

Overweight and obesity: Time trend in the population residing in the city of Rio de Janeiro

Excesso de peso e obesidade: tendência na população residente no município do Rio de Janeiro

Sobrepeso y obesidad: una tendencia en la población residente en el municipio de Río de Janeiro

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ABSTRACT This is an ecological time-series study conducted between 2006 and 2021 using data from VIGITEL (Surveillance System of Risk and Protective Factors for Chronic Diseases by Telephone Survey). The objective was to analyze trends in overweight and obesity among adults (≥ 18 years) living in the city of Rio de Janeiro. For temporal analysis, the Prais-Winsten regression model was applied using STATA software, version 13. An increasing trend in the prevalence of overweight was observed across several groups, particularly among individuals aged 65 years or older (APC: 1.18%; 95%CI: 0.78–1.59), Black and Brown individuals (APC: 14.12%; 95%CI: 4.73–24.35), and those with higher education (APC: 2.87%; 95%CI: 2.18–3.57). Regarding obesity, a decreasing trend was observed in the 65 years or older age group (APC: -1.7%; 95%CI: -2.59–0.81) and an increasing trend among those with 12 years or more of education (APC: 3.25%; 95%CI: 1.77–4.75), Black and Brown individuals (APC: 11.29%; 95%CI: 2.08–21.34), and single participants (APC: 2.60%; 95%CI: 1.36–3.86). The findings indicate that overweight and obesity remain significant public health challenges, highlighting the need for comprehensive health promotion strategies to reduce their prevalence and associated impacts.

KEYWORDS Obesity. Health surveys. Health promotion. Public health surveillance.

RESUMO Estudo ecológico de série temporal, realizado entre 2006 e 2021, com dados do Sistema de Vigilância de Fatores de Risco e Proteção para Doenças Crônicas por Inquérito Telefônico. O objetivo foi analisar a tendência de excesso de peso e obesidade entre adultos (≥ 18 anos) residentes no município do Rio de Janeiro. Para a análise temporal, aplicou-se o modelo de Prais-Winsten, utilizando o software Stata versão 13. Observou-se tendência crescente da prevalência de excesso de peso em diversos grupos, sobretudo entre pessoas com 65 anos ou mais (APC: 1,18%; IC 95%: 0,78-1,59), pretos e pardos (APC: 14,12%; IC 95%: 4,73-24,35) e com maior escolaridade (APC: 2,87%; IC 95%: 2,18-3,57). Quanto à obesidade, houve tendência decrescente na faixa etária de 65 anos ou mais (APC: -1,7%; IC 95%: -2,59-0,81) e crescente entre indivíduos com 12 anos ou mais de estudo (APC: 3,25%; IC 95%: 1,77-4,75), pretos e pardos (APC: 11,29%; IC 95%: 2,08-21,34) e solteiros (APC: 2,60%; IC 95%: 1,36-3,86). Os resultados indicam que o excesso de peso e a obesidade continuam sendo desafios relevantes para a saúde pública, exigindo estratégias amplas de promoção da saúde e redução da prevalência dessas condições.

PALAVRAS-CHAVE Obesidade. Inquérito epidemiológico. Promoção da saúde. Vigilância em saúde pública.

RESUMEN Este estudio ecológico de series temporales, realizado entre 2006 y 2021, utilizó datos del Sistema de Vigilancia de Factores de Riesgo y Protección para Enfermedades Crónicas mediante Encuestas Telefónicas. El objetivo fue analizar la tendencia del sobrepeso y la obesidad en adultos (≥ 18 años) residentes en el municipio de Río de Janeiro. Para el análisis temporal, se aplicó el modelo de Prais-Winsten utilizando el software Stata versión 13. Se observó una tendencia creciente en la prevalencia del sobrepeso en varios grupos, especialmente entre personas de 65 años o más (APC: 1,18%; IC del 95%: 0,78-1,59), personas negras y mestizas (APC: 14,12%; IC del 95%: 4,73-24,35) y personas con mayores niveles de educación (APC: 2,87%; IC del 95%: 2,18-3,57). En cuanto a la obesidad, se observó una tendencia decreciente en el grupo de edad de 65 años o más (APC: -1,7%; IC del 95%: -2,59-0,81) y una tendencia creciente entre las personas con 12 o más años de escolaridad (APC: 3,25%; IC del 95%: 1,77-4,75), las personas negras y mestizas (APC: 11,29%; IC del 95%: 2,08-21,34) y las personas solteras (APC: 2,60%; IC del 95%: 1,36-3,86). Los resultados indican que el sobrepeso y la obesidad siguen siendo importantes desafíos para la salud pública, lo que exige estrategias integrales para la promoción de la salud y la reducción de su prevalencia.

PALABRAS CLAVE Obesidad. Encuesta epidemiológica. Promoción de la salud. Vigilancia en salud pública.

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Introduction

The increase in the prevalence of overweight and obesity is a matter of great concern in both developed and developing countries, since they are risk factors for a series of chronic noncommunicable diseases (NCDs), with an impact on the increased risk of premature death and disability in adulthood^{1,2}. According to the WHO – World Health Organization, the global prevalence of obesity tripled between 1975 and 2016 and, as a result of this scenario, approximately 1.9 billion adults worldwide were overweight in 2016, 650 million of whom were clinically obese, corresponding to 13% of the world population³. In 2023, the World Obesity Atlas highlighted that the impact of this problem on the Gross Domestic Product – GDP will be 3% in 2035, potentially costing the global economy more than US\$ 4 trillion⁴.

In addition to generating high costs for health systems, including expenditure on medicines, hospitalizations and long-term treatments, the treatment of diseases related to overweight and obesity affects quality of life and the economy more broadly, with loss of earnings in the labor market³. In the United States (USA), the per capita costs of a person living with overweight and obesity are 9.9% and 42.7% higher than those of individuals with a healthy body weight⁵.

In Europe, overweight is one of the main determinants of disability and death, affecting almost 60% of adults and approximately 7.9% of children under 5 years of age, representing 4.4 million individuals in this age group⁶. The National Health and Nutrition Examination Survey (NHANES), carried out in the USA between 2017 and 2018, indicated that 32.7% of adults aged 20 years or over were overweight, 37.9% were obese and 7.7% were extremely obese⁷. Latin America has one of the highest body mass index (BMI) prevalences in the world⁸ and Brazil follows the trend of the other countries in the region, although with important differences by income stratum, level of schooling, sex and race/skin color⁹.

The World Obesity Atlas projected an obesity prevalence of 41% in the Brazilian adult population over the next 12 years, generating serious implications for both individuals and society⁴. Considering that a preventive approach is essential to mitigate costs and promote a healthier population, the objective of this study is to describe the time trend in the prevalence of overweight and obesity in the population aged 18 years or over residing in the city of Rio de Janeiro.

Material and methods

Study design

Ecological time series study conducted on the basis of the data produced by VIGITEL, the Surveillance System for Risk and Protective Factors for Chronic Diseases by Telephone Survey, implemented by the Ministry of Health (MS) since 2006. This is a telephone survey whose objective is to monitor the situation of NCDs in the country by means of probabilistic samples of individuals aged 18 years or over; for this analysis, the population of the city of Rio de Janeiro was selected, for the period from 2006 to 2021, with a mean sample of 2,013 interviews/year. According to the established methodology, in each active residential line contact is made with an adult resident and, upon agreeing to participate in the study, the individual to be interviewed is randomly selected¹⁰.

Study setting

This study analyzed VIGITEL data for the city of Rio de Janeiro, the second largest city in the country, with approximately 6.6 million inhabitants, whose HDI – Human Development Index in 2010 was 0.799, ranking 45th in the Brazilian ranking¹¹. In addition to having the largest population concentration in the state, the city presents numerous areas with high

social vulnerability. The care model adopted is based on the Family Health Strategy, with coverage of 70% of the population. This locality was chosen because of the scarcity of evidence produced with the VIGITEL System, which is fundamental to guiding the formulation of more effective public policies focused on the health determinants related to NCDs.

Study outcomes

Overweight and obesity were used as outcomes, constructed from the calculation of the body mass index (BMI). Following the WHO recommendations, an individual was considered to be overweight when presenting a BMI equal to or greater than 25 kg/m² and lower than 30 kg/m², and to be obese when the BMI was equal to or greater than 30 kg/m²¹².

The prevalences of overweight and obesity in each year were estimated as: number of individuals with overweight/number of individuals interviewed multiplied by 100, and number of individuals with obesity/number of individuals interviewed multiplied by 100.

Statistical analysis

For the trend analyses, the Prais-Winsten linear regression model¹³ was used, considering the prevalences of overweight and obesity as dependent variables and the year of the survey as the explanatory variable. The *svy* command, which takes the sample weights into account, was applied.

Initially, in order to reduce the heterogeneity of the variance of the residuals, a logarithmic transformation of the prevalence values of each outcome was performed, followed by the application of the Prais-Winsten autoregressive model.

The values of the model coefficients (b1) were estimated and, subsequently, the annual percent change (APC) was calculated; finally, the 95% confidence intervals (95%CI) were calculated¹⁴.

$$APC = [-1 + 10^{b1}] * 100\%$$

$$IC_{95\%} = [-1 + 10^{b_{\text{mínimo}}}] * 100\%; [-1 + 10^{b_{\text{máximo}}}] * 100\%$$

The b minimum and b maximum values correspond, respectively, to the minimum and maximum values of the Prais-Winsten confidence interval. For the interpretation of the annual percent change estimates, the following criteria were used: a 95% confidence interval (95%CI) not containing the value zero indicates an increasing trend when the APC is positive and a decreasing trend when the APC is negative. If the value zero is contained in the 95% confidence interval, the series is considered stationary. The variables were stratified by sex (male and female), age groups (18-24; 25-34, 35-44, 45-54, 55-64; 65 years and over), schooling in complete years (0-8, 9-11, 12 and more years), race/skin color (white, brown, black, yellow and indigenous) and marital status (single, married/stable union, widowed and divorced). The analyses were performed using STATA software version 13.

As this is a study that uses publicly available data (VIGITEL – Surveillance System for Risk and Protective Factors for Chronic Diseases by Telephone Survey), it was exempt from the Free and Informed Consent Form (TCLE) and from ethical review under the terms of CNS Resolution No. 466/12.

Results

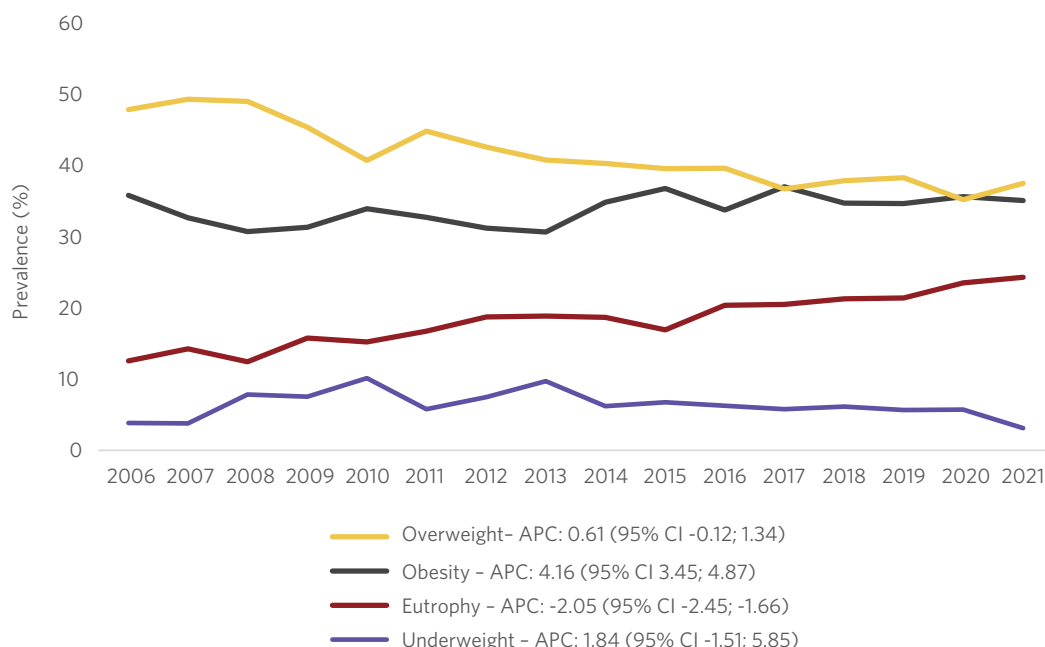
The sample studied was composed of 53.5% women; the largest proportion of respondents was in the 9 to 11 years of schooling range (38.3%), 44% declared themselves to be white, approximately 50.5% were living in a stable union or were married and 22.6% of the participants were between 25 and 34 years of age.

Graph 1 shows the time trend in the prevalence of the 4 BMI categories (underweight, eutrophy, overweight and obesity) in adults. As can be observed, the annual percent change in the prevalence of obesity was 4.16% (95%CI:

3.45; 4.87), indicating an increasing trend between 2006 and 2021. For overweight, despite the positive APC, the trend was considered stationary for the period evaluated

(APC = 0.61%; 95%CI: -0.12; 1.34). In turn, the underweight scenario has been decelerating each year by -1.14% (95%CI: -5.91; -3.73), as has eutrophy, by -2.05% (95%CI: -2.45; -1.66).

Graph 1. Temporal trend of the prevalence of the four BMI categories in adults residing in the municipality of Rio de Janeiro - VIGITEL, 2006 to 2021



Source: Own elaboration.

Table 1 presents factors related to the prevalence of overweight in adults in the city of Rio de Janeiro between 2006 and 2021, in which the following patterns are observed: both sexes maintained high percentages throughout the period, with men displaying higher values than women in most years. Young adults, aged 18 to 24 years, recorded the lowest prevalences throughout the entire historical series. With

regard to schooling, individuals with fewer years of study (0 to 8 years) presented a progressive reduction in their percentages. From 2011 onwards, a change in the racial profile stands out, with a marked increase in prevalence among black and brown individuals. Finally, relatively stable patterns are observed for marital status throughout the whole period analyzed.

Table 1. Prevalence of overweight according to sociodemographic characteristics in the population residing in the municipality of Rio de Janeiro – VIGITEL, 2006 to 2021

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Sex																
Female	32.03	27.51	27.98	30.45	30.8	27.19	28.94	29.15	32.13	32.83	30.95	36.08	34.84	32.94	33.61	30.45
Male	39.73	38.34	36.42	35.94	42.38	41.49	37.46	36.69	41.09	44.66	39.37	39.86	37.26	38.95	41.06	40.29
Age group																
18 to 24 years	8.28	8.62	10.05	8.17	10.25	9.2	9.19	9.22	9.08	10.08	7.9	7.87	6.14	5.77	4.24	7.78
25 to 34 years	20.35	23.87	22.27	20.29	21.86	20.74	20.26	21.39	22.46	21.3	18.95	20.53	23.96	23.23	21.81	22.83
35 to 44 years	26.83	23.04	21.39	20.42	20.7	23.9	22.94	22.82	21.11	21.12	21.49	23.16	19.7	20.33	21.88	20.93
45 to 54 years	18.66	16.93	18.09	18.39	17.71	15.45	17.15	16.16	19.88	17.18	21.89	16.65	17.59	19.66	17.39	17.78
55 to 64 years	12.43	13.25	15.08	16.9	16.03	16.21	15.33	15.05	12.13	14.92	15.8	16.31	16.87	15.13	17.57	14.46
65 years or over	13.45	14.29	13.13	15.83	13.45	14.5	15.12	15.36	15.35	15.39	13.95	15.48	15.75	15.88	17.12	16.23
Schooling																
0–8 years	41.46	42.51	36.36	39.4	37.84	34.45	36.2	35.17	32.57	33.84	33.77	29.7	26.37	28.26	24.61	22
9–11 years	37.8	33.96	36.68	38.87	36.89	39.94	37.32	37.29	41.86	37.38	36.37	42.2	39.1	35.73	46.18	43.06
12 years or older	20.74	23.54	26.96	21.73	25.27	25.6	26.48	27.54	25.57	28.79	29.86	28.1	34.53	36.01	29.21	34.94
Race/skin color																
White	42.44	43.9	38.11	43.6	41.25	48.1	49.27	45.82	49.66	49.99	50.08	44.19	46.69	43.58	45.95	45.9
Black and brown	9.06	10.88	8.19	9.95	8.97	49.48	47.92	52.24	47.64	45.12	49.14	55.01	52.21	55.18	50.85	53.28
Yellow	48.15	45.21	53.58	46.45	49.77	1.69	1.85	0.86	1.07	3.62	0	0.28	0.17	0.61	0.13	0
Indigenous	0.35	0	0.12	0	0	0.74	0.96	1.09	1.63	1.27	0.78	0.53	0.93	0.63	3.07	0.82
Marital status																
Single	28.95	26.15	31.64	28.52	28.92	31.49	26.61	30.74	35.94	32.82	31.31	28.82	35.36	32.51	28.39	32.03
Married/stable union	64.03	58.78	55.45	55.61	57.38	56.79	60.8	57.42	52.55	55.27	58.01	59.39	54.12	56.93	58.19	53.75
Widowed	7.02	8.55	7.79	8.12	7.9	5.61	5.74	6.52	7.32	6.17	4.61	6.88	4.73	5.35	5.75	4.9
Divorced	0	6.53	5.12	7.75	5.8	6.11	6.85	5.32	4.18	5.74	6.08	4.92	5.79	5.21	7.67	9.33

Source: Own elaboration.

When analyzing the time trend in overweight according to sociodemographic characteristics (*table 2*), significantly distinct patterns were found by age and schooling. Among young adults, aged 18 to 24 years, a significant decline was observed (APC: -2.82%; 95%CI: -5.35%; 0.27%), whereas in the 65 years or over age group the prevalence presented an increasing trend (APC: 1.18%; 95%CI: 0.78; 1.59).

A similar pattern was found for schooling: individuals with up to 8 years of study showed a significant reduction (APC: -3.67%;

95%CI: -4.57; -2.76) and, as the years of study increased, the trend rose in the population (APC: 2.87%; 95%CI: 2.18; 3.57). For the race/skin color variable, there was significant growth among black and brown individuals (APC: 14.12%; 95%CI: 4.73; 24.35), followed by indigenous individuals (APC: 10.91%; 95%CI: 0.63; 2.23). With regard to marital status, the group of widowed individuals was the only one to present a statistically significant decreasing trend for overweight (APC: -3.12%; 95%CI: -4.37; -1.85), while all the others remained within the stationarity range.

Table 2. Annual Percentage Change (APC) in overweight according to sociodemographic characteristics in the population residing in the municipality of Rio de Janeiro – VIGITEL, 2006 to 2021

Year	2006	2021	APC	IC 95%	Tendência	Período
Sex						
Female	32.03	29.92	0.8	-0.39; 2.01	Estacionária	2006-2021
Male	39.73	40.22	0.3	-0.48; 1.09	Estacionária	2006-2021
All	35.77	35.05	0.61	-0.12; 1.34	Estacionária	2006-2021
Age group						
18 to 24 years	8.28	7.78	-2.82	-5.31; -0.27	Decrescente	2006-2021
25 to 34 years	20.35	22.83	0.3	-0.57; 1.17	Estacionária	2006-2021
35 to 44 years	26.83	20.93	-0.84	-1.73; 0.07	Estacionária	2006-2021
45 to 54 years	18.66	17.78	0.3	-0.44; 1.05	Estacionária	2006-2021
55 to 64 years	12.43	14.46	0.85	-0.56; 2.28	Estacionária	2006-2021
65 years or over	13.45	16.23	1.18	0.78; 1.59	Crescente	2006-2021
Schooling						
0-8 years	41.46	22	-3.67	-4.57; -2.76	Decrescente	2006-2021
9-11 years	37.8	43.06	0.94	0.34; 1.54	Crescente	2006-2021
12 years or older	20.74	34.94	2.87	2.18; 3.57	Crescente	2006-2021
Race/skin color						
White	42.44	45.9	0.67	0.36; 1.70	Crescente	2006-2021
Black and brown	9.06	53.28	14.12	4.73; 24.35	Crescente	2006-2021
Yellow	48.15	0	-36.38	-45.29; -26.02	Decrescente	2006-2021
Indigenous	0.35	0.82	10.91	0.63; 2.23	Crescente	2006-2021
Marital status						
Single	28.95	32.03	0.83	-0.04; 1.70	Estacionária	2006-2021
Married/stable union	64.03	53.75	-0.42	-0.99; 0.15	Estacionária	2006-2021
Widowed	7.02	4.9	-3.12	-4.37; -1.85	Decrescente	2006-2021
Divorced	0	9.33	0.91	-2.18; 4.09	Estacionária	2006-2021

Source: Own elaboration.

CI = Confidence Interval.

Table 3 indicates important transformations in the epidemiological profile of obesity in the adult population of the city of Rio de Janeiro. Men and women presented similar patterns of growth, with prevalences that became equivalent by the end of the period analyzed. The young population (18-24 years) maintained the lowest indicators, in contrast with adults

aged 25 to 44 years, who recorded the highest prevalences. A relevant transformation was observed in the educational profile: while the group with low schooling experienced a consistent decline, individuals with higher educational attainment presented an increase in the prevalence of obesity.

Table 3. Prevalence of obesity according to sociodemographic characteristics in the population residing in the municipality of Rio de Janeiro – VIGITEL, 2006 to 2021

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Sex																
Female	13.38	14.52	12.59	14.45	16.19	17.05	19.8	16.76	18.32	20.47	20.28	20.73	22.75	22.64	24.29	23.2
Male	11.72	13.99	12.26	17.24	14.08	16.36	17.42	21.28	19.07	12.79	20.42	20.22	19.55	19.96	22.58	25.47
Age group																
18 to 24 years	5.31	1.65	4.56	8.52	5.56	5.27	2.98	3.22	3.8	3.86	4.24	4.6	3.45	3.21	3.85	3.75
25 to 34 years	18.81	20.32	18.55	20.28	19.85	22.15	25.27	19.26	23.12	23.64	18.98	14.9	24.58	24.92	20.6	25.96
35 to 44 years	18.85	22.92	19.27	22.32	24.3	17.78	23.5	24.71	28.39	26.67	25.65	23.09	23.91	21.84	20.93	20.55
45 to 54 years	19.68	22.03	20.7	21.2	22.17	27.16	22.88	21.83	15.19	20.62	21.61	23.75	19.18	20.34	24.54	19.04
55 to 64 years	20.95	20.99	20.15	15.34	14.29	15	13.69	18.07	17.15	13.54	16.71	19.76	16.3	17.78	20.18	19.8
65 years or over	16.4	12.09	16.77	12.35	13.82	12.65	11.68	12.9	12.35	11.67	12.81	13.89	12.57	11.9	9.9	10.89
Schooling																
0–8 years	48.68	51.57	50.31	47.93	39.15	35.25	38.31	42.74	37.59	35.35	37.35	36.9	34.52	23.49	24.19	26.98
9–11 years	28.07	29.42	32.06	31.23	38.2	40.24	35.29	32.54	39.45	40.21	35.13	38.69	39.85	45.11	42.56	38.31
12 years or older	23.25	19.01	17.63	20.85	22.66	24.51	26.4	24.71	22.97	24.44	27.52	24.41	25.63	31.4	33.25	34.71
Race/skin color																
White	46.17	37.18	45.18	40.03	42.11	48.55	45.62	41.54	44.3	46.08	42.62	44.01	49.97	45.68	46.04	39.35
Black and brown	13.77	14.18	10.7	8.56	15.83	47.14	50.72	56.79	54.43	51.91	56.17	54.46	49.02	53.66	53.27	58.15
Yellow	40.06	48.64	44	51.41	42.06	1.29	1.26	1.52	0.85	1.29	0.1	0.45	0.24	0.23	0.32	0.53
Indigenous	0	0	0.12	0	0	3.02	2.41	0.15	0.42	0.72	1.11	1.08	0.78	0.42	0.37	1.97
Marital status																
Single	27.06	21.45	26.11	28.47	24.83	29.26	27.5	23.3	25.47	28.85	36.46	30.23	31.33	32.47	29.59	45.48
Married/stable union	70.09	58.18	61.25	62.54	60.25	55.23	62.48	64.79	62.86	55.31	51.31	56.63	56.19	53.52	59.05	43.87
Widowed	2.85	11.55	8.14	3.36	7.38	8.59	5.53	5.21	6.28	9.12	6.15	6.22	6.27	6.57	4.37	5.5
Divorced	0	8.82	4.51	5.63	7.55	6.93	4.48	6.7	5.38	6.72	6.08	6.92	6.21	7.44	6.99	5.15

Source: Own elaboration.

Table 4 presents the APC, which proved to be increasing both for females (APC: 4.26; 95%CI: 3.53; 5.00) and for males (APC: 3.96; 95%CI: 2.56; 5.37). As for age group, only individuals aged 65 years or over presented a decreasing trend in obesity (APC: -1.70%;

95%CI: -2.59; -0.81), whereas, for all the other groups, the trend proved to be stationary. With regard to schooling, an increasing trend was observed for the groups with 9 to 11 years of study (APC: 2.28%; 95%CI: 1.13; 3.44) and 12 years or more (APC: 3.25; 95%CI: 1.77; 4.75).

Table 4. Annual Percentage Change (APC) in obesity according to sociodemographic characteristics in the population residing in the municipality of Rio de Janeiro – VIGITEL, 2006 to 2021

Year	2006	2021	APC	IC 95%	Tendência	Período
Sex						
Female	13.38	23.2	4.26	3.53; 5.00	Crescente	2006-2021
Male	11.72	25.47	3.96	2.56; 5.37	Crescente	2006-2021
All	12.57	24.33	4.16	3.45; 4.87	Crescente	2006-2021
Age group						
18 to 24 years	5.31	3.75	-1.14	-5.35; 3.26	Estacionária	2006-2021
25 to 34 years	18.81	25.96	1.03	-0.54; 2.64	Estacionária	2006-2021
35 to 44 years	18.85	20.55	-0.6	-1.23; 2.47	Estacionária	2006-2021
45 to 54 years	19.68	19.04	-0.22	-1.75; 1.32	Estacionária	2006-2021
55 to 64 years	20.95	19.8	-0.03	-2.58; 2.58	Estacionária	2006-2021
65 years or over	16.4	10.89	-1.7	-2.59; -0.81	Decrescente	2006-2021
Schooling						
0-8 years	48.68	26.98	-4.3	-5.93; 2.72	Estacionária	2006-2021
9-11 years	28.07	38.31	2.28	1.13; 3.44	Crescente	2006-2021
12 years or older	23.25	34.71	3.25	1.77; 4.75	Crescente	2006-2021
Race/skin color						
White	46.17	39.35	0.48	-0.19; 1.16	Estacionária	2006-2021
Black and brown	13.77	58.15	11.29	2.08; 21.34	Crescente	2006-2021
Yellow	40.06	0.53	-32.30	-43.12; -19.41	Decrescente	2006-2021
Indigenous	0	1.97	7.02	-11.82; 36.74	Estacionária	2006-2021
Marital status						
Single	27.06	45.48	2.6	1.36; 3.86	Crescente	2006-2021
Married/stable union	70.09	43.87	-1.41	-2.19; -0.62	Decrescente	2006-2021
Widowed						
Divorced	2.85	5.5	-0.5	-3.71; 2.82	Estacionária	2006-2021
Divorciado(a)	0	5.15	0.5	-1.29; 2.32	Estacionária	2006-2021

Source: Own elaboration.

CI = Confidence Interval.

For this same table, in the analysis by race/skin color, the black and brown population presented a marked increase in obesity (APC: 11.29%; 95%CI: 2.08; 21.34) over time. Among indigenous individuals, although a positive APC of 7.02% (95%CI: -11.82; 36.74) was observed, it was not possible to establish statistical significance, and the trend was therefore considered stationary. For those who declared themselves to be white, the obesity situation remained stationary, and for those who reported themselves as yellow, there was a decrease over time, with

an APC of -32.30% (95%CI: -43.12; -19.41). It should be noted that the information for participants of yellow and indigenous race/skin color must be viewed with caution, owing to the small sample size, which consequently generates a limitation regarding representativeness in the population. With regard to marital status, single individuals presented an increasing trend in obesity, with an APC of 2.60% (95%CI: 1.36; 3.86) and, in contrast, among married individuals the trend was decreasing, with an APC of -1.41% (95%CI: -2.19; -0.62).

Discussion

VIGITEL data showed that, although overweight presented a stationary trend between 2006 and 2021 for both sexes, obesity showed an important increase over the years, probably reflecting the behavioral changes that have been occurring in our society, mainly in relation to the type of diet and the pattern of physical activity. The 2019 National Health Survey (PNS) corroborates these findings, insofar as the proportion of obese individuals in the Brazilian population aged 20 years or over more than doubled between 2003 and 2019, rising from 12.2% to 26.8%¹⁵. Malta¹⁶ found, in the Brazilian capitals and the Federal District, that the prevalence of overweight in adults increased from 43.2% in 2006 to 51.0% in 2012, with a mean annual increment of 1.37%. Another study conducted between 2006 and 2017 observed a higher prevalence among women, in individuals aged 25 to 44 years and at all levels of schooling¹⁷.

In India, considered one of the countries with the lowest prevalence of obesity, the frequency in adults was estimated at 5.1%; however, there has been an upward trend over the last two decades⁴. Spain, in turn, considering the average of the 35 member countries of the Organisation for Economic Co-operation and Development (OECD), has one of the highest prevalences of obesity in adults in the European region⁴.

The main factors that may contribute to overweight in adults are changes in the quality and quantity of meals, with a preference for fast food and ultra-processed foods with excess sugar and fat, low energy expenditure, genetics itself, stress and the use of certain medications, notably antidepressants, contraceptives and diabetes medications, which may contribute to weight gain in adults¹⁵⁻¹⁸. It is important to highlight that, among the countries of Latin America, Brazil has one of the lowest levels of physical activity¹⁵. When the profile of overweight and obesity is analyzed according to the age group variable, a stationary trend is

observed in most groups, except for individuals aged 65 years or over, in whom overweight presented an increasing trend and obesity a decreasing one.

According to the literature, in many countries the prevalence of overweight and obesity among men tends to increase with age, up to 55 years, and decreases thereafter; among women, however, the prevalence of both continues to increase with advancing age^{18,19}. Nevertheless, adult BMI standards for older adults are not consensual, mainly because the cut-off points may be inappropriate in view of the physiological modifications that occur with aging, generating changes in body composition. Although the MS has a classification according to SISVAN (Food and Nutrition Surveillance System) – an information system that monitors the nutritional status of the population – this study adopted the WHO parameters, based on a large American population-based study covering people of all ages, including older adults^{20,21}.

According to Sousa et al.²², eating habits play a major role in the construction of human life and may change throughout life. A childhood with the consumption of caloric foods and low consumption of greens, fruits and vegetables tends to make individuals more prone, in adult life, to maintaining this habit, generally increasing the amount of calories in relation to what they expend, generating fat accumulation^{22,23}. The rise in the gradient of overweight and obesity with increasing schooling is noteworthy. These findings were similar to the studies by Fildes et al.²³ and Xia et al.²⁴; however, the authors drew attention to the fact that people with higher schooling tend to have greater access to treatment measures^{24,25}. Among those who declared themselves to be black, brown and indigenous, there was an increasing trend in obesity, and different aspects may exacerbate this scenario.

In a complex city such as Rio de Janeiro, it is necessary to broaden the discussion of social and racial vulnerability and, undoubtedly, the social context in which black,

brown and indigenous individuals are inserted may have repercussions on the adoption or not of healthier behaviors, which may favor weight gain²³.

A study published in 2023 on weight increase in the white and black populations in Brazil showed, with VIGITEL data, that there is a more pronounced increase in the prevalence of overweight and obesity in black populations²⁶. The authors also highlighted that black populations had a lower-quality diet when compared with the white population, demonstrating the need to understand and problematize structural changes in various segments that may have repercussions on health inequities.

A cross-sectional investigation with a sample of older adults aged 65 years or over living in communities in Brazil showed that the black race/skin color category was more associated with obesity, in comparison with the brown race/skin color category, even after adjustment for socioeconomic variables (schooling and family income)²⁷.

In the ELSA-Brasil cohort study, which involved public servants of Brazilian institutions aged between 35 and 74 years, there was also a higher incidence of overweight among black women and those with low schooling²⁸. In a cross-sectional investigation with a sample of older adults aged 65 years or over living in communities in Brazil, the black race/skin color category was associated, among women, with general and central obesity, in comparison with the brown race/skin color category, even after adjustment for socioeconomic variables (schooling and family income)²⁹.

Although there is no clear relationship between marital status and overweight or obesity, some studies suggest that married people are more likely to have a higher BMI³⁰; in our study, in turn, obesity follows an increasing trend among single individuals. For Meller et al.³¹, marital status may be associated with differences in lifestyle, in that people with a partner may be more likely to share family meals and follow a more regular eating

routine, which may positively influence health and reduce the risk of obesity. On the other hand, single or divorced people tend to have more freedom in their food choices and fewer family responsibilities, which may result in less healthy habits³².

Given the multicausality involved in this problem, whose roots are systemic, public policy makers and managers need to strengthen care coordination in order to achieve a deceleration of overweight and obesity in the population. Various policies have been promoted by the Federal Government, such as the Strategic Action Plan to Tackle NCDs, 2021-2030, aligned with the targets of the 2030 Agenda formulated by the United Nations³³. These are measures that recognize the need to act on the social determinants through adequate coordination of care among services. At the municipal level, tackling this problem – marked by food deserts, social inequalities and the fragility of the care network structure itself – depends on strengthening primary health care (PHC) as a unique space for preventing and treating overweight in the population, primarily because of its capillarity in the territories^{32,33}.

The implementation of Multiprofessional Teams – eMulti (formerly Family Health Support Centers – NASF) and of the Academia Carioca Program in PHC may contribute to tackling this problem, helping to enhance the integration of the promotion of adequate and healthy eating with physical and bodily activities^{34,35}. Considering that eating habits may change throughout life²², a childhood with the consumption of caloric foods and reduced intake of greens, fruits and vegetables tends to make adults more prone to maintaining this habit, generally increasing the amount of calories in relation to what they expend, generating fat accumulation^{22,23}.

Moreover, the food issue may be embedded in a social problem, given families that deal with the scarcity of healthy foods (fresh or minimally processed), whether because of low purchasing power or because of the

concentration of establishments offering healthy food in wealthier areas. Encouraging the production of and access to healthy foods by expanding the supply of *in natura* products in school meals, creating mechanisms to facilitate open-air markets and developing urban agriculture may help to promote sustainability, in favor of healthier eating habits, in addition to contributing to raising people's awareness and engagement, making them more protagonists of the process of change. The installation of community gardens may take place in public spaces, such as squares and gardens, or in locations designated by the city government, which would strengthen not only access to fresh foods but also social integration. This movement may help to break paradigms about the idea of complexity in preparation, as well as helping to recover the history and cultural identity that surround meals and real access to food^{36,37}.

One of the main technical areas of food and nutrition in the city, the Annes Dias Nutrition Unit (Unad), has sought to value this debate; even so, efforts do not always translate into strategic actions, owing to the political-institutional context³⁶, in which many projects have difficulty moving beyond the discourse of multidisciplinary as concrete responses to complex problems³⁸.

Recently, the Obesity Prevention Strategy was established at the national level, with the purpose of promoting a reduction in the occurrence of these conditions, mainly among children, adolescents and populations in situations of greater vulnerability and social risk. It is expected that the city of Rio de Janeiro, in implementing this proposal, will broaden the articulation of public policies with initiatives for the production of, access to and consumption of healthy foods, from a food and nutrition security perspective, together with the promotion of physical activity and the fostering of urban mobility³⁹.

Finally, it is worth highlighting some limitations regarding the use of VIGITEL, which is restricted to individuals with a landline

telephone and, currently, most people have been opting for mobile phones, which may imply selection bias; however, the methodology is widely used and recommended in the research field, in addition to being validated for Brazil. Another important point is that these differences were identified on the basis of anthropometric data self-reported by the interviewee, which may generate inaccuracies in the calculation of BMI, limiting the validity of this research.

Final considerations

This study sought to contribute to the understanding of the epidemiological scenario of overweight and obesity in the city of Rio de Janeiro. The evidence base showed that sociodemographic characteristics may have an influence on the trend of these phenomena, with a higher prevalence of obesity among those with 9 years or more of schooling, older adults and black individuals. However, it must be considered that differences are found when anthropometric measures are self-reported by the interviewee, with possible inaccuracies in the calculation of BMI, limiting the validity of this research.

The results reinforce the need to invest in intersectoral and interdisciplinary actions, beyond the health sector, in order to change the perspective on life habits and behaviors.

Investing in urban architecture to expand spaces for the practice of physical activity, as well as advancing food and nutrition surveillance with a family-based approach to obesity that goes beyond the focus on blaming the individual, will help to enhance the organization of care for patients.

These are efforts that may increase the chances of recognizing obesogenic environments, helping to strengthen practices that can prevent, control and treat overweight and obesity throughout life so as to leave no one behind in terms of the benefits that can be obtained from health-promoting actions.

Authorship contributions

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