Rev Rene. 2025;26:e95361.
DOI: 10.36517/2175-6783.20252695361
www.periodicos.ufc.br/rene

Original Article

Evolution of overweight and obesity in Brazilian adults: evidence for health surveillance

Evolução do excesso de peso e da obesidade em adultos brasileiros: evidências para a vigilância em saúde

How to cite this article:
Kavano CR, Silva TPR, Silva TIM, Silva AG. Evolution of overweight and obesity in Brazilian adults: evidence for health surveillance. Rev Rene. 2025;26:e95361. DOI: https://doi.org/10.36517/2175-6783.20252695361

Caroline Robete Kavano[1]
Thales Philipe Rodrigues da Silva[2]
Talita Ingrid Magalhães Silva[3]
Alanna Gomes da Silva[2]

[1]Secretaria Municipal de Saúde de Campo Grande. Campo Grande, MS, Brazil.
[2]Universidade Federal de Minas Gerais. Belo Horizonte, MG, Brazil.
[3]Centro Universitário de Formiga. Formiga, MG, Brazil.

Corresponding author:
Alanna Gomes da Silva
Avenida Professor Alfredo Balena, 190
Santa Efigênia, CEP: 30130-100.
Belo Horizonte, MG, Brazil.
E-mail: alannagomes@ufmg.br

Conflict of interest: the authors have declared that there is no conflict of interest.

EDITOR IN CHIEF: Ana Fatima Carvalho Fernandes
ASSOCIATE EDITOR: Ana Luisa Brandão de Carvalho Lira

ABSTRACT

Objective: to analyze temporal trends in the prevalence of overweight and obesity in the adult population of Brazilian state capitals. **Methods:** a time series epidemiological study using data from the Surveillance System for Risk and Protective Factors for Chronic Diseases by Telephone Survey, from 2006 to 2023. The prevalence of overweight and obesity was analyzed by sex, age, education level, and the capital city of Brazil. The Prais-Winsten regression was used, and the Annual Percentage Change was calculated. **Results:** there was an increase in the prevalence of overweight and obesity. The increase was observed in both sexes, in all age groups, and all levels of education. Aracaju, Belém, and Belo Horizonte had the highest overweight, and Brasília had the highest obesity. **Conclusion:** there was a significant increase in the prevalence of overweight and obesity among adults in Brazilian state capitals between 2006 and 2023, with consistent growth in all sociodemographic strata analyzed. **Contributions to practice:** nursing can play a role in screening and monitoring overweight and obesity, and in health education to promote healthy habits. Furthermore, it can contribute to intersectoral coordination and implementing public policies to address these conditions.

Descriptors: Obesity; Overweight; Risk Factors; Noncommunicable Diseases; Behavioral Risk Factor Surveillance System.

RESUMO

Objetivo: analisar as tendências temporais das prevalências do excesso de peso e da obesidade na população adulta das capitais brasileiras. **Métodos:** estudo epidemiológico de série temporal com dados do Sistema de Vigilância de Fatores de Risco e Proteção para Doenças Crônicas por Inquérito Telefônico, de 2006 a 2023. Analisaram-se as prevalências de excesso de peso e obesidade, por sexo, idade, escolaridade e capitais brasileiras. Utilizou-se a regressão de Prais-Winsten e calculou-se a Variação Percentual Anual. **Resultados:** houve aumento da prevalência de excesso de peso e de obesidade. O crescimento foi observado em ambos os sexos, em todas as faixas etárias e níveis de escolaridade. Aracaju, Belém e Belo Horizonte apresentaram os maiores aumentos no excesso de peso, e Brasília para obesidade. **Conclusão:** observou-se um aumento expressivo na prevalência de excesso de peso e obesidade entre adultos nas capitais brasileiras entre 2006 e 2023, com crescimento consistente em todos os estratos sociodemográficos analisados. **Contribuições para a prática:** a enfermagem pode atuar no rastreamento e monitoramento do excesso de peso e obesidade, educação em saúde para a promoção de hábitos saudáveis. Outrossim, pode contribuir para a articulação intersetorial e implementação de políticas públicas para o enfrentamento dessas condições.

Descritores: Obesidade; Sobrepeso; Fatores de Risco; Doenças não Transmissíveis; Sistema de Vigilância de Fator de Risco Comportamental.

Received: Apr. 2nd 2025; Accepted: May 13rd 2025.

Introduction

Overweight and obesity are two of the main contemporary challenges in public health due to their high prevalence and repercussions on morbidity and mortality. These conditions are strongly associated with several noncommunicable diseases (NCDs), such as systemic hypertension, type 2 diabetes mellitus, cardiovascular diseases, stroke, and some types of cancer[1-2]. In addition to physical impacts, they can also lead to psychosocial consequences, such as eating disorders, depression, and low self-esteem, extending their effects beyond the biological field, with social and economic implications[3].

The increase in obesity has been significant in recent decades. In 2022, it was estimated that 504 million women and 374 million men were obese[4]. The previous year, overweight was responsible for approximately 3.7 million deaths and 128.5 million Disability-Adjusted Life Years (DALYs). Between 1990 and 2021, deaths attributable to high Body Mass Index (BMI) increased from 1.5 to 3.7 million, and DALYs from 48 to 128.5 million[5]. Projections indicate that, if current trends continue, by 2050, more than half of the global adult population could be overweight or obese[1].

Between 2013 and 2019, the prevalence of obesity in Brazil's adult population increased from 20.8% to 25.9%. Among men, this percentage rose from 16.8% to 21.8%, while among women, the increase was from 24.4% to 29.5%[6]. The mortality rate attributed to obesity grew from 1.1% in 2010 to 1.78% in 2021, representing an increase of approximately 63%[7].

The determinants of overweight and obesity are multifactorial, including poor dietary patterns, increased consumption of ultra-processed foods, sedentary behavior, genetic factors, and environmental conditions[8]. Added to this is the obesogenic environment, characterized by physical, economic, political, and sociocultural factors that favor weight gain and hinder healthy choices, representing a significant challenge for health promotion and comprehensive care for the population. In this context, marked by multiple influences and inequalities, the prevention and management of overweight and obesity require an intersectoral and integrated approach that involves lifestyle changes, dietary re-education, encouragement of physical activity, and psychosocial support[9].

In this regard, since the 1990s, Brazil has implemented a series of public policies aimed at preventing and controlling overweight and obesity, including the National Food and Nutrition Policy, a series of public policies aimed at preventing and controlling overweight and obesity, including the National Food and Nutrition Policy, the Food Acquisition Program, the National Food and Nutrition Security System, the National Health Promotion Policy, and the Dietary Guidelines for the Brazilian Population[10].

Dietary standards-related policies align with the Sustainable Development Goals (SDGs), especially SDG 2, which aims to end hunger, achieve food security, and improve nutrition by promoting sustainable agriculture. SDG 3 proposes to ensure healthy lives and promote well-being for all ages[11]. The articulation between these goals reinforces the need for integrated and sustainable actions that consider the social determinants of health and promote equity in the country's access to adequate food, physical activity, and health care.

Despite advances in public policies, controlling overweight and obesity still shows limited results, requiring intersectoral interventions considering regional inequalities and health's social determinants. From the perspective of Public Health, these problems represent one of the main contemporary challenges, with significant impacts on health systems. Within Primary Health Care (PHC), there is a growing demand for care for individuals with excess weight, especially in areas marked by socioeconomic vulnerabilities.

In this reality, nursing plays a central role in screening, monitoring, and health education, as well as coordinating intersectoral actions to promote healthy eating and physical activity. The choice of them

is based on epidemiological relevance and evidence from care practice and research, which indicate the need to strengthen health surveillance and improve the care provided. Studies that analyze the evolution of these indicators can support the planning of more effective and equitable actions to tackle obesity in the context of PHC.

As a result of changes in dietary patterns, lifestyle, and social inequalities in Brazil in recent decades, it is assumed that the prevalence of overweight and obesity has shown an upward trend in Brazilian capitals, with variations according to gender and level of education. Given the above, this study aimed to analyze temporal trends in the prevalence of overweight and obesity in the adult population of Brazilian state capitals.

Methods

Study design

This is a time-series epidemiological study of the prevalence of overweight and obesity among adults living in Brazilian state capitals and the Federal District.

The study is based on the assumptions of NCD surveillance within the scope of the Unified Health System, which guides the production of information, the systematic analysis of data, the continuous monitoring of NCDs, and their risk and protection factors. This surveillance aims to subsidize the implementation of sectoral and intersectoral strategies, support the implementation of the Strategic Action Plan to Combat Non-Communicable Diseases in Brazil, and allow the periodic monitoring and evaluation of the results obtained[12].

Context

Vigitel is a population-based telephone survey carried out by the Ministry of Health. It annually monitors the frequency and distribution of the main risk and protective factors for CNCDs, including overweight and obesity. Since 2006, a probabilistic sample of adults aged 18 or over living in households with a landline telephone has been interviewed annually in the 26 Brazilian state capitals and the Federal District[13].

Data collection

The sampling process uses databases from the country's leading fixed-line operators. An adult resident is chosen randomly to participate in the survey in each selected household.

The editions between 2006 and 2019 established a minimum sample size of around 2,000 individuals in each city, totaling around 54,000 individuals assessed annually. However, in 2020 and 2021, a reduced sample size of around 1,000 individuals was established in each town. For 2023, data was collected between December 26, 2022, and April 24, 2023, and a further reduction was necessary, establishing a minimum of 800 interviews in each location. In addition, half of the interviews were conducted by cell phone, resulting in a final sample of 400 landline and 400 cell phone interviews in each location. Just so you know, the survey was not carried out in 2022, so data from that year is not presented[13].

The interviews carried out are weighted to be representative of the total adult population of each city.

The questionnaire used was based on different previously consolidated models, such as simplified instruments adopted by surveillance systems for NCD risk factors. It also incorporated the experience accumulated in the system's implementation tests and throughout its continued execution. Methodological studies to validate the Vigitel questionnaire showed satisfactory levels of reproducibility and validity, reinforcing its suitability for collecting information in population surveys by telephone[13].

The system's annual technical report provides details of the sampling process, Vigitel's data collection procedures, and the full questionnaire[13].

Variables

The following indicators were evaluated in Vigitel: Percentage of excessive weight adults: ratio of excessive weight individuals to the total interviewed. Individuals with a BMI ≥25 kg/m^2 were considered to have excessive weight, calculated from weight in kilograms divided by the square of height in meters, both self-reported, according to the questions: Do you know your weight (even if it is approximate)? Do you know your height? Percentage of adults with obesity: ratio of individuals with obesity to the total number of people interviewed. Individuals with a BMI ≥30 kg/m^2 were considered obese, calculated from weight in kilograms divided by the square of height in meters, both self-reported, according to the questions: Do you know your weight (even if it is approximate)? Do you know your height?

Vigitel analyzes excessive weight and obesity using information on self-reported weight and height of the interviewees.

The variables were stratified according to sex (male and female); years of schooling (0 to 8, 9 to 11 and ≥12 years); age group (18 to 24, 25 to 34, 35 to 44, 45 to 54, 55 to 64 and ≥ 65 years); regions (North, Northeast, Southeast, South, and Midwest); Brazilian capitals and the Federal District.

Data analysis

The analyses were carried out using Prais-Winsten generalized linear regression, which corrects for the effect of first-order serial autocorrelation[14]. Thus, a significant trend was considered when the β of the regression differed from zero and the p- value was less than or equal to 0.05. The trend was increasing when β was positive, decreasing when β was negative, and stationary when no statistically significant difference was identified.

The Annual Percentage Change (APC) was calculated for each variable analyzed using the formula: APV = (-1+10^β1) × 100%. Beta 1 (β1) refers to the angular coefficient of the Prais-Winsten regression.

The 95% confidence intervals (CI) of the APV measurements were also calculated using the following formula: Minimum 95% CI = (-1+10^[β1-t×e]) × 100%, and maximum 95% CI = (-1+10^[β1+t×e]) × 100%, where the t in the formula refers to the Student's t-test gradually of freedom for the periods and with a 95% confidence level, while e corresponds to the standard error. The statistical analysis program generated the β1 values from the Prais-Winsten regression and the standard error.

The indicators of interest (percentage of excessive weight and obesity) in each year were taken as the outcome variable and the year as the explanatory variable. The analyses were done using Stata software (Stata Corp LP, College Station, Texas, United States), version 14.2.

Ethical aspects

This study used secondary data, in the public domain, without the possibility of identifying the participants, eliminating the need to submit to the Research Ethics Committee, under Resolution 510/2016 of the National Health Council.

Results

There was an upward trend in the prevalence of excessive weight among the total population, from 42.7% in 2006 to 61.4% in 2023 (APV = 2.02; 95%CI 1.7;2.34). Among men, prevalence rose from 47.6% in 2006 to 63.4% in 2023. The upward trend was statistically significant, with an APV of 1.57% (95% CI: 1.23; 1.92). Among women, prevalence rose from 38.5 to 59.6% in the same period, with an APV of 2.50% per year (95% CI: 2.16; 2.84), indicating a faster growth rate than men (Figure 1).

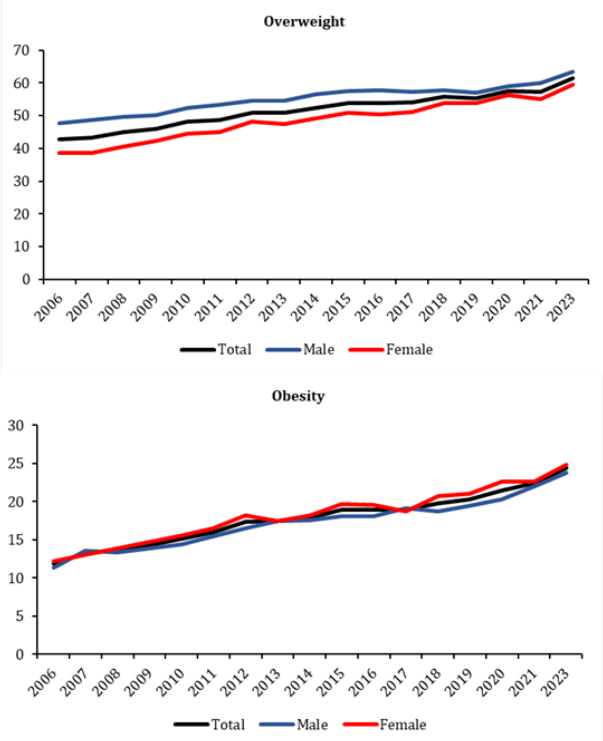

Figure 1 – Trends in the prevalence of overweight and obesity in Brazilian state capitals, according to total population and sex. Belo Horizonte, MG, Brazil, 2025

The increase in overweight was also statistically significant in all the age groups and levels of education analyzed. However, the increase was more pronounced among younger individuals, especially in the 18- to 24-year-old group (APC = 3.18; 95%CI: 2.11; 4.26), in the groups with 9 to 11 years of schooling (APC = 2.75; 95%CI: 2.18; 3.12), and with 12 years or more of schooling (APC = 2.41; 95%CI: 2.06; 2.76) (Table 1).

A trend toward increased overweight was observed in all Brazilian state capitals. The increase was most pronounced in Aracaju (APC = 2.31; 95% CI: 1.86; 2.77); Belém (APC = 2.38; 95% CI: 1.97; 2.80); Belo Horizonte (APC = 2.21; 95% CI: 1.95; 2.46); Fortaleza (APC = 2.16; 95% CI: 1.62; 2.71); Goiânia (APC = 2.02; 95% CI: 1.54; 2.51); Maceió (APC = 2.15; 95% CI: 1.41; 2.89); Manaus (APC = 2.32; 95% CI: 1.73; 2.92); Salvador (APC= 2.27; 95% CI: 1.80; 2.73); São Luís (APC = 2.31; 95% CI: 1.95; 2.68); São Paulo (APC = 2.06; 95% CI: 1.86; 2.27); Brasília (APC = 2.34; 95% CI: 1.78; 2.91) (Table 2).

Table 1 – Trends in the prevalence of overweight in Brazilian state capitals, according to schooling and age. Belo Horizonte, MG, Brazil, 2025

Variables	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2023	APC* (95%CI)†
Education (years)																		
0 to 8	49.0	49.6	50.3	52.1	54.2	54.4	57.3	58.1	58.9	61.7	59.2	59.7	61.8	61.0	63.0	63.3	64.3	1.61 (1.20;2.01)
9 to 11	37.6	37.1	40.7	42.2	44.4	45.7	46.7	47.3	51.6	52.0	53.3	53.0	54.5	53.8	56.0	56.0	61.1	2.75 (2.18;3.12)
≥12	37.3	40.2	40.7	40.6	43.6	44.6	48.4	45.5	45.0	46.8	48.8	49.6	51.3	52.2	54.6	53.8	59.3	2.41 (2.06;2.76)
Age (years)																		
18 to 24	20.7	21.0	23.2	25.6	27.7	25.7	28.9	29.7	31.5	33.2	30.3	32.1	32.1	30.1	30.6	35.7	37.4	3.18 (2.11;4.26)
25 to34	37.7	39.7	41.0	41.4	44.3	46.0	47.7	45.3	48.0	49.6	50.3	50.0	52.9	53.1	55.1	54.4	61.0	2.52 (2.20;2.83)
35 to 44	48.5	48.2	49.4	50.4	51.8	55.0	55.9	56.4	58.6	60.2	61.1	60.9	61.3	61.0	64.9	62.4	65.8	1.82 (1.40;2.24)
45 to 54	54.7	55.1	55.3	55.2	57.9	57.7	60.8	60.7	61.6	62.4	62.4	61.6	64.0	63.7	65.2	64.4	70.7	1.37 (1.12;1.62)
55 to 64	56.8	57.0	58.6	59.4	60.4	60.2	60.3	62.7	61.8	63.8	62.4	61.0	63.1	63.1	65.0	64.1	66.4	0.80 (0.61;0.99)
≥65	52.4	50.8	53.6	54.2	56.6	54.3	58.5	56.3	57.8	57.3	57.7	59.6	60.6	59.8	60.9	60.7	60.9	1.05 (0.86;1.24)

*APC: Annual Percent Change; †CI: Confidence Interval

Table 2 – Trends in the prevalence of overweight, according to Brazilian state capitals. Belo Horizonte, MG, Brazil, 2025

Capitals	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2023	APC* (95% CI)†
Aracaju	40.3	39.4	43.6	46.4	48.0	45.6	51.7	50.0	51.7	52.2	55.5	53.3	54.6	53.6	56.3	57.3	62.9	2.31 (1.86;2.77)
Belém	40.9	42.4	46.8	44.0	46.6	47.7	52.0	51.1	55.5	54.4	54.4	53.6	57.7	53.3	56.1	61.3	63.4	2.38 (1.97;2.80)
Belo Horizonte	37.7	41.4	42.6	44.0	44.3	45.6	48.7	47.1	48.6	50.3	50.2	50.7	53.5	52.5	53.3	58.6	57.9	2.21 (1.95;2.46)
Boa vista	42.0	42.4	45.1	49.3	47.8	49.8	47.3	49.9	50.6	58.2	53.1	53.7	54.4	54.3	59.2	56.4	58.0	1.95 (1.47;2.43)
Campo Grande	43.3	45.6	46.4	49.0	52.3	51.0	56.4	53.3	55.2	59.9	57.2	59.7	58.6	58.0	56.0	58.1	62.8	1.89 (1.22;2.56)
Cuiabá	45.1	48.5	48.5	48.2	50.4	51.9	52.9	55.4	55.0	52.9	57.4	57.9	60.4	55.8	62.7	57.0	61.6	1.90 (1.66;2.14)
Curitiba	44.1	44.1	46.3	46.5	49.1	50.1	51.2	53.1	54.1	54.1	54.7	53.3	51.1	53.7	53.9	55.3	60.3	1.68 (1.04;2.32)
Florianópolis	41.2	43.1	41.5	45.4	45.3	47.6	48.8	47.9	50.1	50.9	48.7	49.4	52.1	53.6	52.5	56.9	56.8	1.78 (1.49;2.07)
Fortaleza	42.5	45.2	45.9	47.8	51.7	52.0	54.0	52.1	56.7	56.0	56.8	55.1	59.4	55.6	59.1	59.2	63.3	2.16 (1.62;2.71)
Goiânia	38.3	39.0	42.7	44.4	44.6	46.4	49.7	47.9	50.2	45.5	48.2	51.2	49.6	52.7	52.9	56.3	55.0	2.02 (1.54;2.51)
João Pessoa	42.0	45.0	45.9	44.1	46.6	49.6	50.5	51.9	51.2	54.1	57.0	53.2	54.6	54.7	53.5	59.6	57.6	1.73 (1.30;2.17)
Macapá	42.4	43.5	49.1	46.1	49.0	52.3	52.4	52.8	52.1	51.5	54.2	58.0	55.0	53.3	56.2	58.7	61.9	0.21 (-0.24;0.65)
Maceió	39.9	41.7	44.5	44.0	47.7	51.9	53.7	53.2	51.8	54.5	54.8	57.3	55.1	54.4	59.8	58.1	57.7	2.15 (1.41;2.89)
Manaus	44.1	44.7	44.0	47.3	50.9	52.1	52.7	54.1	55.9	61.9	56.5	58.7	60.8	60.9	56.3	63.5	63.5	2.32 (1.73;2.92)
Natal	43.3	45.9	44.9	46.1	48.9	51.6	52.0	52.9	51.6	54.9	57.1	54.9	54.8	56.6	57.7	59.1	61.2	1.92 (1.52;2.31)
Palmas	37.3	34.4	38.6	38.9	40.9	40.7	45.2	47.9	48.5	47.9	48.3	47.5	49.2	49.9	52.8	50.1	50.4	1.96 (1.20;2.73)
Porto Alegre	48.9	44.7	48.6	46.9	51.5	54.0	53.9	54.0	55.2	56.0	54.7	55.3	60.0	59.2	58.8	62.2	62.4	1.74 (1.40;2.08)
Porto Velho	41.5	44.8	44.5	50.2	50.9	49.8	52.8	53.7	56.5	55.1	55.4	59.7	56.0	56.6	59.2	64.4	55.7	1.99 (1.30;2.68)
Recife	44.4	43.7	45.5	46.6	50.3	49.1	53.5	51.2	55.4	54.7	56.0	54.7	56.2	59.5	58.1	56.7	60.0	1.89 (1.51-2.27)
Rio Branco	44.1	42.5	49.1	49.5	53.0	51.9	55.1	52.2	56.0	56.8	61.3	57.0	61.0	56.6	57.7	60.4	60.6	1.89 (1.37-2.40)
Rio de Janeiro	48.1	47.0	45.0	49.7	52.7	51.4	52.7	53.0	55.9	56.1	55.8	59.1	58.0	57.1	60.4	56.1	65.2	1.77 (1.48-2.06)
Salvador	39.7	40.6	42.2	45.5	42.8	45.5	46.9	47.0	52.0	53.5	54.2	53.4	54.0	51.8	55.9	53.2	61.7	2.27 (1.80-2.73)
São Luis	34.7	36.6	39.0	39.4	41.0	41.2	45.6	42.6	45.6	46.7	48.8	50.5	47.0	50.3	51.3	49.3	51.9	2.31 (1.95-2.68)
São Paulo	44.4	43.6	47.0	47.5	49.5	48.1	52.4	51.5	51.4	55.1	54.5	55.3	56.7	55.8	59.6	57.4	63.0	2.06 (1.86-2.27)
Teresina	35.7	38.5	37.7	40.1	44.3	45.6	46.8	49.0	49.1	49.8	51.5	48.5	48.4	52.7	55.0	52.5	50.0	1.90 (0.94-2.87)
Vitória	39.1	41.5	42.9	45.2	46.2	46.8	48.7	48.5	50.6	49.3	49.8	52.6	52.1	49.1	56.8	51.5	56.1	1.72 (1.38-2.06)
Brasília	41.4	39.3	41.4	39.2	44.3	50.1	46.7	49.3	50.1	48.6	48.5	47.1	51.8	55.0	54.6	56.4	60.3	2.34 (1.78-2.91)

*APC: Annual Percent Change; †CI: Confidence Interval

The prevalence of obesity has also increased among the total population, rising from 11.9% in 2006 to 24.3% in 2023 (APC = 3.98; 95% CI: 3.43; 4.54). Among men, the prevalence rose from 11.4% to 23.8% (APC = 3.84; 95% CI: 3.30, 4.39). Among women, the increase was from 12.2% to 24.8% in the same period (APC = 3.95; 95% CI: 3.33, 4.48). It is noteworthy that the growth in obesity was similar among men and women (Figure 1).

The upward trend in obesity prevalence was significant in all age groups and educational levels. Regarding age, although individuals aged 18 to 24 had the lowest prevalence throughout the period, this group showed the most pronounced increase (APC = 6.26%; 95% CI: 4.98, 7.56). Regarding education, the highest prevalence rates were recorded among those with 0 to 8 years of schooling. However, the largest annual increases occurred among individuals with 9 to 11 years (APC = 5.52%; 95% CI: 4.72, 6.33) and 12 or more years of schooling (APC = 5.11%; 95% CI: 4.30, 5.93) (Table 3).

Table 3 – Trends in the prevalence of obesity in Brazilian state capitals, according to schooling and age. Belo Horizonte, MG, Brazil, 2025

Variables	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2023	APC* (95% CI)†
Education (years)																		
0 to 8	15.3	16.9	17.5	18.1	18.8	19.7	21.7	22.3	22.7	23.6	23.5	23.3	24.5	24.2	25.3	25.8	26.9	3.25 (2.35;4.16)
9to 11	9.1	10.7	10.9	12.2	13.1	14.2	15.2	15.1	17.2	17.8	18.3	17.8	19.4	19.9	20.8	22.8	24.1	5.52 (4.72;6.33)
≥12	8.7	9.9	10.2	10.7	11.7	13	14.4	14.3	12.3	14.6	14.9	16.0	15.8	17.2	19.3	19.0	22.7	5.11 (4.30;5.93)
Age (years)																		
18 to 24	4.3	4.2	4.8	6.6	5.7	5.7	7.5	6.3	8.5	8.3	8.5	9.2	7.4	8.7	9.9	12.2	13.3	6.26 (4.98;7.56)
25 to 34	9.9	11.3	11.2	11.9	12.2	13.7	15.1	15	15.1	17.9	17.1	16.5	18.0	19.3	19.6	20.8	23.9	4.86 (4.30;5.42)
35 to 44	12.7	15.1	15.2	15.6	16.6	19.6	19.7	20.1	22.0	23.6	22.5	22.3	23.2	22.8	24.7	25.5	27.0	4.12 (3.08;5.17)
45 to 54	16.2	19.4	18.6	17.9	21.6	21.2	22.6	22.5	21.3	21.7	22.8	23.3	24	24.5	27.1	26.2	30.0	2.83 (2.24;3.43)
55 to 64	17.6	19.9	20.8	21.6	19.8	21.1	23.4	24.4	23.1	22.7	22.9	22.6	24.6	24.3	26.2	26.2	26.1	1.97 (1.3;2.57)
≥65	16.8	14.9	17.4	17.7	19.4	17.7	19.0	20.2	19.8	19.4	20.3	20.3	21.5	20.9	20.2	21.8	22.4	1.85 (1.35;2.34)

*APC: Annual Percent Change; †CI: Confidence Interval

In all Brazilian state capitals, there was a trend toward increased obesity, particularly in Brasília APC = 5.02; 95% CI 3.92; 6.13); Teresina (APC = 4.02; 95% CI 3.48; 4.57); São Luis (APC = 4.09; 95% CI 3.48; 4.70): Recife (APC = 4.02; 95% CI 3.49;4.56); Manaus (APC = 4.10; 95% CI 3.25;4.97); Fortaleza (APC = 4.31; 95% CI 3.02;5.61); Cuiabá (APC = 4.01; 95% CI 2.94;5.10); Boa Vista (APC = 4.17; 95% CI 3.25;5.11); Belo Horizonte (APC = 4.02 95% CI 3.35;4.70) (Table 4).

Table 4 – Obesity prevalence trends, according to Brazilian state capitals. Belo Horizonte, MG, Brazil, 2025

Capitals	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2023	APC* (95% CI)†
Aracaju	13.4	11.7	14.0	15.9	15.8	16.0	18.0	17.1	17.9	17.5	20.2	19.6	17.0	20.6	23.2	25.0	25.0	3.88 (3.0;4.77)
Belém	13.3	14.3	13.7	13.6	15.9	14.4	16.1	15.8	21.1	19.1	19.3	18.0	20.7	19.6	22.5	24.0	25.7	3.90 (3.23;4.58)
Belo Horizonte	9.8	11.7	12.1	12.8	12.8	14.1	14.5	14.6	16.5	17.4	16.6	16.4	17.2	19.9	17.1	21.4	20.7	4.02 (3.35;4.70)
Boa vista	12.5	12.2	14.4	14.0	14.6	15.6	15.1	17.3	18.5	22.8	18.7	16.6	20.0	21.2	22.5	23.6	24.9	4.17 (3.25;5.11)
Campo Grande	12.9	15.7	14.3	16.7	17.5	18.4	21.0	17.7	21.8	22.2	19.9	23.4	21.5	22.5	22.3	20.2	27.0	3.31 (2.31;4.31)
Cuiabá	12.6	14.3	14.5	14.9	18.6	18.2	19.2	22.4	21.5	17.3	21.9	22.7	23.0	22.5	24.0	23.8	27.2	4.01 (2.94;5.10)
Curitiba	12.7	13.4	13.9	12.9	17.3	16.1	16.3	17.6	18.8	16.4	18.9	18.1	16.0	19.4	17.9	22.6	24.5	3.07 (2.19;3.97)
Florianópolis	10.4	11.2	11.9	14.0	14.5	15.5	15.7	15.4	14.3	15.7	14.5	15.0	17.4	17.8	17.6	20.2	21.9	3.96 (2.71;5.23)
Fortaleza	11.7	13.8	15.2	15.5	18.6	18.6	18.8	18.1	19.3	19.8	20.0	19.2	20.2	19.9	23.1	23.7	27.7	4.31 (3.02;5.61)
Goiânia	10.0	11.8	11.3	11.5	12.9	13.8	14.0	16.3	15.0	13.3	16.3	17.9	16.5	19.5	14.8	23.3	17.7	3.79 (3.06;4.52)

(the Table 4 continue in the next page...)

João Pessoa	14.3	13.2	15.6	13.5	14.8	17.0	19.9	17.0	16.6	20.0	21.7	18.6	20.5	20.4	20.8	23.7	22.4	3.28 (2.47;4.09)
Macapá	13.9	16.5	14.9	15.4	17.0	18.8	17.6	18.3	18.6	19.9	17.7	23.6	20.1	22.9	22.6	23.7	30.4	3.33 (2.83;3.83)
Maceió	13.0	12.9	14.5	14.2	14.9	17.8	19.9	18.4	20.0	20.1	21.1	19.4	18.5	20.0	22.3	24.6	21.2	3.25 (1.83; 4.69)
Manaus	13.7	13.9	14.9	15.9	17.6	19.3	19.6	18.8	19.3	27.2	20.3	23.8	23.0	23.4	24.9	25.0	27.0	4.10 (3.25; 4.97)
Natal	13.0	14.1	13.4	14.5	16.4	17.0	21.2	16.6	18.4	19.0	19.8	18.5	21.2	22.5	20.4	23.0	21.9	3.30 (2.46; 4.15)
Palmas	10.2	9.3	10.7	9.5	13.0	13.3	15.7	16.8	16.3	13.6	14.7	15.9	16.3	15.4	16.9	19.5	19.0	3.96 (2.41;5.53)
Porto Alegre	12.7	13.4	15.3	14.9	15.1	18.2	18.4	17.7	20.9	20.9	19.9	19.0	20.6	21.6	19.7	22.6	28.3	3.98 (2.89;5.09)
Porto Velho	12.9	15.7	14.5	18.6	16.0	17.1	18.9	17.8	19.7	20.4	21.3	22.4	21.7	19.9	22.1	26.4	21.8	3.20 (2.47;3.92)
Recife	13.4	12.8	13.8	14.5	18.4	15.9	17.7	18.0	18.6	18.7	20.0	21.0	21.9	21.7	23.3	22.6	26.3	4.02 (3.49;4.56)
Rio Branco	13.2	14.0	16.1	15.6	17.8	18.3	21.3	18.1	19.9	21.9	23.8	20.5	20.9	23.3	21.7	24.2	26.1	3.56 (2.62;4.51)
Rio de Janeiro	12.8	14.6	13.8	16.9	16.2	17.4	19.5	20.7	19.4	18.5	20.9	20.2	22.4	21.7	23.8	21.5	26.2	3.61 (2.84;4.39)
Salvador	11.6	13.2	12.9	14.4	12.9	14.7	14.1	14.9	18.2	16.3	19.9	19.5	18.6	18.1	19.1	20.5	25.6	3.93 (3.18;4.69)
São Luis	9.4	10.2	10.3	11.3	12.3	12.8	13.2	13.2	14.6	14.0	15.6	17.9	15.7	17.2	16.8	18.0	18.5	4.09 (3.48;4.70)
São Paulo	11.3	13.6	14.1	14.6	14.6	15.5	17.8	17.9	16.7	21.2	18.1	18.5	20.0	19.9	23.6	22.5	24.3	3.96 (3.34;4.59)
Teresina	10.0	11.8	11.5	12.3	12.9	13.3	15.0	16.2	15.3	15.8	17.2	15.7	18.4	17.6	18.5	20.3	20.8	4.02 (3.48;4.57)
Vitória	10.0	12.3	11.9	12.4	14.8	14.5	15.5	16.1	16.2	15.0	15.2	16.8	18.4	17.6	19.5	17.9	19.0	3.31 (2.44;4.19)
Brasília	10.5	10.5	12.4	9.1	10.0	14.2	14.3	15.0	15.8	14.4	16.6	15.3	18.0	19.6	18.8	22.6	21.9	5.02 (3.92;6.13)

*APC: Annual Percent Change; †CI: Confidence Interval

Discussion

The study identified a growing trend in the prevalence of overweight and obesity among adults living in Brazilian state capitals between 2006 and 2023.

These findings reflect global trends of increasing overweight and obesity. In 2022, the prevalence of obesity exceeded that of underweight in 177 countries for women and in 143 for men. The scenario is even more alarming due to the growth among children and adolescents, an age group in which reversal is more difficult in adulthood[4]. Projection studies indicate that if current trends continue, Brazil is unlikely to achieve the goal of halting the growth of obesity in adults by 2030, as established in the Strategic Action Plan to Combat Noncommunicable Diseases and Conditions[10,15].

The increase in overweight was more pronounced among women, possibly due to physiological, hormonal, and metabolic factors favoring body fat accumulation. Psychosocial pressures, multiple responsibilities, and less physical activity during leisure time, associated with sociocultural barriers, also contribute to this scenario[16-18]. In Brazil, projections indicate that by 2030, the prevalence of obesity could reach 30.2% among women and 28.8% among men[15]. Despite the increase among women, the upward trend affects both sexes, requiring coping strategies sensitive to gender specificities.

Regarding educational levels, although the highest prevalence of overweight and obesity was found among those with 0 to 8 years of schooling, the increase was more pronounced among those with higher levels of education. Higher educational attainment is a proxy for higher income and better jobs, resulting in better health indicators. Individuals with lower levels of education have higher prevalences of NCDs and their risk factors[19-20]. Low educational attainment may limit access to information and healthier lifestyles, favoring purchasing cheaper and more caloric foo-

ds, such as ultra-processed foods. In contrast, the likelihood of consuming organic and natural foods, such as fruits and vegetables, increases with family income and educational attainment[21].

Consistent with this fact, the more pronounced increase in the prevalence of overweight and obesity among more educated individuals, associated with higher incomes and greater purchasing power, allows greater access to food and higher calorie consumption, especially in urban areas, and contemporary lifestyles that further favor the demand for ultra-processed foods[22].

The highest prevalence of overweight and obesity was observed among individuals aged 45 to 64 years. This finding may be related to physiological changes associated with senescence, such as the redistribution of body fat from peripheral and subcutaneous deposits to the central region of the body, increasing waist circumference[23-24]. It is important to note that there is a natural loss of muscle mass and strength with aging[24]. In several countries, especially in high-income nations, the increase in obesity is strongly related to population aging. This factor contributes to increased demand for health care and associated costs. Estimates from the Global Burden of Disease Study indicate that by 2050, approximately one quarter of the world's obese population will be individuals aged 65 years or older, highlighting the growing impact of this condition on health systems in the context of demographic transition.

In contrast, the more pronounced growth among those aged 18 to 24 can be attributed to behavioral, social, and environmental factors characteristic of the transition to adulthood. During this period, there is greater dietary autonomy, often accompanied by unhealthy choices, such as frequent consumption of ultra-processed foods. The routine tends to be more sedentary, with long periods of screen time, irregular sleep, and high stress levels. Mental disorders, such as anxiety and depression, can also promote weight gain. In addition, socioeconomic inequalities limit access to healthy foods and physical activity in a context marked by obesogenic environments[25].

It is possible to observe that capitals in four to five regions of the country stand out, which shows that the nutritional transition is a reality throughout the country. It is also essential to consider that the difference in the prevalence of overweight and obesity between capitals suggests that local, regional, and socioeconomic factors influence eating behavior, lifestyle, and access to health services. A higher percentage of people with obesity was observed in states in the North, Central-West, and Northeast regions of Brazil, since inequality in access to food may influence the less favored population to consume foods that are high in calories but more affordable[22].

It is estimated that the capitals of the North and Central-West regions will have the highest prevalence of obesity by 2030, with Manaus (35.8%; 95% CI: 31.0–40.6), Cuiabá (34.9%; 95% CI: 30.7–39.1), and Rio Branco (32.8%; 95% CI: 29.5–39.8). In contrast, the lowest projected prevalence rates were observed in the capitals of the South and Southeast, such as Florianópolis (23.0%; 95% CI: 19.6–26.5), Palmas (23.8%; 95% CI: 19.8–27.8) and Curitiba (24.9%; 95% CI: 21.5–28.4)[15]. These findings reflect regional inequalities in the risk profile for obesity, possibly related to differences in social determinants of health, dietary patterns, level of urbanization, and access to health promotion policies.

Obesity and overweight are multifactorial conditions whose approach has been linked to the formulation of public policies aimed at modifying obesogenic environments and reducing social inequalities. Strategies include front-of-package nutrition labeling, restrictions on advertising aimed at children, taxation of sweetened beverages, incentives for producing healthy foods, and promotion of physical activity[10].

Despite these efforts, progress in controlling overweight and obesity remains limited, requiring the implementation of intersectoral interventions adapted to the sociodemographic and economic realities of the country. In PHC, nursing is essential in preventing and managing obesity through comprehensive care, health surveillance, and education to promote healthy habits[26]. However, the effectiveness of these actions

is limited by challenges such as high demand for services, a shortage of professionals, and reduced time for consultations. Socioeconomic barriers such as food insecurity, restricted access to healthy foods and spaces for physical activity, combined with an obesogenic environment, make it difficult to adopt healthy habits. In addition, adherence to lifestyle changes is compromised by factors such as low educational attainment, comorbidities, and psychosocial issues[27-29].

There is also a need to improve the care provided to overweight and obese individuals in PHC, as the care offered remains insufficient: only 2.5% of all individual consultations are directed toward the treatment of obesity. PHC should act strongly to plan and implement strategies for obesity prevention, food and nutrition surveillance, health education, and medical and interdisciplinary care. To this end, it is essential to have adequate infrastructure, equipment, trained teams, and effective multidisciplinary teams (eMulti) in the services. eMulti teams increase the effectiveness of PHC, especially in the care of chronic conditions such as obesity, by promoting integrated actions focused on health promotion and continuous care. However, their limited implementation in some areas compromises the comprehensiveness and continuity of care[30].

The increase in overweight and obesity highlights an essential challenge in the control of NCDs, representing a growing trend not only in Brazil but also in several countries, especially those with low and middle incomes, where the nutritional transition has occurred rapidly[1-2]. In the last three decades, the African and Asian continents have recorded the highest percentage increases in the prevalence of obesity. In these regions, obesity tends to reach higher proportions among younger individuals when compared to other parts of the world, which raises additional concerns about the anticipation of associated complications and early overload of health systems[1]. Therefore, continuous and systematic monitoring is essential to support national and global strategies to reduce the burden of NCDs. In addition to playing a strategic role in health surveillance, contributing to the identification of trends, definition of priorities, and evaluation of the effectiveness of public policies, it allows for the early detection of the most vulnerable populations, promotes health equity, and supports the formulation of evidence-based intersectoral policies.

Study limitations

The data were collected on a self-reported basis, which may result in underestimation or overestimation of actual prevalence rates and generate less accurate estimates. However, the questionnaire was validated and showed satisfactory results in terms of reproducibility and validity. The fact that the Vigitel sample consists only of individuals residing in the capitals of Brazilian states and the Federal District, who live in households with a landline telephone until 2021, represents a potential risk to the sample's representativeness. However, this issue is minimized through data weighting factors. Furthermore, the decrease in sample size in 2021 implies a reduction in the accuracy of the estimates; therefore, they should be confirmed in future Vigitel investigations.

Contributions to practice

The significant increase in the prevalence of overweight and obesity over the years highlights the need for further studies on the determinants of these conditions, including biological, behavioral, social, and environmental aspects. In addition, the findings contribute to improving care and preventive practices, highlighting the importance of developing evidence-based care for the screening, monitoring, and management of overweight and obesity. There is also a need to implement educational and intersectoral interventions, especially in Primary Health Care, to promote healthy habits and reduce inequalities related to these conditions.

Conclusion

A significant increase in the prevalence of overweight and obesity was observed in the adult

population living in Brazilian state capitals between 2006 and 2023. This increase was consistent among men and women in all age groups and educational levels analyzed. The results show the continuous progression of prevalence rates throughout the period analyzed and reinforce the importance of monitoring to support public prevention and control policies, especially considering the sociodemographic inequalities identified.

Acknowledgements

We would like to thank the National Council for Scientific and Technological Development for supporting Alanna Gomes da Silva's Junior Postdoctoral Scholarship.

Authors' contribution

Conception, design, analysis and interpretation of the data; Writing of the manuscript and relevant critical review of the intellectual content; Final approval of the version to be published; Agreement to be responsible for all aspects of the manuscript related to the accuracy or integrity of any part of the manuscript being investigated and resolved appropriately: Kavano CR, Silva TPR, Silva TIM, Silva AG.

References

1. Ng M, Gakidou E, Lo J, Abate YH, Abbafati C, Abbas N, et al. Global, regional, and national prevalence of adult overweight and obesity, 1990-2021, with forecasts to 2050: a forecasting study for the Global Burden of Disease Study 2021. Lancet. 2025;405(10481):813-38. doi: http://dx.doi.org/10.1016/S0140-6736(25)00355-1
2. GBD 2021 Adolescent BMI Collaborators. Global, regional, and national prevalence of child and adolescent overweight and obesity, 1990-2021, with forecasts to 2050: a forecasting study for the Global Burden of Disease Study 2021. Lancet. 2025;405(10481):785-812. doi: https://doi.org/10.1016/S0140-6736(25)00397-6
3. Tarozo M, Pessa RP. Impacto das consequências psicossociais do estigma do peso no tratamento da obesidade: uma revisão integrativa da literatura. Psicol Ciênc Prof. 2020;40:e190910. doi: https://doi.org/10.1590/1982-3703003190910
4. Nowell HP, Singleton RK, Zhou B, Heap RA, Mishra A, Bennett JE, et al. Worldwide trends in underweight and obesity from 1990 to 2022: a pooled analysis of 3663 population-representative studies with 222 million children, adolescents, and adults. Lancet. 2024;403(10431):1027-50. doi: https://doi.org/10.1016/S0140-6736(23)02750-2
5. Zhou XD, Chen QF, Yang W, Zuluaga M, Targher G, Byrne CD, et al. Burden of disease attributable to high body mass index: an analysis of data from the Global Burden of Disease Study 2021. EClinicalMedicine. 2024;76:102848. doi: http://doi.org/10.1016/j.eclinm.2024.102848
6. Ferreira APS, Szwarcwald CL, Damacena GN, Souza Júnior PRB. Increasing trends in obesity prevalence from 2013 to 2019 and associated factors in Brazil. Rev Bras Epidemiol. 2021(Suppl 2):e210009. doi: https://doi.org/10.1590/1980-549720210009.supl.2
7. Ministério da Saúde (BR). Cenário da obesidade no Brasil. Boletim Epidemiológico [Internet]. 2024 [cited Apr 2, 2025]. Available from: https://www.gov.br/saude/pt-br/centrais-de-conteudo/publicacoes/boletins/epidemiologicos/edicoes/2024/boletim-epidemiologico-volume-55-no-07.pdf
8. Swinburn BA, Kraak VI, Allender S, Atkins VJ, Baker PI, Bogard JR, et al. The global syndemic of obesity, undernutrition, and climate change: the Lancet Commission Report. Lancet. 2019;393(10173):791-846. doi: https://dx.doi.org/10.1016/S0140-6736(18)32822-8
9. Pineda E, Stockton J, Scholes S, Lassale C, Mindell JS. Food environment and obesity: a systematic review and meta-analysis. BMJ Nutr Prev Health. 2024;7(1):204-11. doi: https://doi.org/10.1136/bmjnph-2023-000663
10. Silva AG, Teixeira RA, Prates EJS, Malta DC. Monitoring and projection of targets for risk and protection factors for coping with noncommunicable diseases in Brazilian capitals. Ciênc Saúde Colet. 2021;26(4):1193-206. doi: https://dx.doi.org/10.1590/1413-81232021264.42322020

11. United Nations. Transforming our world: the 2030 Agenda for Sustainable Development [Internet]. 2015 [cited Apr 2, 2025]. Available from: https://sdgs.un.org/2030agenda

12. Malta DC, Morais Neto OL, Silva MMA, Rocha D, Silva Junior JB. The implantation of the Surveillance System for Non-communicable Diseases in Brazil, 2003 to 2015: successes and challenges. Rev Bras Epidemiol. 2017;20(4):661-75. doi: https://doi.org/10.1590/1980-5497201700040006

13. Ministério da Saúde (BR). Vigitel Brasil 2023: vigilância de fatores de risco e proteção para doenças crônicas por inquérito telefônico [Internet]. 2023 [cited Apr 02, 2025]. Available from: https://www.gov.br/saude/pt-br/centrais-de-conteudo/publicacoes/svsa/vigitel/vigitel-brasil-2023-vigilancia-de-fatores-de-risco-e-protecao-para-doencas-cronicas-por-inquerito-telefonico/view

14. Antunes JLF, Cardoso MRA. Uso da análise de séries temporais em estudos epidemiológicos. Epidemiol Serv Saúde. 2015;24(3):565-76. doi: https://doi.org/10.5123/S1679-49742015000300024

15. Estivaleti JM, Guzman-Habinger J, Lobos J, Aedo C, Souza JD, Bielemann RM. Time trends and projected obesity epidemic in Brazilian adults between 2006 and 2030. Sci Rep. 2022;12:12699. doi: http://doi.org/10.1038/s41598-022-16934-5

16. Amiri M, Mousavi M, Azizi F, Tehrani FR. The relationship of reproductive factors with adiposity and body shape indices changes over time: findings from a community-based study. J Transl Med. 2023;21(1):137. doi: https://dx.doi.org/10.1186/s12967-023-04000-1

17. Parra-Peralbo E, Talamillo A, Barrio R. Origin and Development of the adipose tissue, a key organ in physiology and disease. Front Cell Dev Biol. 2021;9:786129. doi: https://dx.doi.org/10.3389/fcell.2021.786129

18. Mielke GI, Stopa SR, Gomes CS, Silva AG, Alves FTA, Vieira MLFP, et al. Leisure time physical activity among Brazilian adults: National Health Survey 2013 and 2019. Rev Bras Epidemiol. 2021;24(Suppl 2):e210008. doi: https://dx.doi.org/10.1590/1980-549720210008.supl.2

19. Macinko J, Mullachery PH. Education-related health inequities in noncommunicable diseases: an analysis of the Brazilian National Health Survey, 2013 and 2019. Cad Saúde Pública. 2022;38(Suppl 1):e00137721. doi: https://doi.org/10.1590/0102-311X00137721

20. Gaspar RS, Rossi L, Hone T, Dornelles AZ. Income inequality and non-communicable disease mortality and morbidity in Brazil States: a longitudinal analysis 2002-2017. Lancet Reg Health Am. 2021;2:100042. doi: https://doi.org/10.1016/j.lana.2021

21. Silva TPR, Matozinhos FP, Gratão LHA, Rocha LL, Inácio MLC, Oliveira CF, et al. The coexistence of obesogenic behaviors among Brazilian adolescents and their associated factors. BMC Public Health. 2022;22(1):1290. doi: https://dx.doi.org/10.1186/s12889-022-13708-6

22. Ribeiro ML, Spolador H. Saúde, renda e obesidade: uma análise para os estados brasileiros. J Bras Econ Saúde [Internet]. 2022 [cited Apr 02, 2025];14(1):8-20. Available from: https://www.jbes.com.br/index.php/jbes/article/view/79

23. Silva AG, Andrade FMD, Ribeiro EG, Malta DC. Temporal trends of morbidities, and risk and protective factors for noncommunicable diseases in elderly residents in Brazilian capitals. Rev Bras Epidemiol. 2023;26(Suppl 1):e230009. doi: https://doi.org/10.1590/1980-549720230009.supl.1

24. Wei S, Nguyen TT, Zhang Y, Ryu D, Gariani K. Sarcopenic obesity: epidemiology, pathophysiology, cardiovascular disease, mortality, and management. Front Endocrinol (Lausanne). 2023;14:1185221. doi: https://doi.org/10.3389/fendo.2023.1185221

25. Ellison-Barnes A, Johnson S, Gudzune K. Trends in obesity prevalence among adults aged 18 through 25 years, 1976-2018. JAMA. 2021;326(20):2073-4. doi: https://doi.org/10.1001/jama.2021.16685

26. Mendes LL, Gazzinelli A, Velasquez-Melendez G. Is the management of obesity in primary health care appropriate in Brazil? Cad Saúde Pública. 2021;37(Suppl 1):e00051620. doi: https://doi.org/10.1590/0102-311X00051620

27. Jesus JGL, Campos CMS, Scagliusi FB, Burlandy L, Bógus CM. Work process in the Family Health Strategy oriented to people with overweight and obesity in São Paulo. Saúde Debate. 2022;46(132):175-87. doi: https://dx.doi.org/10.1590/0103-1104202213212

28. Lindner SR, Coelho EBS, Campos DA, Warmling D, Faust SB, Conceição TB, et al. Nursing care for individuals with overweight and obesity: contributions of a remote specialization course. Texto Contexto Enferm. 2024;33:e20230297. doi: https://doi.org/10.1590/1980-265X-TCE-2023-0297en

29. Wang D, Benito PJ, Rubio-Arias JA, Ramos-Campo DJ, Rojo-Tirado MA. Exploring factors of adherence to weight loss interventions in population with overweight/obesity: an umbrella review. Obes Rev. 2024;25(9):e13783. doi: https://dx.doi.org/10.1111/obr.13783

30. Lopes MS, Freitas PP, Carvalho MCR, Ferreira NL, Menezes MC, Lopes ACS. Is the management of obesity in primary health care appropriate in Brazil? Cad Saúde Pública. 2021;37(Suppl 1):e00051620. doi: http://doi.org/10.1590/0102-311X0005162