

Shifting trends in obesity growth rates in Brazilian adults between 2006 and 2021

Claudia Cristina Gonçalves Pastorello <https://orcid.org/0000-0002-0646-8777>^{1,2}; Caroline dos Santos Costa <https://orcid.org/0000-0002-3522-1546>^{2,3}; Rafael Moreira Claro <https://orcid.org/0000-0001-9690-575X>^{2,4}; Maria Laura da Costa Louzada <https://orcid.org/0000-0002-3756-2301>^{1,2}

Abstract *The aim of this article is to analyze and quantify changes in acceleration and/or deceleration in temporal trends in the prevalence of overweight and obesity in adults in Brazilian capitals and the Federal District between 2006 and 2021. Using data from Risk and Protective Factors Surveillance System for Chronic Diseases by Telephone Interviews (Vigitel), joinpoint regression analyses were performed to identify potential inflection points in trends and to estimate the annual percentage change (VPA) of overweight and obesity prevalence. Obesity prevalence increased from 11.9% in 2006 to 22.4% in 2021, and that of overweight from 37.3% in 2006 to 58.8% in 2021. The increase in obesity suggests an annual growth rate of 5.8% (95%CI 4.7; 7.0) in the period from 2006 to 2012, and after that, a slower annual rate of 2.7% (95%CI 2.1; 3.3) between 2012 and 2021. The same trend pattern occurs for overweight prevalence, which grew by 2.9% (95%CI 2.7; 3.2) from 2006 to 2013, and by 1.3% (95%CI 1.1; 1.5) from 2013 to 2021. Reductions in the growth rates were more intense for women with less than 8 years of schooling. The results indicate a likely deceleration in the growth rates of the prevalence of overweight and obesity from 2012/2013 among Brazilian adults.*

Key words Obesity, Overweight, Food and nutritional surveillance, Time series studies, Health surveys

¹ Programa de Pós-Graduação em Nutrição em Saúde Pública, Faculdade de Saúde Pública, Universidade de São Paulo. Av. Dr. Arnaldo, 715, Sumaré. 01246-90 São Paulo SP Brasil. claudia.pastorello@usp.br

² Núcleo de Pesquisas Epidemiológicas em Nutrição e Saúde, Universidade de São Paulo. São Paulo SP Brasil.

³ Programa de Pós-Graduação em Epidemiologia, Universidade Federal de Pelotas. Pelotas RS Brasil.

⁴ Departamento de Nutrição, Universidade Federal de Minas Gerais. Belo Horizonte MG Brasil.

Introduction

Obesity is one of the greatest global public health challenges. Prevalence of overweight has tripled worldwide since 1975^{1,2}, affecting almost one quarter of the global population in 2019³. Obesity is associated with a range of noncommunicable diseases (NCDs), including cardiovascular diseases, type 2 diabetes mellitus and some types of cancers¹, and is one of the leading factors contributing to the global burden of disease and years of life lost due to disability⁴.

In view of this problem, the creation of health surveillance policies that enable the monitoring and analysis of trends in obesity and overweight is a priority for national governments. In Brazil, since 2006, the annual Surveillance of Risk and Protective Factors for Chronic Diseases Telephone Survey (Vigitel) has been collecting data on height and weight, socioeconomic and demographic characteristics, behavior and health status among adults living in the country's capital cities and the Federal District (DF). The annual nature of the survey and the long period covered by data mean it is possible to monitor trends in the obesity epidemic and provide essential information to help shape public policies designed to address this problem and evaluate implementation⁵.

A study using Vigitel data showed that the prevalence of overweight and obesity increased from 42.6% and 55.4%, respectively, in 2006, to 11.8% and 20.3%, respectively, in 2019⁶. The 2020 and 2021 Vigitel reports indicate that this upward trend was maintained^{5,7}. However, these studies did not explore eventual shifts in trends in time series, which can help identify points of acceleration and deceleration and stabilization or contraction of the epidemic, providing important insights into the potential effects of public policies. This first-of-its-kind study investigates potential shifts in trends in prevalence of overweight and obesity among adults living in the country's capital cities and the DF between 2006 and 2021.

Methods

We used Vigitel data for the period 2006–2021. The data are freely available to the public on the national health system's department of informatics' (DATASUS) website. Each edition of the Vigitel was approved by the National Research Ethics Committee attached to the Ministry of Health, and verbal informed consent was obtained from all respondents.

The Vigitel sampling process consists of the random selection of 10,000 landline telephone numbers distributed uniformly across the country⁵. One individual aged 18 years or over is then randomly selected from each household and asked to answer a questionnaire. A mean of approximately 2,000 interviews were conducted annually in each capital, except in 2020 and 2021, when the number of interviews was reduced to 1,000 per capital due to the COVID-19 pandemic. The total population over the period 2006–2021 was 811,753 respondents (an average of 50,735 per edition).

Self-reported weight and height were used to calculate overweight and obesity rates. The respondent is asked to say their approximate weight in kilograms (accepting weights of between 30 and 300 kg) and height in meters (accepting heights of between 1.20 and 2.20 m). Body mass index [weight (kg)/height (m)²] was used to classify obesity (≥ 30 kg/m²) and overweight (≥ 25 kg/m²). Missing data from respondents who were unaware of their weight and height or did not wish to respond were imputed using the Hot Deck method⁵. Further information about methodology can be found in the annual Vigitel reports.

National overweight and obesity prevalence rates and their respective 95% confidence intervals (95%CI; $p < 0.05$) were described for each year of the study by sex (female and male) and education level (up to 8 years of schooling, 9–11 years; and 12 years and over). Absolute percentage-point (pp) differences in prevalence between the beginning and end of the period (delta) were calculated and the t-test was used to assess the statistical significance of these differences.

Joinpoint v.4.9.1.0 (The National Cancer Institute, MD, EUA) was used to perform the time series analysis and calculate annual percentage change (APC). This software detects linear patterns in the distribution of estimated annual prevalence rates, identifying line segments with similar APC. The null hypothesis of this analysis was that a single linear equation explains year-to-year variability and the alternative hypothesis was that two or more linear equations better explain this variability. In other words, the analysis identifies whether there are inflection points in the time series data, indicating potential shifts in trends. We described APC and respective 95%CI ($p < 0.05$) across all years, comparing the following strata: sex (male and female); and education level (low: up to 8 years of schooling; and high: 12 years and over).

The Vigitel estimated prevalence rates are weighted using preestablished weighting factors to correct for the unequal probability of selecting households with more than one telephone line or adult resident and to match the sex, age and education level strata with the sociodemographic structure of the total adult population in each location in each year (based on census data or official population projections when the former were not available). RStudio v2022.07.2+576⁸ was used to calculate mean prevalence rates and their respective 95%CI ($p < 0.05$) and to perform the t-test for hypothesis testing.

Results

National prevalence of obesity rose 10.5 pp between 2006 and 2021 (from 11.9% to 22.4%). This trend and the magnitude of change was consistent across all population strata, ranging from 10 pp among men with at least 12 years of schooling and 14.8 pp in women with 9-11 years of schooling. National prevalence of overweight rose 18.2 pp (from 37.3% to 53.8%). The increase of overweight was more pronounced in women with 9-11 years of schooling (23.5 pp) and less pronounced among men with at least 12 years of schooling, with overall growth of 11.3 pp (Supplementary Table 1 – available at <https://doi.org/10.48331/scielodata.U4BENU>).

The results of the time series analysis show that the prevalence growth rate was not even over study period. Between 2006 and 2012, APC for obesity prevalence was 5.8%, compared to 2.7% between 2012 and 2021, showing a significant reduction in the pace of growth (Table 1; Figure 1a).

The analysis of the data stratified according to sex reveals similar results to those of the general population, with the period 2006-2012 seeing a sharper increase in prevalence of obesity than the period 2012-2021 (APC of 5.9% and 2.7%, respectively, for both sexes). However, trends differed according to education level, with a slowdown in growth of obesity from 2013 among people with at least 8 years of schooling (5.3% of APC up to 2013 compared to 1.7% in the following period). This break was not observed however in the stratum with at least 12 years of schooling, with APC stabilizing at 4.8% throughout the study period (Table 1; Figure 1b).

Women with a low level of education showed a similar break in trend to that of the

general population, with an APC of 5.7% up to 2013 and 1.8% up to 2021. In contrast, among women with a high level of education APC was 6.2% throughout the whole study period. Men showed a similar upward trend in prevalence of obesity across both education groups (APC of 3.6% throughout the whole study period) (Table 1; Figure 1c).

As with obesity, the rate of increase in prevalence of overweight was not even over the study period among the general population. APC decreased from 2.9% up to 2013 to 1.3% from 2013 up to the end of the time series, revealing a slowdown in growth (Table 2; Figure 1a).

The findings reveal differences between men and women, with the former showing a significant increase in prevalence of overweight from 2006 to 2015 (APC 2.2%), followed by a stationary trend between 2015 and 2019 (APC -0.1%; not statistically significant), increasing once again up to the end of the time series (APC 2.3%). This stationary trend was not observed among women, who showed an APC of 3.7% up to 2012, falling to 1.9% for the rest of the time series. As with obesity, the results of the time series analysis reveal differences in overweight prevalence growth rates according to education level. APC among the group with up to 8 years of schooling was 5.2% up to 2014, falling to 0.8% throughout the rest of the time series. A point of inflection was not found in the group with at least 12 years of schooling, which showed an APC of 2.3% over the whole period (Table 2; Figure 1b).

The results of the analysis by sex and level of education showed that trends were not even. Among women with a low level of education, there was a slowdown in the overweight prevalence growth rate, from 2.8% between 2006 and 2014 to 1.0% between 2014 and the end of the time series. A break was not observed in women with a high level of education, with APC remaining stable at 3.9% throughout the study period. Breaks were not observed in men, with APC remaining stable throughout the study period at 1.5% for the group with a low level of education and at 1.1% for those with a high level (Table 2; Figure 1c).

Discussion

The data on weight and height collected during the period 2006-2021 from a sample of over 810,000 adults living in the country's capital cities and the DF indicate changing patterns of

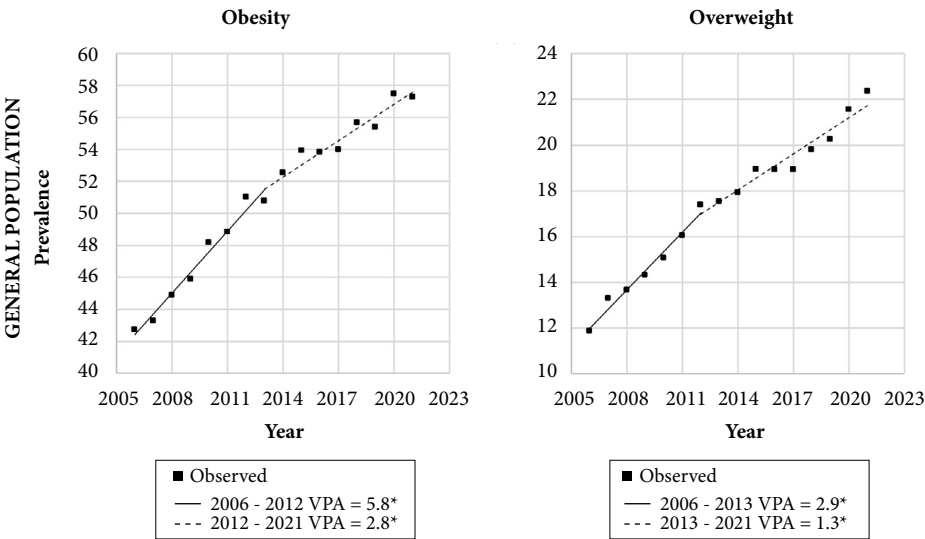
Table 1. Annual percentage change (total and in periods determined by inflection points) for prevalence of obesity among the adult population (18 years and over) living in Brazil's capital cities and the Federal District by sex, level of education, and sex stratified by level of education.

Models	MAPC ² (95%CI)	Inflection points	Period 1		Period 2	
			Years	APC ² (95%CI)	Years	APC ² (95%CI)
General trend	3.9 (3.4-4.4)	1	2006 - 2012	5.8 (4.7-7.0)	2012 - 2021	2.7 (2.1-3.3)
Sex						
Women and men	4.0 (3.4-4.5)	1	2006 - 2012	5.9 (4.7-7.1)	2012 - 2021	2.7 (2.1-3.3)
Education level						
General pop						
≤ 8 years	3.3 (2.8-3.8)	1	2006 - 2013	5.3 (4.4-6.2)	2013 - 2021	1.7 (1.1-2.4)
≥ 12 years	4.8 (4.0-5.5)	0	2006 - 2021	4.8 (4.0-5.5)		
Women						
≤ 8 years	3.3 (2.6-4.1)	1	2006 - 2012	5.7 (4.1-7.4)	2012 - 2021	1.8 (0.9-2.6)
≥ 12 years	6.2 (5.1-7.3)	0	2006 - 2021	6.2 (5.1-7.3)	-	-
Men						
≤ 8 years and ≥ 12 years	3.6 (3.1-4.1)	0	2006 - 2021	3.6 (3.1-4.1)	-	-

¹ Mean annual percentage change; ² annual percentage change.

Source: Authors.

(a) Trends in the general population.



faltou
tradução

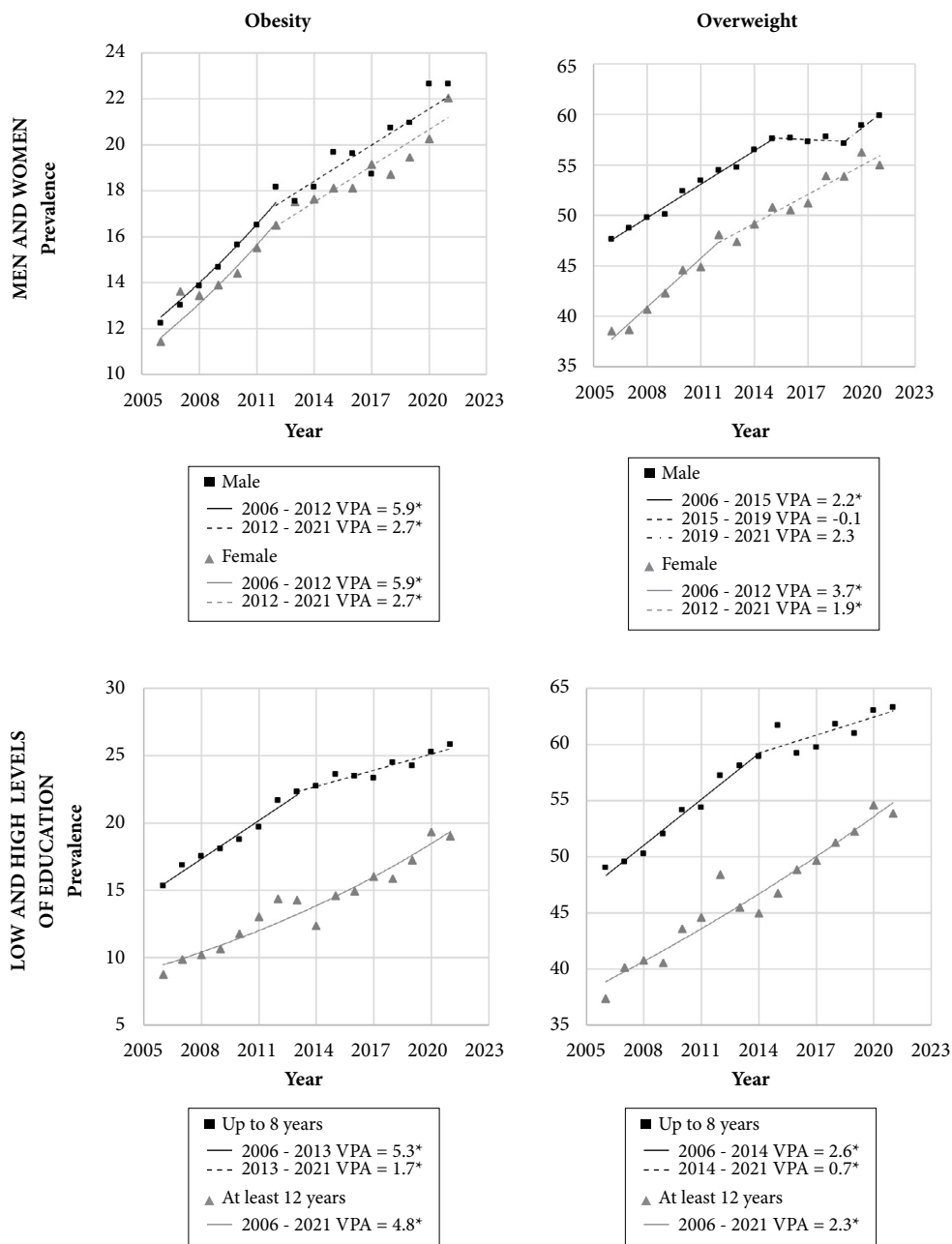
* VPA possui p-valor < 0.05 para um Intervalo de Confiança de 95%

it continues

Figure 1. Temporal trends with points of inflection in prevalence of overweight and obesity among the adult population (18 years and over) living in Brazil's capital cities and the Federal District by sex and education level.

prevalence of overweight and obesity, revealing an upward trend in rates throughout the period marked by a slowdown in growth from 2012 and 2013. This slowdown was more pronounced in women with a low level of education.

(b) Trends stratified by sex and trends stratified by education level.



* VPA possui p-valor < 0.05 para um Intervalo de Confiança de 95%

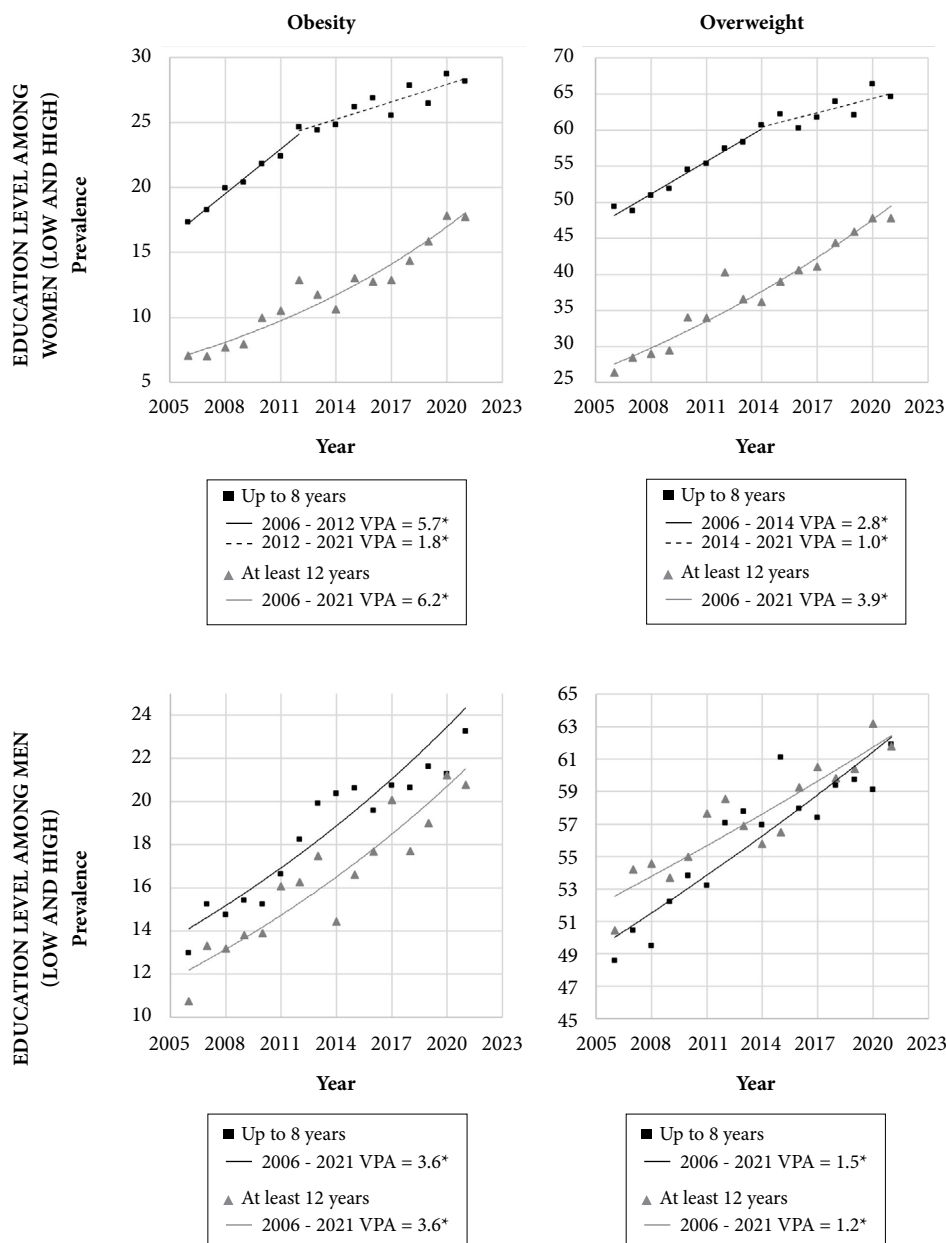
it continues

Figure 1. Temporal trends with points of inflection in prevalence of overweight and obesity among the adult population (18 years and over) living in Brazil's capital cities and the Federal District by sex and education level.

Understanding the causes of this slowdown is a complex task and the results should be interpreted with caution. However, it is worth noting that this slowdown occurred in tandem

with a decline in the share of ultra-processed foods in household food purchases⁹. High rates of consumption of these foods is strongly associated with increased risk of overweight and

(c) Trends among women and men stratified by education level.



* VPA possui p-valor < 0.05 para um Intervalo de Confiança de 95%

Figure 1. Temporal trends with points of inflection in prevalence of overweight and obesity among the adult population (18 years and over) living in Brazil's capital cities and the Federal District by sex and education level.

Source: Authors.

obesity¹⁰⁻¹², with a study analyzing data from 80 countries showing that increased sales of these products between 2002 and 2016 was positively associated with population-level BMI trajec-

tories¹³. Data from household budget surveys shows that there was a 4pp/year rise in purchases of ultra-processed foods between the periods 2002-2003 and 2008-2009; however, between

Table 2. Annual percentage change (total and in periods determined by inflection points) for prevalence of overweight among the adult population (18 years and over) living in Brazil's capital cities and the Federal District by sex, level of education, and sex stratified by level of education.

Models	MAPC ² (95%CI)	Inflection points	Período 1		Período 2		Período 3	
			Years	APC ² (95%CI)	Years	APC ² (95%CI)	Years	APC ² (95%CI)
General trend	2.1 (1.9-2.2)	1	2006 - 2013	2.9 (2.7-3.2)	2013 - 2021	1.3 (1.1-1.5)	-	-
Sex								
Women	2.6 (2.2-3.1)	1	2006 - 2012	3.7 (2.8-4.7)	2012 - 2021	1.9 (1.4-2.4)	-	-
Men	1.6 (1.0-2.1)	2	2006 - 2015	2.2 (1.9-2.4)	2015 - 2019	-0.1 (-1.5-1.2)	2019 - 2021	2.3 (-1.5-6.2)
Education level								
General pop								
≤ 8 years	1.7 (1.3-2.2)	0	2006 - 2014	5.2 (4.1-6.3)	2014 - 2021	0.8 (0.0-1.5)	-	-
≥ 12 years	2.3 (2.0-2.7)	1	2006 - 2021	2.3 (2.0-2.7)				
Women								
≤ 8 years	2 (1.5-2.5)	1	2006 - 2014	2.8 (2.1-3.6)	2014 - 2021	1.0 (0.2-1.9)	-	-
≥ 12 years	3.9 (3.3-4.5)	1	2006 - 2021	3.9 (3.3-4.5)	-	-	-	-
Men								
≤ 8 years	1.5 (1.1-1.9)	0	2006 - 2021	1.5 (1.1-1.9)	-	-	-	-
≥ 12 years	1.1 (0.9-1.4)	0	2006 - 2021	1.1 (0.9-1.4)	-	-	-	-

¹ Mean annual percentage change; ² annual percentage change.

Source: Authors.

the periods 2008-2009 and 2017-2018 the rate of growth fell to 2pp/year. A similar trend was observed with data limited to urban areas and metropolitan regions, where the population is similar to that of the Vigitel sample⁹. Previous results from the Vigitel also suggest a significant reduction in the consumption of sodas and artificial fruit juices between 2011 and 2017 (APC of -10.96%; 95%CI -12.4%; -9.5%). This reduction was also more pronounced in women (APC of -11.69%; 95%CI -13.7%; -9.6%) and individuals with a low level of education (APC of -12.14%; 95%CI 14.8%; -9.4%)¹⁴.

Possible explanations for these shifts in trends include an increased focus on public policies addressing obesity from the beginning of the 2000s. Measures included the provision of healthy school meals, strengthening of actions to promote healthy eating and exercise in primary health care services, the launch of the strategic action plan to tackle NCDs in Brazil and the integration of actions to promote food and nutrition security between different government sectors¹⁵.

Despite the above measures and decline in obesity and overweight growth rates, it is not possible to say that the obesity epidemic in Brazil is under control. Brazil has experienced a

major political and economic crisis over the last decade as a consequence of the agendas of recent federal governments. This includes, among other aspects, the imposition of a health spending ceiling in 2016, dismantling of the National Council for Food Security and Nutrition (CONSEA) in 2018 (which was reestablished only in 2022), and increase in non-evidence-based interventions, culminating in the dismantling of a large part of science, education and health policies¹⁶. The COVID-19 pandemic, which started to unfold in 2020, complicated this situation even more, with the Latin American Federation of Obesity Societies calling it a “tragedy of two pandemics”¹⁷. On the other hand, Brazil's return to the hunger map is a result of reduced access to food, which may have also partially contributed to the slowdown in growth of obesity among some population strata¹⁶.

Another important point is the recent growth in prevalence of overweight among Brazilian children (defined by the World Health Organization as $\geq +2$ standard deviations from weight-for-height z-scores). There was an apparently stationary trend in prevalence of overweight in children under 5 up to 2007, with the rate standing at around 7%. This trend was not confirmed however in the last representative

survey conducted in 2019, which showed that prevalence of overweight among this age group was significantly higher, at 10.1%¹⁸.

Data from the national health survey, which collects household data in both rural and urban areas across all Brazil's regions, also reveal an increase in prevalence of obesity among adults, from 20.8%, in 2013, to 25.9%, in 2019, which is equivalent to 5.1 pp over the period. The same study shows that the obesity growth rate began to rise once again in the latest period¹⁹.

In Mexico, which recently began to implement a comprehensive set of policies to curb consumption of ultra-processed foods, data from the National Health and Nutrition Survey (ENSANUT) suggest improvements in the control of the obesity epidemic. The findings reveal a fall in prevalence of overweight across the adult population between 2020 and 2021, from 35.2% to 32.8% among women and 40.6% to 37.8% among men. Younger age groups showed a decline in prevalence of overweight: school-children aged 5-11 years (from 19.6% to 18.8%); and adolescents (26.8% to 24.7%). However, prevalence of obesity rose slightly among men in the same period, from 31.5% to 31.8%. This increase was more pronounced among women (from 37.6% to 39.0%)²⁰.

Temporal trends in nutritional status are complex measures. In a study investigating literature from other countries suggesting breaks and decreases in obesity rates, Visscher *et al.* (2015) identified bias related to measurement

errors, lack of representativeness and few timeseries data points, as well as studies whose results were not confirmed by subsequent studies²¹. One of the limitations of the Vigitel is the fact that the sample is limited to individuals with a landline telephone living in capital cities. However, the estimates of prevalence of obesity are very similar to those of the national health survey, which is countrywide²².

On the other hand, the present study analyzes relatively long breaks in trends and the general sample is representative of the target population and strata analyzed. While the measure of BMI adopted by this study (based on self-reported weight and height) is prone to inaccuracies, this method has been previously validated for use with the adult population in Brazil²³. Finally, it is important to highlight that the COVID-19 pandemic affected data collection in the 2020 and 2021 editions of the Vigitel, when the sample was half the usual size⁷.

Conclusion

The results of this first-of-its-kind study show shifting trends in overweight and obesity in Brazil, with a slowdown in rates of growth among the adult population living in capital cities and the DF. This break in trends was more pronounced in women with a low level of education. Future research using Vigitel data should be carried out to verify whether this trend continues.

Collaborations

Collaborating with the conception, selection and management of data, formal analysis in software, literature review, interpretation of results, methodology, visualization, original draft, writing, review and editing: CCG Pastorello. Collaborating with the conception, selection of data, methodology, interpretation of results, review and editing of the manuscript: CS Costa. Collaborating with the methodology, interpretation of results, review and editing of the manuscript: RM Claro. And collaborating with the conception, selection and management of data, literature review, interpretation of results, methodology, visualization, writing, review and editing: MLC Louzada.

Funding

Conselho Nacional de Desenvolvimento Científico e Tecnológico – 403892/2021-0.

References

- World Health Organization (WHO). Obesity and overweight [Internet]. 2021 [cited 2023 maio 5]. Available from: <https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight>
- NCD Risk Factor Collaboration (NCD-RisC). Worldwide trends in body-mass index, underweight, overweight, and obesity from 1975 to 2016: a pooled analysis of 2416 population-based measurement studies in 128.9 million children, adolescents, and adults. *Lancet* 2017; 390(10113):2627-2642.
- GBD 2019 Risk Factors Collaborators. Global burden of 87 risk factors in 204 countries and territories, 1990-2019: a systematic analysis for the Global Burden of Disease Study 2019. *Lancet* 2020; 396(10258):1223-1249.
- Dai H, Alsallhe TA, Chalhaf N, Riccò M, Bragazzi NL, Wu J. The global burden of disease attributable to high body mass index in 195 countries and territories, 1990-2017: An analysis of the Global Burden of Disease Study. *PLoS Med* 2020; 17(7):e1003198.
- Brasil. Ministério da Saúde (MS). *Vigilância de fatores de risco e proteção para doenças crônicas por inquérito telefônico: estimativas sobre frequência e distribuição sociodemográfica de fatores de risco e proteção para doenças crônicas nas capitais dos 26 estados brasileiros e no distrito federal em 2020*. Brasília: MS; 2021.
- Silva LESD, Oliveira MM, Stopa SR, Gouvea ECDP, Ferreira KRD, Santos RO, Valença Neto PDF, Macário EM, Sardinha LMV. Tendência temporal da prevalência do excesso de peso e obesidade na população adulta brasileira, segundo características sociodemográficas, 2006-2019. *Epidemiol Serv Saude* 2021; 30(1):e2020294.
- Brasil. Ministério da Saúde (MS). *Vigilância de fatores de risco e proteção para doenças crônicas por inquérito telefônico: estimativas sobre frequência e distribuição sociodemográfica de fatores de risco e proteção para doenças crônicas nas capitais dos 26 estados brasileiros e no distrito federal em 2021*. Brasília: MS; 2022.
- Posit. RStudio [Internet]. [cited 2023 fev 12]. Available from: <https://www.rstudio.com/products/rstudio/>
- Levy RB, Andrade GC, Cruz GL, Rauber F, Louzada ML, Claro RM, Claro RM, Monteiro CA. Três décadas da disponibilidade domiciliar de alimentos segundo a NOVA – Brasil, 1987-2018. *Rev Saude Publica* 2022; 56:75.
- Askari M, Heshmati J, Shahinfar H, Tripathi N, Daneshzad E. Ultra-processed food and the risk of overweight and obesity: a systematic review and meta-analysis of observational studies. *Int J Obes* 2020; 44(10):2080-2091.
- Moradi S, Entezari MH, Mohammadi H, Jayedi A, Lazaridi AV, Kermani MAH, Miraghajani M. Ultra-processed food consumption and adult obesity risk: a systematic review and dose-response meta-analysis. *Crit Rev Food Sci Nutr* 2023; 63(2):249-260.
- Lane MM, Davis JA, Beattie S, Gómez-Donoso C, Loughman A, O'Neil A, Jacka F, Berk M, Page R, Marx W, Rocks T. Ultraprocessed food and chronic noncommunicable diseases: a systematic review and meta-analysis of 43 observational studies. *Obes Rev* 2021; 22(3):e13146.
- Vandevijvere S, Jaacks LM, Monteiro CA, Moubarac JC, Girling-Butcher M, Lee AC, Pan A, Bentham J, Swinburn B. Global trends in ultraprocessed food and drink product sales and their association with adult body mass index trajectories. *Obes Rev* 2019; 20(Suppl. 2):10-19.
- Lopes MS, Edwards B, Lima YD, Ramalho AA. Tendência temporal do consumo excessivo de refrigerantes nas capitais brasileiras e Distrito Federal (2007 a 2019). *DRIFT* 2022; 9(2):129-143.
- Jaime PC, Silva AC, Gentil PC, Claro RM, Monteiro CA. Brazilian obesity prevention and control initiatives. *Obes Rev* 2013; 14(Suppl. 2):88-95.
- Cátedra Josué de Castro. Combate à fome: 75 anos de políticas públicas. In: Campelo T, Bortoletto AP, organizadores. *Da fome à fome: diálogos com Josué de Castro*. São Paulo: Elefante; 2022. p. 44-61.
- Halpern B, Louzada MLDC, Aschner P, Gerchman F, Brajkovich I, Faria-Neto JR, Polanco FE, Montero J, Juliá SMM, Lotufo PA, Franco OH. Obesity and COVID-19 in Latin America: a tragedy of two pandemics. Official document of the Latin American Federation of Obesity Societies. *Obes Rev* 2021; 22(3):e13165.
- Casto, Inês Rugani Ribeiro, Tendências temporais de indicadores do estado nutricional no Brasil. In: Campelo T, Bortoletto AP, organizadores. *Da fome à fome: diálogos com Josué de Castro*. São Paulo: Elefante; 2022. p. 90-95.
- Ferreira AP, Szwarcwald CL, Damacena GN, Souza Júnior PR. Aumento nas prevalências de obesidade entre 2013 e 2019 e fatores associados no Brasil. *Rev Bras Epidemiol* 2021; 24:E210009.SUPL.2.
- México. Secretaría de Salud. Instituto Nacional de Salud Pública. *Encuesta Nacional de Salud y Nutrición 2021 Sobre COVID-19*. Morelos: Instituto Nacional de Salud Pública; 2021
- Visscher TL, Heitmann BL, Rissanen A, Lahti-Koski M, Lissner L. A break in the obesity epidemic? Explained by biases or misinterpretation of the data? *Int J Obes* 2015; 39(2):189-198.
- Instituto Brasileiro de Geografia e Estatística (IBGE). *Pesquisa Nacional de Saúde 2019: percepção do estado de saúde, estilos de vida, doenças crônicas e saúde bucal: Brasil e grandes regiões*. Rio de Janeiro: IBGE; 2020.
- Peixoto MD, Benício MH, Jardim PC. Validade do peso e da altura auto-referidos: o estudo de Goiânia. *Rev Saude Publica* 2006; 40:1065-1072.

Article submitted 21/01/2024

Approved 25/06/2024

Final version submitted 27/06/2024

Chief editors: Maria Cecília de Souza Minayo, Romeu Gomes, Antônio Augusto Moura da Silva