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"ONE STEP FORWARD, AND YOU ARE NO LONGER IN THE SAME PLACE": AN ANALYSIS OF OBESITY IN ADULTS IN THE METROPOLITAN REGION OF RECIFE IN THE YEARS 2006, 2015/16 AND 2019

"UM PASSO À FRENTE E VOCÊ NÃO ESTÁ MAIS NO MESMO LUGAR": UMA ANÁLISE DA OBESIDADE EM ADULTOS DA REGIÃO METROPOLITANA DO RECIFE NOS ANOS DE 2006, 2015/16 E 2019

"UN PASO ADELANTE Y YA NO ESTÁS EN EL MISMO LUGAR": UN ANÁLISIS DE LA OBESIDAD EN ADULTOS EN LA REGIÓN METROPOLITANA DE RECIFE EN LOS AÑOS 2006, 2015/16 Y 2019

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ABSTRACT

This study aimed to describe the temporal evolution of obesity in 2006, 2015/16, and 2019 and its relationship with sociodemographic, economic, clinical, and lifestyle factors in adults in the Metropolitan Region of Recife, Pernambuco. An analytical and quantitative cross-sectional study was conducted on three adult populations of both sexes in the Metropolitan Region of Recife (MRR) in 2006, 2015/2016, and 2019. The odds ratio (OR) of obesity was calculated for each exposure variable using logistic regression, adjusted with their respective 95% confidence intervals (CI 95%). Variables with a p-value ≤ 0.05 and those with a borderline association between 0.05 and 0.10 were considered to be associated with obesity. An increase in the percentage of obesity (p<0.001) was observed, along with adults

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with a per capita income of up to ½SM (p<0.001) and low educational level (p<0.001) across the three periods. Obesity was associated with age 30-40 years (p<0.001) in all three periods. Hypertension (HAS) was also identified as a risk factor for obesity in the first (p<0.001) and third periods of the study (p<0.01). In the second (p<0.05) and third periods (p<0.07), higher education was identified as a protective factor. In the last period of the study, females (p<0.001) had nearly three times higher odds of being obese. This study underscores the need for continued public policies in food and nutritional security (FNS). With a focus on healthy food environments and built environments, the aim is to ensure the adoption of healthier lifestyles and habits among the studied population.

Keywords: Obesity. Adults. Sociodemographic factors. Economic factors. Lifestyle.

RESUMO

Este estudo teve como objetivo descrever a evolução temporal da obesidade nos anos de 2006, 2015/16 e 2019 e sua relação com fatores sociodemográficos, econômicos, clínicos e de estilo de vida em adultos da Região Metropolitana do Recife, Pernambuco. Foi realizado um estudo transversal analítico e quantitativo em três populações adultas de ambos os sexos da Região Metropolitana do Recife (RMR) nos anos de 2006, 2015/2016 e 2019. A razão de chances (RC) de obesidade foi calculada para cada variável de exposição por meio de regressão logística, ajustada com seus respectivos intervalos de confiança de 95% (IC 95%). Foram consideradas associadas à obesidade as variáveis com valor de p ≤ 0,05 e aquelas com associação limítrofe entre 0,05 e 0,10. Foi observado um aumento na porcentagem de obesidade (p < 0,001), juntamente com adultos com renda per capita de até ½SM (p < 0,001) e baixo nível educacional (p < 0,001) nos três períodos. A obesidade foi associada à idade de 30 a 40 anos (p < 0,001) em todos os três períodos. A hipertensão arterial sistêmica (HAS) também foi identificada como um fator de risco para obesidade no primeiro (p < 0,001) e terceiro períodos do estudo (p < 0,01). No segundo (p < 0,05) e terceiro períodos (p < 0,07), o ensino superior foi identificado como um fator de proteção. No último período do estudo, as mulheres (p < 0,001) tiveram quase três vezes mais chances de serem obesas. Este estudo ressalta a necessidade de políticas públicas contínuas em segurança alimentar e nutricional (SAN). Com foco em ambientes alimentares saudáveis e ambientes construídos, o objetivo é garantir a adoção de estilos de vida e hábitos mais saudáveis entre a população estudada.

Palavras-chave: Obesidade. Adultos. Fatores sociodemográficos. Fatores econômicos. Estilo de vida.

RESUMEN

Este estudio tuvo como objetivo describir la evolución temporal de la obesidad en 2006, 2015/16 y 2019 y su relación con factores sociodemográficos, económicos, clínicos y de estilo de vida en adultos en la Región Metropolitana de Recife, Pernambuco. Se realizó un estudio transversal analítico y cuantitativo en tres poblaciones de adultos de ambos sexos en la Región Metropolitana de Recife (RMR) en 2006, 2015/2016 y 2019. Se calculó la razón de probabilidades (OR) de obesidad para cada variable de exposición mediante regresión logística, ajustada con sus respectivos intervalos de confianza del 95% (IC 95%). Las variables con un valor p ≤ 0,05 y aquellas con una asociación limítrofe entre 0,05 y 0,10 se consideraron asociadas con la obesidad. Se observó un aumento del porcentaje de obesidad (p<0,001), junto con adultos con un ingreso per cápita de hasta ½SM (p<0,001) y

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bajo nivel educativo (p<0,001) en los tres períodos. La obesidad se asoció con la edad de 30 a 40 años (p<0,001) en los tres períodos. La hipertensión (HAS) también se identificó como un factor de riesgo para la obesidad en el primer (p<0,001) y tercer período del estudio (p<0,01). En el segundo (p<0,05) y tercer período (p<0,07), la educación superior se identificó como un factor protector. En el último período del estudio, las mujeres (p<0,001) tuvieron casi tres veces más probabilidades de ser obesas. Este estudio subraya la necesidad de políticas públicas continuas en seguridad alimentaria y nutricional (SAN). Con un enfoque en entornos alimentarios saludables y entornos construidos, el objetivo es asegurar la adopción de estilos de vida y hábitos más saludables entre la población estudiada.

Palabras clave: Obesidad. Adultos. Factores sociodemográficos. Factores económicos. Estilo de vida.

INTRODUCTION

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Obesity is defined by the excessive or abnormal accumulation of fat in the body, being a risk factor for other chronic non-communicable diseases (NCDs)1. According to the World Health Organization (WHO), there has been a significant increase in obesity worldwide in recent decades; in 2016, 650 million adults were obese. Two. It is estimated that in 2019, overweight and obesity were responsible for approximately 8.8% of total deaths worldwide and 12.6% in Brazil, becoming one of the leading causes of deaths3.

In 2021, the Surveillance of Risk and Protective Factors for Chronic Diseases by Telephone Survey (Vigitel) survey shows that Brazilians reached the highest obesity rate, at 22.3%. The performance was higher than the previous year, which was 21.5%, thus indicating growth during the Covid-19 pandemic. In 2019, the rate of people with obesity was 20.2%1.

Between 2006 and 2021, the frequency of adults with obesity ranged from 11.8% to 22.4%, respectively (average increase of 0.66 pp/year). This increase was observed in both sexes, being greater among women, ranging from 12.1% in 2006 to 22.6% in 2021 (0.67 pp/year). Furthermore, in 2021, it was more prevalent in the age groups of 55 to 64 years old (26.2%), 45 to 54 years old (26.2%) and 35 to 44 years old (25.5%)1.

The Lancet Commission report, published in 2019, demonstrates that pandemics of obesity, malnutrition, and climate change are the main challenges for people, the environment, and the planet. These three pandemics represent a global syndemic because they co-occur in the same space; they Interact to produce complex consequences with common underlying social determinants in food systems, transport, urban planning, and land use.4

According to Swinburn et al. (2019)4, despite almost two decades of recommendations from competent national and international organizations, especially the WHO, implementing effective prevention measures and policies against obesity has been slow and inconsistent.

Given this scenario, monitoring nutritional status at all levels, including regional levels, becomes essential for monitoring public policies and can also serve as a basis for actions aimed at obesity care. In this sense, the present work aimed to describe the temporal evolution of obesity in the years 2006, 2015/2016, and 2019 and its relationship with sociodemographic, economic, clinical, and lifestyle factors in adults in the Metropolitan Region of Recife (MRR), Pernambuco.

METHODOLOGY

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STUDY DESIGN, ETHICAL ASPECTS, AND SAMPLE

This is an analytical and quantitative cross-sectional study of three adult populations from the RMR in 2006, 2015/2016, and 2019, part of the II State Survey on Chronic Diseases and Non-Communicable Diseases in Pernambuco.

The 1st State Survey on Chronic Diseases and Noncommunicable Diseases (2006) was approved by the Human Ethics Committee of the Professor Fernando Figueira Institute of Integral Medicine (IMIP) under number 709, The II State Survey on Chronic Diseases and Non-Communicable Diseases (2015/2016) was approved by the Research Ethics Committee of the Health Sciences Center of the Federal University of Pernambuco Under CAAE number 07803512.9.0000.5208. The study carried out in 2019 was approved by the Research Ethics Committee of the Federal University of Pernambuco Health Sciences Center under the number CAAE 38868720.2.0000.5208.

The sample calculation in 2006 was estimated based on the prevalence of obesity in 1997 of 11.8%5 for the adult population, with an error of ±3.1 percentage points and a 95% confidence level, resulting in a sample of 416 adults. In 2015/16 and 2019, it was estimated based on the prevalence of obesity in 2006 at 21.1%6, with an error of ±4 percentage points and a confidence level of 95%, resulting in a sample of 400 individuals for both periods. To evaluate the associated factors, a selection was estimated a posteriori considering a confidence level of 95% (1-α), a study power of 80% (1-β), a ratio of 1:1 (between exposed: unexposed), and a prevalence ratio of 1.80.

The Statcalc program of the EPI-INFO Software, version 6.04 (Centers for Disease Control and Prevention, Atlanta, United States), was used to calculate the sample size.

DATA COLLECT

Data collection was household-based, through active search and took place from May to October 2006, June 2015 to September 2016, and from May to August 2019 in the municipalities of Recife, Paulista, Olinda, Cabo de Santo Agostinho, and Jaboatão dos Guararapes. More details about the studies and data collection process can be found in Leal et al.7, Costa et al.8, Souza et al.9, Oliveira et al.10, and Menezes et al.11. Data were collected by properly trained researchers using a structured form containing the following variables: with sociodemographic, economic, clinical and lifestyle data.

Dependent variable

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For anthropometric assessment, adults' weight and height were measured twice, using a digital scale model Tanita-BF-683, with a maximum capacity of 150 kg and precision of up to 100 g, and a portable stadiometer from the Alturaexata brand, millimeters with accuracy of up to 1mm.

The measurements were carried out using the techniques established by the Food and Nutrition Surveillance System (FNSS), a protocol adopted by the Ministry of Health. When the difference between the assessments exceeded 0.5 cm for height and 100 g for weight, they were repeated. The measurement was carried out, and the two measures with the closest values were noted, using the average for recording. During measurements, individuals were barefoot and wearing light clothing.12.

To diagnose obesity, the body mass index (BMI) classification recommended by the WHO was used.13, whose cutoff point is ≥ 30Kg/m².

INDEPENDENT VARIABLES

The following were included in the questionnaire: age (years), sex (female/male), education (< 12 years of study /≥ 12 years of study), self-declared skin color categorized according to the 2010 IBGE census (white/brown/black/indigenous), income classified according to the minimum wage (SM) of the year of study (≤ ½ MW; up to 1 MW and > 1 MW), being R$ 350.00 in 200614, R$880.00 in 2015/1615 and R$998.00 in 201916, and practice of physical activity (inactive < 150 minutes/week and active≥ 150 minutes/week)17, diagnosis of high cholesterol (yes/no), being considered the cutoff point≥ 190 mg/dL18, blood pressure (systemic arterial hypertension (SAH): yes/no), with hypertension being regarded as having the following cutoff points: systolic ≥ 130mm hg and/or diastolic ≥ 85mm hg19.

Regarding behavioral variables (smoking and alcohol consumption), the following categories were considered for smoking: smoker (the adult who reported the habit of smoking), ex-smoker (the adult who wrote the habit of smoking at some point during the life but at the time of applying the questionnaire, he no longer did so) and non-smoker (the adult who reported never having smoked). For the variable, alcohol consumption, the consumption of alcoholic beverages in the 30 days before the application of the questionnaire was assessed, with the answer being considered: yes or no.

To analyze physical activity, the International Physical Activity Questionnaire (IPAQ) was used in its short version, which considers the four dimensions of physical activity:

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leisure time, domestic activities, occupational activities, and activities related to commuting. The cutoff point to classify individuals as insufficiently active or sedentary was < 150 minutes per week of activity17.

An automatic device with a MICROLIFE® monitor was used to measure blood pressure with the individual seated and performed on the same arm. Two measurements were taken, with a one-minute interval between them. The average of the blood pressure levels obtained in the two measurements was taken as the final value; according to the techniques recommended by the Brazilian Arterial Hypertension Guidelines19, adults who were taking medication were also considered to have hypertension (SAH), even if they had adequate blood pressure at the time of measurement.

STATISTICAL ANALYZES

Data was entered using the Epi Info program, version 6.04 (CDC, Atlanta). Data were analyzed using SPSS (Statistical Package for the Social Sciences), version 13.1 (SPSS Inc. Chicago, II USA).

Pearson's chi-square test verified the association between the dependent variable (obesity) and the independent variables (sex, age, education, income, self-declared skin color, diagnosis of high cholesterol, hypertension, physical activity, smoking, and alcohol consumption). The odds ratio (OR) of obesity was calculated for each exposure variable using logistic regression. In the binary logistic regression model analysis, variables with p-value < 0.20 were maintained.

This procedure was carried out following a block modeling process, according to the hierarchical model proposed by Vedana et al. 20 The first module included sociodemographic variables: gender, age, education, and number of people in the household. In module 2, lifestyle variables were included: smoking, alcohol consumption, and physical activity. Finally, in module 3, the clinical variables were added: hypertension and high cholesterol diagnosis.

The results were presented using odds ratios (OR) adjusted with the respective 95% confidence intervals (95% CI), with variables with a p-value ≤ 0.05 being considered associated with obesity and a borderline association with a p-value between 0.05 and 0.10. The percentage variations in prevalence in 2006 and 2019 were calculated using the values obtained in the regression21.

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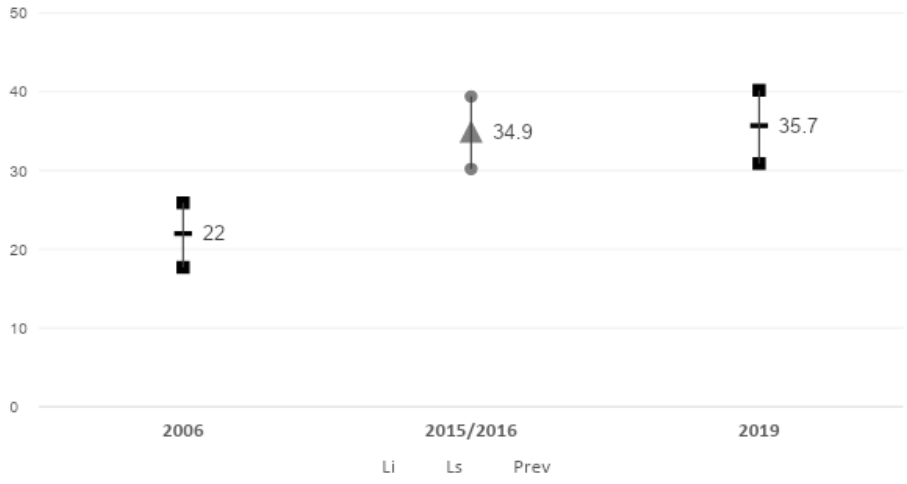
The calculation of the temporal variation in obesity was made by the difference in the prevalence of obesity in 2019 and 2006, divided by the value in 2006, multiplied by 10022. The chi-square test was used to verify differences in the majority of obesity between the three research periods, considering that temporal changes were significant when $p<0.05$.

RESULTS

SAMPLE CHARACTERIZATION

The sample consisted of 439 adults in 2006, 426 in 2015/16 and 432 in 2019. In 2006, the prevalence of obesity was 22.0%, jumping to 34.9% in 2015/16, maintaining growth in 2019 (35.7%) (Figure 1).

Figure 1. Evolution of obesity in adults in the Metropolitan Region of Recife between 2006, 2015/16, and 2019. Significance level: $p<0.001$ (difference between years). Li, Ls = Confidence Interval; Prev=Prevalence;



Source: prepared by the authors.

Between 2006 and 2019, there was a significant increase in the percentage of adults aged 41-59. Between 2006 and 2015/16, there was a decrease in the rate of adults with less than 12 years of education; however, in 2019, it increased again. The rate of adults living with an income ≤ 1/2 the minimum wage increased considerably between 2006, 2015/16, and 2019. There was a decrease in the percentage of people living with five or more people in the household. SAH and diagnosis of high cholesterol demonstrated a significant increase between the years studied. Alcohol consumption decreased between

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2006 and 2015/16 and increased in 2019. The percentage of physically active adults increased between 2006 and 2015/16 and fell in 2019, and smoking decreased between the years studied (Table 1).

Table 1- Sociodemographic, clinical, and lifestyle description of adults in the Metropolitan Region of Recife, Pernambuco, in 2006, 2015/16, and 2019.

Variables	n (%)			
	2006	**2015/16**	**2019**	**P***
Sociodemographic conditions				
Gender⇊				0.16
Masculine	173 (39.4)	146 (34.3)	146 (33.8)	
Feminine	266 (60.6)	280 (65.7)	286 (66.2)	
Age years)⇊				<0.001
20-29	98 (24.5)	117 (27.5)	84 (19.5)	
30-40	186 (46.5)	151 (35.4)	115 (26.6)	
41-59	116 (29.0)	158 (37.1)	233 (53.9)	
Color				0.26
White	106 (24.1)	87 (20.4)	107 (24.8)	
Black/brown	333 (75.9)	339 (79.6)	325 (75.2)	
Education				<0.001
<12 years of study	291 (66.3)	219 (51.4)	246 (56.9)	
≥12 years of study	148 (33.7)	207 (48.6)	186 (43.1)	
Per capita income△⇊				<0.001
≤ ½ SM	272 (62.7)	310 (73.1)	356 (90.1)	
Up to 1 SM	129 (29.7)	82 (19.3)	30 (7.6)	
>1 SM	33 (7.6)	32 (7.6)	9 (2.3)	
Number of people in the household				<0.001
<5 people	218 (49.7)	273 (64.1)	326 (75.5)	
≥5 people	221 (50.3)	153 (35.9)	106 (24.5)	
Anthropometric and clinical measurements				
Hypertension●⇊				<0.001
Yes	73 (17.4)	106 (26.7)	72 (58.1)	
No	347 (82.6)	291 (73.3)	52 (41.9)	
High cholesterol■⇊				0.003
Yes	63 (14.4)	39 (9.2)	73 (17.0)	
No	376 (85.6)	387 (90.8)	357 (83.0)	
Lifestyle				
Alcohol consumption				<0.001
Yes	375 (85.4)	158 (37.1)	171 (39.7)	
No	64 (14.6)	268 (62.9)	260 (60.3)	
Smoker				0.03
Yes/ex-smoker	155 (35.3)	122 (28.6)	120 (27.8)	
No	284 (64.7)	304 (71.4)	311 (72.2)	
Physical activity□⇊				0.01
Active	282 (64.2)	263 (73.5)	209 (71.8)	
Inactive	157 (35.8)	95 (26.5)	82 (28.2)	

Source: prepared by the authors.

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EVOLUTION OF OBESITY PREVALENCE ACCORDING TO SOCIODEMOGRAPHIC VARIABLES, ECONOMIC, CLINICAL AND LIFESTYLE

The prevalence of obesity showed a significant increase in females, adults aged between 30-40 years and 41-50 years, and white or black/brown individuals between 2006 and 2019. It increased in adults<12 years of study, with <0.5 minimum wage income and living with <5 people in the household, with hypertension between 2006 and 2015/16 and decreased between 2015/16 and 2019. Among individuals who were diagnosed with high cholesterol, obesity decreased between 2006 and 2015/16, and increased in 2019. There was an increase in the variation in obesity among individuals who did not consume alcoholic beverages and who did not smoke, in addition, obesity increased in the physically active population between 2006 and 2015/16, and a decrease between 2015/16 and 2019 (Table 2).

Table 2– Prevalence of obesity according to sociodemographic, anthropometric, clinical and lifestyle variables of adults in the Metropolitan Region of Recife, Pernambuco in the years 2006, 2015/16 and 2019.

Variables	Obesity						P*	Variation
	2006 n (%)	**95%CI**	**2015/16 n (%)**	**95%CI**	**2019 n (%)**	**95%CI**		**2006/2019**
Sociodemographic conditions								
Gender								
Masculine	37 (34.9)	25.0-44.7	41 (38.7)	30.5-46.8	28 (26.4)	19.0-33.7	0.22	-24.3
Feminine	53 (20.2)	11.9-28.4	97 (37.0)	28.9-45.0	112 (42.7)	34.5-50.8	<0.001	111.3
Age years)								
20-29	11 (20.0)	11.3-28.6	29 (52.7)	44.3-61.0	15 (27.3)	19.9-34.6	0.39	36.5
30-40	42 (30.2)	20.3-40.0	47 (33.8)	25.9-41.6	50 (36.0)	28.0-43.9	0.001	19.2
41-59	30 (18.0)	9.7-26.6	62 (37.1)	29.0-45.1	75 (44.9)	36.6-53.1	0.04	149.4
Color								
White	23 (25.3)	16.3-34.2	32 (35.2)	27.2-43.1	36 (39.6)	31.4-47.7	0.04	56.5
Black/brown	67 (24.2)	15.3-33.0	106 (38.3)	30.1-46.4	104(37.5)	29.4-45.5	<0.001	54.9
Education								
<12 years of study	62 (26.5)	17.2-35.7	82 (35.0)	27.0-42.9	90 (38.5)	30.4-46.5	<0.001	45.2
≥12 years of study	28 (20.9)	12.4-29.3	56 (41.8)	33.5-50.0	50 (37.3)	29.2-45.3	0.10	78.4
Per capita income$^{\Delta}$								

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≤ ½ SM	55 (19.8)	11.5-28.0	103 (37.1)	29.0-45.1	120 (43.1)	20.6-35.9	<0.001	42.9
Up to 1 SM	26 (44.8)	34.5-55.0	22 (37.9)	29.8-45.9	10 (17.2)	10.7-23.6	0.13	-61.6
>1 SM	9 (37.5)	27.4-47.5	13 (54.2)	45.8-62.5	2 (8.3)	3.5-13.0	0.38	-77.8
Number of people in the household								
<5 people	31 (13.9)	6.7-21.0	84 (37.7)	29.6-45.7	108 (48.4)	40.1-56.6	<0.001	248.2
≥5 people	59 (40.7)	30.5-50.8	54 (37.2)	29.1-45.2	32 (22.1)	15.2-28.9	0.18	-45.7
Clinical measures								
Hypertension●								
Yes	30 (27.8)	18.2-37.3	43 (39.8)	31.6-47.9	35 (32.4)	19.1-45.6	<0.001	16.5
No	54 (33.3)	23.2-43.3	95 (58.6)	50.3-66.8	13 (8.0)	0.3-15.6	0.51	-75.9
High cholesterol■								
Yes	22 (32.4)	22.6-42.1	17 (25.0)	17.7-32.2	29 (42.6)	34.3-50.8	0.50	31.4
No	68 (22.7)	13.9-31.4	121 (40.5)	32.3-48.6	110 (36.8)	28.7-44.8	<0.001	62.1
Lifestyle								
Alcohol consumption								
Yes	79 (42.5)	32.1-52.8	54 (29.0)	21.4-36.5	53 (28.5)	20.9-36.0	0.001	-32.9
No	11 (6.1)	1.0-11.1	84 (46.4)	38.0-54.7	86 (47.5)	39.1-5.8	0.03	678.6
Smoker								
Yes/ex-smoker	35 (35.0)	25.1-44.8	37 (37.0)	28.9-45.0	28 (28.0)	20.5-35.4	0.28	-20.0
No	55 (20.6)	12.2-28.9	101 (37.8)	29.7-45.8	111 (41.6)	33.4-49.7	<0.001	101.9
Physical activity□								
Active	59 (27.2)	18.0-36.3	85 (39.2)	29.9-48.4	73 (33.6)	24.3-42.8	<0.001	23.5
Inactive	31 (38.3)	28.2-48.3	23 (28.4)	19.8-36.9	27 (33.3)	24.0-42.5	0.11	-13.0

*p valuefor test x2;ΔAmount referring to the minimum wage for the respective years studied;□Active: moderate activity for ≥150 minutes/week. Inactive: adults with moderate activity <149 minutes/week;▲Obesity: BMI ≥30kg/m²; ● Hypertension: systolic ≥130mm hg and/or diastolic ≥85mm hg; ■High cholesterol: ≥190 mg/dl. Source: prepared by the authors.

Source: prepared by the authors.

The results of the multiple logistic regression analysis and the adjusted effects of the explanatory variables in relation to obesity are found in Tables 3 to 5. In 2006, the adjusted

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ORs indicated that living with ≥5 people in the household was twice as likely to have obesity, and having hypertension increased the chance of having obesity by almost three times. Borderline, being between 30-40 years old (OR=2.0) and having a diagnosis of high cholesterol (OR=1.8) also remained among the factors associated with obesity (Table 3).

Table 3–Relationship between the prevalence of obesity in adults aged 20-59 years and sociodemographic and clinical variables, Metropolitan Region of Recife, 2006.

Variables	adjusted OR	95%CI	P*
	Module 1		
Number of people in the household			
<5 people	1		
≥5 people	2.1	1.2-3.6	0.007
Age years)			
20-29	1.0		
30-40	2.0	0.9-4.3	0.07
41-59	1.4	0.6-3.3	0.41
	Module 2		
High cholesterol■			
No	1.0		
Yes	1.8	0.9-3.6	0.08
Hypertension□			
No	1.0		
Yes	2.9	1.5-5.4	0.001

*p value for the x2 test. 95%CI: 95% confidence interval. Module 2: adjusted by the variables from module 1: □Hypertension: systolic ≥130mm hg and/or diastolic ≥85mm hg; ■High cholesterol: ≥190 mg/dl.

Source: prepared by the authors.

In 2015/16, the adjusted ORs showed that being between 30-40 years old must be obese. However, being aged between 41-59 years and having ≥12 years of education were shown to be protective factors, that is, adults in these conditions had a lower chance of being obese, when compared to adults aged between 20-29 and 41- 59 years old, and with adults with less than 12 years of education (Table 4).

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Table 4–Relationship between the prevalence of obesity in adults aged 20-59 years and sociodemographic and clinical variables, Metropolitan Region of Recife, 2015/16.

Variables		Adjusted OR	95%CI	P*
		Module 1		
Gender				
	Masculine	1.0		
	Feminine	1.4	0.9-2.2	0.13
Age years)				
	20-29	1.0		
	30-40	1.8	1.0-3.1	0.03
	41-59	0.6	0.4-1.0	0.05
Education				
	<12 years of study	1.0		
	≥12 years of study	0.6	0.4-1.0	0.05
		Module 2		
Physical activity				
	Active	1.0		
	Inactive	0.6	0.3-1.1	0.15
		Module 3		
High cholesterol▪				
	No	1.0		
	Yes	0.9	0.4-2.0	0.89

**p value for* the x2 test. 95%CI: 95% confidence interval. Module 2: adjusted by the variables from module 1.Module 3: adjusted by variables from module 1 and 2;▪High cholesterol: ≥190 mg/dl.

Source: prepared by the authors.

In 2019, the adjusted ORs showed that being female and aged between 30-40 years old was three times more likely to be obese, being between 41-50 years old indicated almost twice as likely to be obese, having SAH indicated that they were three times more likely to be obese. However, having ≥ 12 years of education presented a borderline association as a protective factor. And being a smoker or ex-smoker proved to be a protective factor when compared to adult smokers (Table 5).

Table 5–Relationship between the prevalence of obesity in adults aged 20-59 years and sociodemographic and clinical variables, Metropolitan Region of Recife, 2019.

Variables		Adjusted OR	95%CI	P*
		Module 1		
Gender				
	Masculine	1.0		
	Feminine	2.7	1.7-4.6	<0.001
Age years)				
	20-29	1.0		
	30-40	3.1	1.6-6.3	0.001
	41-59	1.9	1.0-3.8	0.04
Education				
	<12 years of study	1.0		

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	≥12 years of study	0.6	0.4-1.0	0.07
		Module 2		
Smoker				
	No	1.0		
	Yes/ex-smoker	0.5	0.3-0.8	0.01
		Module 3		
Hypertension□				
	Yes	3.1	1.3-7.8	0.01
	No	1.0		
High cholesterol■				
	Yes	0.5	0.1-1.5	0.23
	No	1.0		

*p value for the x2 test. 95%CI: 95% confidence interval. Module 2: adjusted by the variables from Module 1: Module 3: adjusted by variables from module 1 and 2. □Hypertension: systolic ≥130mm hg and/or diastolic ≥85mm hg; ■High cholesterol: ≥190 mg/dl.

Source: prepared by the authors.

DISCUSSION

The continuous increase in the prevalence of obesity over the three years studied corroborates the results of research carried out by Lin et al.23, which based on a review summarized global obesity trends. Considering obesity a public and multifactorial health problem, it is necessary to highlight the time and political-social context in which Brazil and its public policies were inserted in the years 2006, 2015/16 and 2019, considering that the implementation of a right – in this case health and healthy and adequate food – are implemented through policy24. Briefly, given that it is not the objective of this study, but that it has a strong influence on health and food scenarios.

The historical-political-social context can support this study, the increase in obesity, poverty, low education between 2015/16 and 2019, the consumption of alcoholic beverages between 2015/16 and 2019, hypertension, high cholesterol, and decrease in the prevalence of physical activity practitioners between 2015/16 and 2019, due to the austerity policy initiated in 2016, and consequently, the lack of investment in public health and food policies.

The period from 2006 to 2010 was marked by the recognition of the importance of the Human Right to Adequate Food (HRAF) as a way of guaranteeing the health of the population: with the creation of laws and bodies aimed at guaranteeing food and nutritional security (NS)25, 26. And 2012 and 2015 were marked by the focus on controlling overweight and obesity, as manifestations of inadequate nutrition, with the publication of official documents focused on healthy eating, such as the Food and Nutritional Education

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Reference Framework, updating the Food Guide for the Brazilian Population and National Pact for Healthy Eating27-29.

The year 2016 was marked by the institutional coup that led to the deposition of elected president Dilma Rousseff, and the rise of the extreme right began in the country's history. As a result, the following governments of Michel Temer and Jair Bolsonaro promoted strong changes in essential policies to combat hunger and control obesity: extinction of the Ministry of Social Development and Combating Hunger (MSDCH) – the main public institution for combating hunger and inequality social – and extinction of National Food and Nutritional Security Council (NFNS), which meant the State's exemption from the inalienable right inherent to the human condition: healthy and adequate food30.

Following this dismantling, projects on agrarian reform and the development of family farming, cooperativism, agroecology, solidarity economy and territorial development were interrupted. As a consequence, rural workers suffered the impacts of these changes, which affected essential policies such as the Food Acquisition Program (FAP), which guaranteed producers a fair price and guaranteed people, families and communities in social vulnerability the HRAF.31.

Regarding the increase in the percentage of older adults and decrease in younger adults, this is an expected finding, common to the demographic transition at the national level, resulting from the drop in fertility rates and low mortality.32. The decrease in smoking can be justified as a result of national public policies to control smoking, for example, the increase in taxes on tobacco products and expanded access to the approach and treatment of smoking in the Unified Health System (UHS). The decrease in this variable was smaller between 2015/16 and 2019, and may be related to government cuts with the post-coup government transition.A similar result was found in the study by Malta et al.33, which observed an improvement in this indicator in Brazilian capitals between 2006 and 2017.

With regard to associations with the outcome variable, an association between ages between 30-40 and 41-50 years old with obesity was observed in the first and third periods of the research, this data was also found in other studies34-36. This association can be attributed to some factors such as: financial independence, long working hours and, consequently, reduced time for preparing meals and carrying out physical activity, as well as the practicality of ultra-processed foods and their high availability in food environments and the facilitating access through tax incentive policies for large food corporations10, 34. At the same time as in 2019, there were cuts in structuring public food and nutrition policies, as

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previously mentioned. Putting the government's economic interests in favor of the HRAF, with a reduction in the supply of healthy foods through programs such as the FAP.

However, in the second period of the research, the age between 41-59 years, was presented as a protective factor, different from other years, this finding may be related to the fact that older adults have a more traditional food culture, have access to foods healthy – the result of public food policies that were abolished in the third period of the research – and because they already have some comorbidity, thus showing greater care with their diet37.

In the first period studied, living with≥5 people in the household remained associated with obesity, a different result from research carried out by Ferreira et al.38, which demonstrated an inverse association, showing that, as previously mentioned, a greater number of people in the house can mean greater adherence to healthier foods than ultra-processed foods. The relationship between obesity and diagnosis of high cholesterol was observed in the first period of the study, in line with other research39, which shows that in obesity, the occurrence of insulin resistance is related to increased cholesterol.

In the second and third periods studied, having higher education was shown to be a protective factor, other studies describe a similar association38. It can be understood that a higher level of education expresses greater purchasing power and, therefore, a greater possibility of living in food environments with a greater availability of healthy foods, as well as greater access to settings built for the practice of physical activity.10.

In the first and third periods of the research, having SAH increased the chances of having obesity by three times; other studies reported similar findings40, 41. It is known that the distribution of body fat plays a vital role in the development of hypertension42.

In the last period studied, it was observed that the female sex as a risk factor for obesity can be explained by mechanisms related to gender (psychosocial) and/or sex (physiological). According to a study carried out by Cooper et al.43, mechanisms associated with gender norms and identity, such as customs and beauty standards, influence eating behavior, which is evident from childhood. Furthermore, insecurity due to being female can limit physical activities in open and accessible places, just as marital status and multiparity can lead to an overload of domestic and formal work and, consequently, the consumption of pre-prepared foods. Ready-made foods, such as ultra-processed foods, contribute to differences in the prevalence of obesity between men and women.

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Another related point for females concerns the physiological mechanisms that present themselves differently both concerning adiposity and fat distribution, which are mediated by sexual hormones, particularly in the peri- and postmenopausal period43, 44.

Furthermore, smoking appeared as a protective factor for obesity in the third period studied, and it can be clarified, as mentioned before, that nicotine can lead to a reduction in appetite45. However, it is essential to highlight that it was a cross-sectional study, and causality cannot be established.

Finally, by making an analogy of the results of the three periods of this research with the excerpt from the song by singer and composer Chico Science (1991)46, “One step forward and you are no longer in the same place”, it is clear that in time there is no inertia: with each period studied the social, political and health scenario changed, making the RMR unrecognizable and unequal.

FINAL CONSIDERATIONS

Had an increase the percentage of obesity, adults with a per capita income of up to ½MW, and a low level of education in all years studied. Furthermore, in the three periods, the association between obesity and age 30-40 years was observed; in the last period of the research, females were almost three times more likely to be obese. And hypertension was also a risk factor in the first and third periods of the research, increasing the chance of being obese three times. In the second and third periods, higher education was shown to be a protective factor for obesity.

These results may be a consequence of the impermanence of public policies, especially SAN, fundamental to guarantee HRAF, and prevention and control of obesity. Food and Nutritional Education (FNE) actions are necessary, structural changes in the psychosocial mechanisms imposed on people who identify as women, ensuring that gender inequalities are overcome, in order to guarantee the full health of this public;

And in general, the study reveals the urgency of regulation of advertising of ultra-processed foods and taxation of processed and ultra-processed drinks, in addition of public policies that guarantee healthier food environments and built environments.

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LIMITATION AND POTENTIAL

Due to the design of the studies analyzed in this research being cross-sectional, one can only suggest association and not causality. However, tchichis study presents an overview of obesity and the political-historical and health context in the MRR, at different times, with data from the last decade and recent years. Enabling an expanded view of factors associated with obesity in adults in a region in the Brazilian Northeast.

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