumed the commitment of a 17.8% increase in the number of adults who regularly consume fruits and vegetables by 2019.

The consumption of ultra-processed products was higher among women and younger adults. Bielemann et al.[31] also found higher consumption among women and reported that more than half of the 3,758 kcal/day ingested by young adults (mean age: 22.8 years) was from ultra-processed products.

The reduction in the consumption of ultra-processed foods with the increase in age among the adults studied is an argument in favor of food culture and cooking traditions for the preservation of healthier eating habits, as adults between 50 and 59 years of age at the beginning of the 2000s only had greater access to ultra-processed foods when they were already young adults. However, further studies are needed to confirm this hypothesis.

The large participation of ultra-processed foods in the diet of women (25.2% of the total energy intake; p=0.018) is worrisome, as studies indicate that a diet with a large amount of ultra-processed products, which increases the intake of calories, fat, sugar and salt and lowers the intake of fiber and micronutrients, is related to an increase in excess weight and other non-communicable diseases[3,4,7,8,18,31]. Analyzing the transi-

tion of health and disease in Brazil, Souza et al.[32] found that chronic non-communicable diseases constitute the major cause of death in the country (75%) and that an inadequate diet is one of the main risk factors of these diseases.

Among the variables considered indicative of social vulnerability, schooling was maintained in the multivariate model, revealing an increase in the consumption of ultra-processed products with the increase in the number of years of study. Martins et al.[8] detected an increase in the caloric contribution of ultra-processed products between the first (16.6%) and last (33.8%) quintiles of the distribution of income of the Brazilian population. A study conducted in Mexico also found a greater consumption of ultra-processed foods in strata with a higher income and higher schooling of the head of the family[10]. These results contrast those found in France, where a study reports lower consumption of ultra-processed foods among adults with higher levels of schooling and income[13].

Although there is no consensus in the literature on the association between ultra-processed products and socioeconomic status, there has been an increase in the consumption of these products in all social strata and the most promising markets for the food industry are no longer the rich countries of North America and Europe, but rather developing and low-income countries. Although the volume of the sales of ultra-processed products is higher in high-income countries, the growth rate between the years 2000 and 2013 was 48.0% in low-income countries and only 2.3% in North America[3].

The inclusion of the right to adequate, healthy food among the basic social rights of the Brazilian population is undoubtedly an advance. However, one must consider the severe social inequalities that affect the society, determining different negative impacts on the eating pattern. The incorporation of new eating habits by the poorer strata of the population has been driven by advertising and the lower costs of ultra-processed products[19,33]. Monteiro and Castro[33] cite some of the strategies used by the food industry to induce the purchasing of ultra-processed foods among low-income consumers, such as the development of fortified products, economy sizes and the creation of new marketing channels to facilitate access to these products regardless of one's social status:

It is one thing to eat cookies and drink soda pop while watching television after returning from school, as children in a higher social class do. It is quite another thing for a poor child to eat cookies and drink soda pop because it is a cheap way to satisfy his hunger[34].

Thus, the food and nutritional security and, consequently, the right of the Brazilian population to an adequate, healthy diet is threatened not only by the current model of economic development in detriment to social development in the country, but also by market expansion strategies of large corporations.

In the present study, ex-smokers consumed more ultra-processed food products (29.4%), which is in disagreement with data described by Tian et al.[35], who found that Australian ex-smokers adopted healthier practices of diet and physical activity. The literature reports an association between quitting smoking and greater weight gain, which may indicate the replacement of one inadequate habit for another. There are hypotheses that the use of psychoactive substances and the consumption of foods, especially those rich in fat and sugar, affect common areas of the brain[36].

Regarding living habits, the energy contribution of ultra-processed products was higher among individuals who were physically active during leisure. This result as well as the greater consumption among women and younger adults may be explained by the innumerous ultra-processed products available on the market with *fitness* appeal. The worship of a slim body in contemporary society creates opportunities for the food industry to invest in the development of *light*, *diet*, *low carb* or *fitness* versions of products, which induce consumers to believe that these products are healthier[33]. The greater participation of ultra-processed foods in the diet of physically active individuals, those with more schooling and women may stem from a lack of knowledge regarding the harm such products can cause to health. However, this hypothesis requires further investigation.

The present study has limitations that should be considered. The cross-sectional design does not enable the determination of causal relations, although this was not the objective of the study. The application of a single 24-hour dietary recall does not enable estimating usual consumption due to the variability in the diet of individuals. The lack of an association between the consumption of ultra-processed foods and BMI may have been due to under-reporting on the part of individuals with excess weight[37]. However, as a population-based study in which the 24hR collection method ensured data from different days of the week and months of the year as a way to con-

sider variability, it was possible to estimate the mean consumption of the population evaluated. Despite these limitations, this study achieved its objective and contributes evidence regarding the consumption of ultra-processed foods among adults.

It should be pointed out that these results were from a population-based health survey conducted periodically in a large Brazilian city, which enables the development of monitoring studies to determine changes in the consumption pattern of ultra-processed products over the years.

Although recognizing that Brazil has advanced considerably in public policies and actions directed at issues related to diet and nutrition in the last 15 years and that the implantation and dissemination of such policies and actions are not trivial tasks, the increase in the prevalence of obesity and other chronic non-communicable diseases in Brazil continues. This not only shows the contradictions of the country's development model, but also that there is still enough time to intervene in favor of the dietary health of the Brazilian population.

Evaluating the results of these policies and actions to assist in improving them, combating the dismantling of public policies in the country as well as strengthening discussions on the nature, extent and purpose of the food processing are currently priorities. Therefore, the identification of behaviors and factors associated with the consumption of ultra-processed products is indispensable. Besides the harm caused to the quality of the diet and, consequently, health, there are also economic, social and environmental factors involved.

Collaborations

MG Pereira did the programming of the statistical analyses and participated in the analysis of the results and writing of the manuscript. D Assumpção produced the food processing grade classification database, participated in the programming of the statistical analyses, analysis of the results and writing of the manuscript. MBA Barros coordinated the 2008-2009 ISACamp Health Survey, reviewed the statistical analyses and critically read the manuscript. LTO Zangirolani participated in the construction of the statistical analysis plan, the analysis of the results, the writing of the manuscript, and the critical reading of the manuscript. All authors approved the final version of the manuscript.

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