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Changes in food consumption and prevalence of overweight and obesity in Brazilian adults between 2008 and 2018

Mudanças no consumo alimentar e na prevalência de sobrepeso e obesidade em adultos brasileiros entre 2008 e 2018

Ilana Nogueira Bezerra[1], Jamile Carvalho Tahim[2], Renata da Rocha Muniz Rodrigues[3], Rosely Sichieri[3]

[1] Universidade Estadual do Ceará, Centro de Ciências da Saúde, Programa de Pós-Graduação em Nutrição e Saúde. Fortaleza, CE, Brasil.
[2] Universidade Estadual do Ceará, Centro de Ciências da Saúde, Programa de Pós-Graduação em Saúde Coletiva. Fortaleza, CE, Brasil.
[3] Universidade do Estado do Rio de Janeiro, Instituto de Medicina Social, Departamento de Epidemiologia. Rio de Janeiro, RJ, Brasil. Correspondence to: IN BEZERRA. E-mail: <ilana.bezerra@uece.br>.

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ABSTRACT

Objective
To assess dietary intake and weight status changes among Brazilian adults.

Methods
In this dietary survey, data from the food consumption modules of the 2008-2009 (n=21,003 adults) and the 2017-2018 (n=28,153 adults) Household Budget Survey were evaluated to estimate the mean consumption (g/day) of 20 food groups. The body mass index was calculated to classify the weight status of adults and estimate the prevalence of overweight and obesity. Differences between surveys were identified when the 95% confidence intervals were not interspersed. All analyses were stratified by gender and considered the sample weight and the complexity of the sample design.

Results
The prevalence of overweight increased both among men (38.4%; 95% CI: 36.8-40.0, in 2008-2009 vs. 42.2%; 95% CI: 40.9-43.5, in 2017-2018) and women (29.5%; 95% CI: 58.0-30.9 vs. 35.2%; 95% CI: 34.0-36.4, respectively). Mean consumption of poultry and eggs (57.6g/day vs. 77.9 g/day in men and 43.5g/day vs. 57.3g/day in women, $p<0.05$) and fast foods (31.3g/day vs. and 48.7g/day in men and 25.3g/day in 2008-2009 vs. 34.8g/day in women, $p<0.05$) increased between the two surveys, while the mean consumption of rice, beans, fruits, coffee and tea, fish and seafood, processed meats, milk and dairy products, sweets and desserts, sugary drinks, and soups declined.

Conclusion
The Brazilian food consumption pattern follows the increased prevalence of overweight and reinforces the need to encourage healthy patterns that revive our country's food culture and eating habits.

Keywords: Dietary surveys. Eating. Obesity. Overweight.

RESUMO

Objetivo
Avaliar as mudanças no consumo alimentar e status de peso de adultos no Brasil.

Métodos
Neste inquérito dietético, foram avaliados dados dos blocos de consumo alimentar das Pesquisas de Orçamento Familiar dos anos 2008-2009 (n=21.003 adultos) e 2017-2018 (n=28.153 adultos) para estimar a média de consumo (g/dia) de 20 grupos de alimentos. O índice de massa corporal foi calculado para classificar o status de peso dos adultos e estimar a prevalência de sobrepeso e obesidade. Diferenças entre os inquéritos foram identificadas quando os intervalos de 95% de confiança não se intercalaram. Todas as análises foram realizadas separadamente por sexo e consideraram o peso amostral e a complexidade do desenho amostral.

Resultados
A prevalência de sobrepeso aumentou tanto entre homens (38,4%; intervalo de confiança 95%: 36,8-40,0, em 2008-2009 vs 42,2%; intervalo de confiança 95%: 40,9-43,5, em 2017-2018) como entre mulheres (29,5%; intervalo de confiança 95%: 58,0-30,9 vs 35,2%; intervalo de confiança 95%: 34,0-36,4, respectivamente). A média de consumo de frango e ovos (57,6g/dia vs. 77,9 g/dia, em homens e 43,5g/dia vs. 57,3g/dia, em mulheres, p<0,05) e fast foods (31,3g/dia vs. e 48,7g/dia, em homens e 25,3g/dia em 2008-2009 vs. 34,8g/dia, em mulheres, p<0,05) aumentou entre os dois inquéritos, enquanto a média de consumo de arroz, feijão, frutas, café e chá, peixes e frutos do mar, carnes processadas, leite e derivados, doces e sobremesas, bebidas açucaradas e sopas diminuiu.

Conclusão
As mudanças no padrão de consumo da dieta brasileira acompanham o aumento nas prevalências de sobrepeso e reforçam a necessidade de se estimular padrões saudáveis que resgatem a cultura alimentar e hábitos alimentares de nosso país.

***Palavras-chave*:** *Inquéritos sobre dietas. Ingestão de alimentos. Obesidade. Sobrepeso.*

INTRODUCTION

The World Health Organization (WHO) attaches substantial importance to the association between obesity and increased risk of developing cardiovascular diseases, diabetes and endocrine disorders, and other chronic diseases [1]. The last few decades have been marked by an increase in deaths from chronic non-communicable diseases throughout the world population. Obesity, alcohol abuse, smoking, physical inactivity, and unhealthy diet are the main modifiable risk factors associated with these diseases [2].

Proportionally, the increase in the use of health services is associated with the Body Mass Index (BMI) since overweight or obese individuals are at greater risk of diseases [3]. In recent years, an increasing BMI trend has been observed in individuals of both genders and all Brazilian capitals [4]. Factors like physical inactivity can confound the association between food consumption and weight status. However, inadequate nutrition is still the main factor in excessive weight gain and obesity [5,6].

Dietary patterns can be influenced by socioeconomic, ethnic, regional, and cultural traits [7]. Over the years, household food availability data has shown higher access to ultra-processed items and declining acquisition of traditional Brazilian diet foods [8]. However, dietary surveys to investigate actual individual food consumption in a representative population sample were conducted for the first

time in Brazil in 2008-2009 and then only in 2017-2018 [9,10]. Some articles have already evidenced changes in the Brazilian population's food consumption, using different analysis approaches and age groups [11,12]. However, continued investigations into the temporal development of effective food consumption by the population and assessment of weight status in the same period still need to be completed.

Knowing the changes in food consumption and the weight status of the Brazilian population can guide decision-making, management, the development of public policy strategies, and addressing obesity in different government spheres, besides reinforcing the importance of using national survey data to assess food intake changes [13].

Based on available data on personal food consumption collected in the latest Household Budget Surveys (POF) by the Brazilian Institute of Geography and Statistics in a representative sample of the national territory, this article aims to evaluate changes in food consumption and weight status of Brazilian adults from 2008 to 2018.

METHODS

This study is a dietary survey conducted in a representative sample of Brazilian households based on data from the personal food consumption module of the 2008-2009 and 2017-2018 *Pesquisa de Orçamentos Familiares* (POF, Household Budget Surveys) [9,10]. The data is public and available on the *Instituto Brasileiro de Geografia e Estatística* (IBGE, Brazilian Institute of Geography and Statistics) website at: <https://www.ibge.gov.br/estatisticas/sociais/populacao/24786-pesquisa-de-orcamentos-familiares-2.html?=&t=microdados>.

The two surveys used the IBGE Integrated Household Survey System, which selects a "Master Sample", defined as a set of census tracts that cover the entire national territory. The sample was selected in two stages. In the first stage, census tracts were the primary sampling units, selected by systematic sampling with probability proportional to the number of households in each tract. The secondary sampling units were households selected by simple random sampling. The census tracts were submitted to geographic and statistical stratification to allow analyses in different geographic and socioeconomic domains. A subsample of the Master Sample made up the POF sample, following the same sampling infrastructure as the other household surveys [9,10].

A total of 55,970 households with 190,159 individuals were investigated in 2008-2009 POF. Almost 25% of these households (13,569) were selected to participate in the Food Consumption Module, answered by all residents over 10 years of age living in these households (n= 34,003 individuals). In the 2017-2018 POF, around 35% of the 57,920 households were selected to participate in the Food Consumption Module (20,112), and 46,164 residents over 10 years old responded to the food consumption module. Only adults 20 to 59 years of age were included in the analyses for this article. Pregnant or breastfeeding women were excluded, totaling 21,003 individuals in 2008-2009 and 28,153 in 2017-2018 [9,10].

Data was collected in both surveys in the census tracts during a year by trained IBGE agents. Information collection in households occurred over nine consecutive days and was based on the application of seven investigation modules: Household and Resident Characteristics Questionnaires (POF 1), Collective Acquisition Questionnaire (POF 2), Collective Acquisition Booklet (POF 3), Individual Acquisition Questionnaire (POF 4), Work and Individual Income Questionnaire (POF 5), Assessment of Living Conditions (POF 6), and Personal Food Consumption Module (POF 7). POF1 and POF7 data [9,10] will be used for this work.

The socioeconomic data and household characteristics collected in the POF1 and used in this analysis include age, gender, education, ethnicity/skin color, household area (urban or rural), and the geographic region of the household [9].

Food consumption data were collected on two non-consecutive days from individuals aged 10 or over living in the households selected to participate in the food consumption module. In the 2008-2009 POF, we applied food records in which individuals were required to record throughout the day all the food and drinks consumed (except water), the amount consumed, the location (inside or outside the home), the time, and the type of preparation for specific foods [9].

Participants also received guidance through an informative booklet and instructional material with photographs of home measurements to facilitate food recording. The informants wrote down their records, and during the interviews, the research agents reviewed the completed information, supplementing when necessary [9].

The 24-hour recall was adopted in the 2017-2018 POF, and the instrument was completed by a trained agent who personally interviewed individuals. Food and drinks consumed (including water) on the day before the visit were investigated and recorded following the structured script in sequential stages based on the Multi-Passage Method [14], including information on the amount consumed, the place of consumption, the time, and the type of preparation for specific foods.

In 2017-2018, a list of 12 items was available to record the addition of items usually consumed together with other foods, such as olive oil, butter/margarine, sugar, sweetener, honey, molasses, mayonnaise (sauce), ketchup, mustard (sauce), soy sauce, grated cheese, and cream. Individuals also reported the meal consumption occasion, whether they usually added salt to food, whether that day was a typical or atypical food consumption, and the use of vitamin supplements [10].

In both surveys, probing questions were asked to verify the omission of items often under-reported in food surveys, such as small snacks and sweets. Since specific additional items were not collected in the 2008-2009 POF, these items were not considered in the 2017-2018 POF to ensure comparability between surveys and water consumption [9,10].

In both surveys, food items were classified according to nutritional characteristics and food processing level into 25 food groups, as follows: Rice; Beans and other legumes; Greens and vegetables; Roots; Fruits; Supplements; Oilseeds; Other cereals (breakfast cereals, oats, wheat bran, and granola); Bread and pasta; Cakes; Meat; Chicken and eggs; Fish and seafood; Processed meats; Sauces, Coffee and tea; Sugary drinks; Alcoholic beverages; Natural juices; Other drinks (isotonic drinks, sugarcane juice, and coconut water); Milk and dairy products; Sweets and desserts; Fast foods; Oils and Soups. Food groups with a very low percentage of consumers (<5%) were not included in the results (supplements, nuts, sauces, other drinks and oils) [9, 10].

The amounts of food and drinks consumed reported in household measurements were transformed into grams or milliliters to calculate the amount consumed by each food group per informant. This conversion was based on specific home measurement tables developed for each survey [9,10].

The anthropometric assessment (weight and height) was performed during the research agent's visit to the home of the residents present. In 2008-2009, a portable electronic 150kg-capacity scale with a graduation of 100 g was used to measure weight. The individuals stood at the center of the equipment, with as little clothing as possible, barefoot, upright, with their feet together and their arms extended alongside their bodies. A KaWe portable stadiometer with an internal retractable tape, with a 0.1 cm accuracy and an extension of up to 200cm, was adopted to measure height.

Measurements were taken with individuals in a vertical position, standing upright, barefoot, and with their heads free of accessories. The arms were extended alongside the body, with the head raised, looking at a fixed point at eye level and leaning against a wall or a flat, firm surface. Weight and height were self-reported in the 2017-2018 POF [10,15].

The BMI was calculated from weight divided by height squared to assess the weight status of the population. The BMI classification of adults followed the criteria of the World Health Organization (1998): malnutrition (≤18.5kg/m^2), eutrophy (18.5kg/m^2 to 24.9kg/m^2), overweight (25.0kg/m^2 to 29.9kg/m^2), Class I obesity (30kg/m^2 to 34.9kg/m^2), Class II obesity (35kg/m^2 to 39.9kg/m^2) and Class III obesity (≥40kg/m^2) [9,10].

Descriptive analyses were conducted to characterize the population interviewed in the two surveys regarding socioeconomic and demographic variables: ethnicity/skin color (white, brown or black, and others), schooling years (up to 4 years, 5-9 years, 10-12 years, 13 years and over), residence area (urban or rural), region (North, Northeast, South, Southeast, and Midwest). Furthermore, the prevalence of each level of weight status was estimated [9,10]. The relative frequencies were calculated in each survey year to describe the variables, showing the prevalence in the categories of each variable, together with their respective 95% confidence intervals (95% CI).

The population's mean consumption of each food group was estimated in each survey to assess food consumption changes. Estimates by weight status level were also calculated. Differences between surveys were identified when the 95% confidence intervals were not interspersed [9,10].

All analyses were stratified by gender and considered the sample weight and the complexity of the sampling design using the Statistical Analysis System software, version 9.4.

RESULTS

The demographic distribution of the population was similar for almost all variables. In 2017-2018, a slightly higher percentage of individuals self-declared Black or mixed race (5 percentage points – 5 percentage points more among men and 7.5 percentage points more among women). We observed an improvement in the education level of adults, with a significant reduction in the prevalence of individuals with up to four schooling years, down from 28.9% (95% CI: 27.5-30.4) to 13.2% (95% CI: 12.3-14.0) among men and 27.1% (95% CI: 25.6-28.5) to 10.6% (95% CI: 9.8-11.3) among women. In addition to reducing the low education level, we identified an increase in individuals with 10 years or more of schooling. Among men, those with 10-12 years of education rose from 31.2% (95% CI: 29.5-32.8) to 38.0% (95% CI: 36.7-39.4) and 12.8% (95% CI: 11.5-14.1) to 19.7% (95% CI: 18.4-21.1) among those with 13 schooling years and over. Among women, these prevalence levels rose from 33.1% (95% CI: 31.5-34.7) to 38.0% (95% CI: 35.7-38.2) and 14.5% (95% CI: 13.3-15.8) to 25.7% (95% CI: 24.3-27.1), respectively. Regarding the location of the respondents' homes, the prevalence of individuals in the urban area was four times higher than in the rural area in both surveys. However, the percentage distribution of individuals in these areas and Brazilian regions was similar between surveys. (Table 1).

Table 1 – General characteristics of the Brazilian population by gender. Household Budget Surveys 2008-2009 and 2017-2018.

Characteristics	Men		Women	
	2008-2009 (n=9,974)	2017-2018 (n=13,338)	2008-2009 (n=11,029)	2017-2018 (n=14,815)
	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)
Ethnicity/skin color				
White	47.6 (45.8-49.4)	42.2 (40.8-43.7)	50.5 (48.8-52.1)	43.0 (41.6-44.5)
Black and brown	51.4 (50.0-53.3)	56.8 (55.4-58.2)	48.4 (46.8-50.0)	55.9 (54.4-57.3)
Other	0.9 (0.5-1.2)	1.0 (0.7-1.3)	1.1 (0.8-1.5)	0.2 (0.7-1.5)
Schooling years				
Up to 4 years	28.9 (27.5-30.4)	13.2 (12.3-14.0)	27.1 (25.6-28.5)	10.6 (9.8-11.3)
5-9 years	27.1 (25.7-28.5)	29.1 (27.9-30.3)	25.3 (23.9-26.6)	26.8 (25.6-27.9)
10-12 years	31.2 (29.5-32.8)	38.0 (36.7-39.4)	33.1 (31.5-34.7)	38.0 (35.7-38.2)
13 years and over	12.8 (11.5-14.1)	19.7 (18.4-21.1)	14.5 (13.3-15.8)	25.7 (24.3-27.1)
Area				
Urban	83.7 (82.8-84.6)	84.9 (84.1-85.6)	86.3 (85.5-87.0)	87.7 (87.1-88.3)
Rural	16.3 (15.4-17.2)	15.1 (14.4-15.9)	13.7 (13.0-14.5)	12.3 (11.7-12.9)
Region				
North	7.6 (7.1-8.1)	8.5 (7.9-9.1)	7.0 (6.6-7.5)	7.8 (7.3-8.3)
Northeast	26.5 (25.3-27.7)	26.4 (25.5-27.4)	26.3 (25.1-27.4)	26.4 (25.6-27.3)
Southeast	43.5 (41.9-45.2)	42.5 (41.1-43.8)	44.1 (42.6-45.6)	43.2 (42.0-44.4)
South	15.0 (14.1-15.9)	14.7 (13.9-15.5)	15.1 (14.3-16.0)	14.6 (13.8-15.3)
Midwest	7.4 (6.8-7.9)	7.9 (7.3-8.5)	7.5 (7.0-8.0)	8.0 (7.5-8.5)

Note: CI: Confidence Interval.

We observed an increase in the prevalence of overweight in both genders. In women, overweight increased by almost six percentage points between surveys. The increase in overweight was lower (3.8 percentage points) among men. Regarding obesity, in 2008-2009, 16.2% of women had some level of obesity, and there was no difference in 2017-2018 when 17.2% of women also had some level of obesity. This finding was different among men, with the prevalence of Class 1 obesity increasing between the two surveys, from 9.8% (95% CI: 8.9-10.7) to 12.9% (95% CI: 11. 9-13.8) (Table 2).

Table 2 – Weight status of Brazilian adults by gender: National Food Surveys 2008-2018.

Nutricional status	Men		Women	
	2008-2009	2017-2018	2008-2009	2017-2018
	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)
Underweight	1.4 (1.1-1.8)	1.6 (1.1-2.0)	3.5 (3.0-4.0)	2.9 (2.4-3.3)
Eutrophy	47.9 (46.2-49.6)	39.9 (38.6-41.2)	50.2 (48.6-51.8)	44.8 (43.4-46.1)
Overweight	38.4 (36.8-40.0)	42.2 (40.9-43.5)	29.5 (28.0-30.9)	35.2 (34.0-36.4)
Obesity 1	9.8 (8.9-10.70	12.9 (11.9-13.8)	11.8 (10.9-12.8)	12.6 (11.8-13.5)
Obesity 2	1.9 (1.5-2.4)	2.8 (2.3-3.2)	3.8 (3.2-4.4)	3.4 (3.0-3.8)
Obesity 3	0.5 (0.3-0.7)	0.6 (0.5-0.8)	1.2 (0.9-1.6)	1.2 (0.9-1.4)

Note: CI: Confidence Interval.

Gender differences were observed in both surveys, with obesity prevalence rates being higher among men than in women (nine percentage points in 2008-2009 and seven percentage points in 2017-2018). Regarding the different classes of obesity, a difference between the genders was observed only in Class 1 obesity in the 2008-2009 survey, when women had 2% more Class 1 obesity than men. However, this difference disappeared in the 2017-2018 survey. In the last survey, only Class 3 obesity showed a difference between the genders, where women had twice the prevalence of men (Table 2).

Differences between genders can be seen in the amount of specific food groups consumed between surveys. Women showed higher mean consumption of vegetables (45.9g/day; 95% CI: 43.1-48.6 in 2008-2009 and 52.7g/day; 95% CI: 50.6-54.9 in 2017-2018) and alcoholic beverages (12.8 ml/day; 95% CI: 9.6-16.1 in 2008-2009 and 25.3 ml/day; 95% CI: 19.3-25.3), while the mean consumption among men was similar between the two surveys and higher than women's mean consumption of alcoholic beverages (80.7 ml/day; 95% CI: 65.2-96.2 in 2008-2009 and 79.7ml/day; 95% CI: 68.3-91.1 in 2017-2018) (Table 3).

Table 3 – Mean consumption (grams or milliliters/day) of food groups and 95% confidence interval (95%CI). Household Budget Survey, Brazil, 2008-2018.

Food groups	Men			
	2008-2009		2017-2018	
	Mean (g or ml/day)	95% CI	Mean (g or ml/day)	95% CI
Rice	209.6	204.1-215.0	174.1	169.5-178.7
Beans and other legumes	250.6	242.7-258.4	231.9	225.2-239.7
Greens and Vegetables	45.3	43.0-47.7	49.3	46.6-52.0
Roots	63.2	59.4-67.0	59.8	56.5-63.1
Fruits	73.2	68.0-78.4	58.5	54.5-62.5
Coffee and tea	255.2	246.2-264.2	227.9	218.2-237.6
Other cereals	3.0	2.4-3.5	2.5	2.1-2.8
Breads and pasta	114.8	109.9-119.7	115.9	111.2-120.5
Cakes	26.4	23.5-29.2	24.6	23.1-26.1
Meat	94.8	90.8-98.7	101.3	97.4-105.1
Chicken and eggs	57.6	54.8-60.5	77.9	74.7-81.0
Fishes and seafood	30.9	26.8-34.9	20.1	17.1-22.1
Processed meats	11.0	9.7-12.4	7.9	7.0-8.8
Milk and dairy products	66.1	61.1-71.1	39.1	35.9-42.4
Sweets and desserts	33.0	29.5-36.4	23.0	20.7-25.3
Sugary drinks	152.6	142.2-162.9	109.8	102.0-117.6
Fast foods	31.3	28.3-34.4	48.7	45.6-51.8
Alcoholic beverages	80.7	65.2-96.2	79.7	68.3-91.1
Natural juices	124.6	117.1-132.1	136.8	129.5-144.2
Soups	40.7	36.3-45.1	31.6	27.0-36.1
Food groups	Women			
	2008-2009		2017-2018	
	Mean (g or ml/day)	95% CI	Mean (g or ml/day)	95% CI
Rice	141.1	137.4-144.7	115.7	112.7-118.7
Beans and other legumes	157.4	151.8-163.0	143.5	139.3-147.7
Greens and Vegetables	45.9	43.1-48.6	52.7	50.6-54.9
Roots	48.2	45.4-50.9	50.5	48.2-52.8
Fruits	86.3	81.5-91.2	73.0	69.5-73.0
Coffee and tea	259.2	249.7-268.7	215.2	207.3-223.1
Other cereals	1.9	1.6-2.3	2.1	1.8-2.1
Breads and pasta	94.3	90.3-98.3	87.3	84.0-87.3
Cakes	27.4	25.3-29.5	25.4	24.0-25.4
Meat	67.5	64.6-70.4	67.4	64.8-70.1
Chicken and eggs	43.5	41.4-45.6	57.3	55.1-59.6
Fishes and seafood	21.9	19.2-24.5	15.8	14.0-17.5
Processed meats	6.6	5.9-7.3	5.0	4.5-5.0
Milk and dairy products	70.4	65.7-75.0	43.1	40.0-43.1
Sweets and desserts	34.4	31.1-37.7	24.1	22.0-24.1
Sugary drinks	105.5	98.3-112.7	68.0	63.2-68.0
Fast foods	25.3	22.7-27.9	34.8	32.4-34.8
Alcoholic beverages	12.8	9.6-16.1	25.3	19.3-25.3
Natural juices	116.0	109.5-122.4	116.4	110.9-116.4
Soups	52.2	46.7-57.7	37.9	34.4-37.9

Note: CI: Confidence Interval.

Similar findings between genders for the differences in food consumption between the two surveys can be observed in lower consumption of rice, beans, fruits, coffee and tea, fish and seafood, processed meats, milk and dairy products, sweets and desserts, sugary drinks, and soups. Among these groups, the most significant reduction in the mean consumption was for sugary drinks (reduction of 42.8 ml/day among men and 37.5 ml/day among women), rice (reduction of 35.5 g/day among men and 25.4 g/day among women), coffee and tea (reduction of 27.3 ml/day among men and 44.0 ml/day among women) and milk and dairy products (reduction of 27 g/day among men and 27.3 g/day among women) (Table 3).

Men and women increased their consumption of chicken, eggs, and fast foods. The increase in the mean consumption of chicken and eggs went up from 57.6 g/day (95% CI: 54.8-60.5) to 77.9 g/day (95% CI: 74.7-81.0) among men and from 43.5 g/day (95% CI: 41.4-45.6) to 57.3 g/day (95% CI: 55.1-59.6) among women. Regarding fast foods, the increase between surveys was more significant in men (from 31.3 g/day; 95% CI: 28.3-34.4 in 2008-2009 to 48.7 g/day; 95% CI: 45.6 -51.8 in 2017-2018) than in women (from 25.3 g/day; 95% CI: 22.7-27.9 in 2008-2009 to 34.8 g/day; 95% CI: 32.4 -34.8 in 2017-2018) (Table 3).

DISCUSSION

This study evaluated changes in food consumption and weight status of Brazilian adults between the 2008-2009 and 2017-2018 POF surveys and identified an increase in the prevalence of overweight among men and women, and Class 1 obesity among men. Furthermore, it revealed changes in the consumption of specific food groups that varied differently between men and women.

The consumption of chicken, eggs, and fast foods increased in both genders, while typical Brazilian lunch and dinner meal consumption markers, such as beans, rice, and soup, declined. These results suggest a change in the consumption of specific food groups and a transformation in food consumption patterns, which are no longer based fundamentally on traditional meals in the Brazilian diet [8].

Our results regarding changes in weight status corroborate data collected in Primary Health Care regarding the time trend of overweight and obesity among Brazilian adults, who were monitored and recorded by the *Sistema de Vigilância Alimentar e Nutricional* (SISVAN, Food and Nutrition Surveillance System) from 2008 to 2019 [16]. This growing trend has also been observed in Latin America and the Caribbean [17]. Several factors are highlighted as possible explanations for the increase in the prevalence of overweight and obesity over the years in Brazil, such as, for example, the growing sedentarism, lower engagement in physical activity, and higher number of people living in urban areas, where work activities and commuting tend to be more sedentary [4].

The increase in overweight is observed in both genders; however, women continued to have a higher obesity prevalence than men in both surveys. Although no difference was observed in the prevalence of severe obesity (BMI>=40kg/m^2), a recent article using *Sistema de Vigilância de Fatores de Risco e Proteção para Doenças Crônicas por Inquérito Telefônico* (VIGITEL) data from 2006 to 2021 described a significant growing trend in the prevalence of Class 3 obesity in women [18]. The gender discrepancy can be attributed to several factors, including differences in food consumption patterns, energy expenditure, and gender issues [19].

In the present study, part of the weight variations can be attributed to the data collection change, in which weight was measured in the first survey and self-reported in the second; that is, measured and reported weight, respectively. An analysis of data from the 2013 National Health

Survey compared BMI values with measured and reported data and concluded that sensitivity is more significant for overweight data than obesity, although there is good agreement [20].

In the context of evaluating food consumption, we observed that the intake of fast foods increased for both genders. The setting of the growing acquisition of these items is associated with the consumption of high-energy density and low nutritional value preparations. Risk factors related to the consumption of large amounts of red meat, processed meats, ultra-processed items, sugary drinks, and fried foods contribute to weight gain and an increased risk of diet-related diseases and disorders [21].

In parallel with the higher consumption of fast foods, we observed a decrease in items that are traditional Brazilian meal markers, such as beans, legumes, and soups. These modified dietary patterns suggest an increase in the consumption of ultra-processed foods, which are associated with obesity indicators with positive trends, regardless of gender and age group [22]. Given this setting, different strategies are proposed to reduce or slow down the expanding intake of these items, including adjusting nutritional labeling, taxing ultra-processed items, and regulating advertising and promotions related to these products [8]. The food environment has been identified as an essential determinant of food consumption, influencing the choices of individuals and communities based on the availability, accessibility, convenience, quality, and promotion of food [22]. These environments display heterogeneous features in their geographic distribution, suggesting more significant exposure to certain types of food in regions with less or greater socioeconomic vulnerability, which may affect people's health outcomes [22]. In a more recent event, the influence of food acquisition methods began to incorporate online retail services for food prepared outside the home, expanding exposure and access to fast food and ultra-processed items in activities that exceed the environment built and influencing users' consumption patterns [23].

The acquisition of food prepared outside the home, whether for consumption outside or inside the home, is associated with a greater frequency of ready-made and fast food items, such as pizza, fried snacks, sandwiches, ice cream, sweets, sugary drinks, and alcoholic beverages. These items comprise food groups considered unhealthy eating markers, and their consumption is discouraged by health and nutrition guidelines due to their high energy value, low amount of fiber and micronutrients, and high levels of sugar and saturated fats [24]. The expanded use of digital technologies to purchase food prepared outside the home can impact exposure to these foods and changes in customary eating behaviors [23].

A positive aspect of our results was that women showed a higher intake of vegetables, suggesting the habit of consuming fresh or minimally processed foods. This finding corroborates VIGITEL data regarding the regular consumption of fruits and vegetables, considered healthy eating markers in the Brazilian diet [25]. These foods are part of the group of foods whose regular consumption is associated with a lower risk of developing chronic diseases and are included in the recommendations of guides and guidelines for the Brazilian population [26].

The mean intake of chicken and eggs increased between surveys among men and women. According to the NOVA food classification [26], Brazilian population dietary guidelines recommend the consumption of fresh or minimally processed foods as the basis for an adequate and healthy diet. However, we underscore the interaction of different domains influencing food choices, such as culture, price, and availability [27] among the food consumption determinants. Data on household food availability show that the acquisition of red meat varied with the household's income level over the years. Red meat purchase practically did not change (0.1 percentage point – p.p.) in households in the lowest income quintiles, while the purchase of chicken (1.5 p.p.) showed the most significant

change [28]. These findings can be attributed to the Brazilian economic crisis since 2014, and socioeconomic characteristics may have impacted red meat consumption patterns [29].

An essential aspect of our results was the growing alcohol consumption among females. This finding draws attention due to the positive association between alcohol consumption and increased body mass index, waist circumference, and waist-hip ratio. Furthermore, greater consumption of alcoholic beverages may significantly increase individuals' energy intake and influence body adiposity distribution [30].

A significant limitation of our study is the change in how weight and height are assessed, as previously described, and in the instrument for collecting food consumption data. Although the food record was used in 2008-2009 and the 24-hour recall was used in 2017-2018, the multi-pass technique was applied in both surveys to review the records and collect the 24hR, with probing questions for frequently forgotten food. Items not investigated in 2008-2009, such as water consumption and adition items, were not included in these analyses so as to compare surveys. One strength of our study is having a national sample representative of the Brazilian population, with simultaneous analysis of changes in weight status and food consumption.

CONCLUSION

The prevalence of overweight increased among Brazilian men and women between 2008-2009 and 2017-2018. Changes in the Brazilian population's food consumption were observed in the same period, with a higher mean intake of fast foods and a reduction in markers for meals traditionally consumed at lunch and dinner, such as beans, rice, and soups. These findings characterize changes in the consumption pattern of the Brazilian diet and reinforce the need to encourage healthy patterns that restore our country's food culture and eating habits.

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CONTRIBUTORS

IN BEZERRA participated in the conception and design, as well as data analysis and interpretation. JC TAHIM participated in data analysis and interpretation. RRM RODRIGUES contributed to data analysis and interpretation. R SICHIERI participated in the conception and design, as well as data analysis and interpretation. All authors of the present study participated in the review and final approval of the article.