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TEMPORAL ANALYSIS OF THE PREVALENCE OF OBESITY AND OVERWEIGHT IN BRAZIL BETWEEN 2006 AND 2023: EVIDENCE FROM VIGITEL DATA

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RESUMO

INTRODUÇÃO: O excesso de peso é importante fator de risco para aumento de morbidade e mortalidade numa população, sendo considerado como a segunda maior causa de morte evitável, ficando atrás apenas do tabagismo. O objetivo do presente artigo é descrever a série histórica de prevalência de sobrepeso e de obesidade no Brasil entre 2006 e 2023, tanto no geral, quanto estratificado por sexo, faixas etárias e Unidades da Federação.

MATERIAIS E MÉTODOS: As fontes de dados utilizadas foram todas as edições do Sistema de Vigilância de Fatores de Risco e Proteção para Doenças Crônicas por Inquérito Telefônico (Vigitel). As análises foram realizadas no programa estatístico SAS on demand.

RESULTADOS: Considerando o conjunto de todas as capitais estudadas, entre 2010 e 2011 a proporção de indivíduos com excesso de peso passou a ser semelhante à proporção de indivíduos com peso normal nas capitais brasileiras e a partir de 2012 a mesma superou a proporção de indivíduos com peso normal. E por fim, nos resultados de 2023 para o Brasil como um todo, pela primeira vez a proporção de indivíduos com sobrepeso ultrapassou a daqueles com peso normal.

CONCLUSÕES: A presente análise da série histórica do inquérito Vigitel mostra um cenário preocupante nas capitais brasileiras com um aumento progressivo da proporção de obesidade e de sobrepeso e diminuição de peso normal, bem como a velocidade que essas proporções estão se alterando no tempo. Embora haja variações em cada capital, o cenário geral é semelhante.

Palavras-chave: Obesidade; Sobrepeso; Inquéritos Epidemiológicos; Estudos de Séries Temporais; Brasil

ABSTRACT

INTRODUCTION: Excess weight is an important risk factor for increased morbidity and mortality in a population, being considered the second biggest cause of preventable death, second only to smoking. The objective of this article is to describe the historical series of overweight and obesity prevalence in Brazil between 2006 and 2023, both overall and stratified by sex, age groups and Federation Units.

MATERIALS AND METHODS: The data sources used were all editions of the Surveillance System for Risk and Protective Factors for Chronic Diseases by Telephone Survey (Vigitel). The analyzes were performed using the SAS on demand statistical program.

RESULTS: Considering all the capitals studied, between 2010 and 2011 the proportion of individuals with excess weight became similar to the proportion of individuals with normal weight in Brazilian capitals and from 2012 it surpassed the proportion of individuals with normal weight. And finally, in the 2023 results for Brazil as a whole, for the first time the proportion of overweight individuals exceeded that of those with normal weight.

CONCLUSIONS: This analysis of the historical series of the Vigitel survey shows a worrying scenario in Brazilian capitals with a progressive increase in the proportion of obesity and overweight and a decrease in normal weight, as well as the speed at which these proportions are changing over time. Although there are variations in each capital, the general scenario is similar.

Keywords: Obesity; Overweight; Health Surveys; Time Series Studies; Brazil

RESUMEN

INTRODUCCIÓN: El exceso de peso es un factor de riesgo importante para el aumento de la morbilidad y mortalidad en una población, siendo considerado la segunda causa de muerte evitable, sólo superada por el tabaquismo. El objetivo de este artículo es describir la serie histórica de prevalencia de sobrepeso y obesidad en Brasil entre 2006 y 2023, tanto global como estratificada por sexo, grupos de edad y Unidades de la Federación.

MATERIALES Y MÉTODOS: Las fuentes de datos utilizadas fueron todas las ediciones del Sistema de Vigilancia de Factores de Riesgo y Protección de Enfermedades Crónicas mediante Encuesta Telefónica (Vigitel). Los análisis se realizaron mediante el programa estadístico SAS on demand.

RESULTADOS: Considerando todas las capitales estudiadas, entre 2010 y 2011 la proporción de individuos con exceso de peso se volvió similar a la proporción de individuos con peso normal en las capitales brasileñas y a partir de 2012 superó la proporción de individuos con peso normal. Y finalmente, en los resultados de 2023 para el conjunto de Brasil, por primera vez la proporción de personas con sobrepeso superó a la de aquellos con peso normal.

CONCLUSIONES: Este análisis de la serie histórica de la encuesta Vigitel muestra un escenario preocupante en las capitales brasileñas con un aumento progresivo de la proporción de obesidad y sobrepeso y una disminución del peso normal, así como la velocidad con la que estas proporciones están cambiando en el tiempo. . Aunque existen variaciones en cada capital, el escenario general es similar.

Palabras clave: Obesidad; Exceso de peso; Encuestas de Salud; Estudios de Series Temporales; Brasil

INTRODUCTION

Excess weight is an important risk factor for cardiovascular disease. It is associated with dyslipidemia and insulin resistance. Among the cardiovascular diseases linked to excess weight are coronary artery disease (including acute myocardial infarction), stroke and hypertension. It is also a risk factor for other diseases such as various types of cancer, type 2 diabetes mellitus (which is also a risk factor for cardiovascular disease), chronic kidney disease, hepatic steatosis, obstructive sleep apnea syndrome, depression, arthrosis, among others. Therefore, excess weight is an important risk factor for increased morbidity and mortality in a population and is considered to be the second leading cause of preventable death, second only to smoking (1). Therefore, knowledge of the prevalence of excess weight in a population is fundamental for planning and evaluating public health measures to control this problem, as well as for planning primary prevention actions for the various chronic diseases for which it is a risk factor.

Excess body weight is the result of an imbalance between calorie intake and calorie expenditure, with the former being greater than the latter, resulting in hypertrophy of adipose tissue (2). Although its cause is multifactorial, in general its main cause is the increase of the urban lifestyle in recent decades, with a greater prevalence of sedentary lifestyles and a dietary pattern with a greater intake of diets rich in lipids and carbohydrates. The consumption of ultra-processed foods is a common element in this type of diet (3). With regard to the etiology of obesity, despite the predominance of the aforementioned dietary pattern and sedentary lifestyle, there are other factors that may be less commonly associated. Some examples are: the use of medication (such as corticosteroids, antidepressants, among others); endocrine diseases (hypothyroidism, among others); eating disorders; genetic diseases and hereditary predisposition together with lifestyle factors (4).

Excess weight is divided into two main categories: overweitght and obesity, the latter being more severe. The aim of this article is to describe the historical series of the prevalence of overweitght and obesity in Brazil between 2006 and 2023, both in general and stratified by sex, age groups and Federative Units.

MATERIALS AND METHODS

The data sources used in this article were the various annual editions of the Surveillance System for Risk and Protective Factors for Chronic Diseases by Telephone Survey (Vigitel - Ministry of Health). The data was analyzed from 2006 until the last available edition of the survey (2023), with more than 850,000 individuals interviewed in total. The survey was not carried out in just one year during the period (2022). The numbers of individuals interviewed per year and the respective estimated population in each edition of the survey are detailed in Table 1.

The data was obtained from https://svs.aids.gov.br/download/Vigitel/ in August 2023 for the 2006-2021 data and on 01/11/2023 for the 2023 survey data. The analyses were carried out using the statistical program SAS on demand (5).

The Vigitel survey (Surveillance of Risk and Protective Factors for Chronic Diseases by Telephone Survey) is an important initiative conducted by the Ministry of Health, largely because there are no continuous sample surveys whose main objective is to monitor and analyze the risk and protective factors associated with chronic non-communicable diseases in the Brazilian population (6). The aim of the survey is to collect and disseminate detailed information on various health indicators, including the prevalence of obesity, hypertension, diabetes and other risk factors relevant to public health that are in some way associated with cardiovascular and other diseases. It is therefore a survey that provides valuable input for the formulation of public health strategies and decision--making by federal, state and municipal governments, as well as other social actors involved in the issues addressed by the research.

Based on the Vigitel data, the results in relation to the weight and height of the interviewees were used to calculate the Body Mass Index (BMI), by dividing the weight (in kg) by the square of the height (in meters). For this article, based on BMI, the individuals interviewed were stratified into the following categories, according to the criteria adopted by the Ministry of Health: 1) normal weight (BMI between 18.50 and 24.99 kg/m²); 2) overweight (BMI between 25 and 29.99 kg/m²); 3) obesity (BMI \geq 30 kg/m²). A category called "excess body weight" was also created, bringing together overweight and obesity, i.e. BMI \geq 25 kg/m². Individuals with a BMI below 18.50 were excluded from the analysis. The age groups were defined in three categories: 18 to 24 years (young adults); 25 to 59 years (adults) and 60 or over (elderly). Finally, descriptive time-series analyses of the prevalence of the above-mentioned weight categories were carried out for Brazil (overall, by sex and by age group) and by Federative Unit.

Year	Type of research	Sample size	Estimated population	Year	Type of research	Sample size	Estimated population
2006	Landline phone	54,369	30,046,192	2016	Landline phone	53,210	3 5,080,0 36
2007	Landline phone	54,251	31,784,895	2017	Landline phone	53,034	35,364,106
2008	Landline phone	54, 353	31,992,029	2018	Landline phone	<mark>52,395</mark>	35 ,651,10 3
2009	Landline phone	54,367	32,485,702	2019	Landline phone	52,443	35,941,061
2010	Landline phone	54,339	33,423,349	2020	Landline phone	27,077	36,234,023
2011	Landline phone	54,144	33,702,305	2021	Landline phone	27,093	36,478,037
2012	Landline phone	45,448	33,972,289	2022	Not performed	-	
201 3	Landline phone	52,929	34,245,016	2023	Landline phone	10,858	22,303,904
2014	Landline phone	40,853	34,520,527	2023	Mobile phone	10,832	14,744,019
2015	Landline phone	54,174	34,798,855	2023	Total	21,690	37,047,923

Table 1 - Vigitel s	ample sizes and	respective estimated	l populations, b	y year and	type of survey.
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RESULTS

Graph 1.1 shows the distribution over time in Brazil of the proportions in the three groups: normal weight (i.e. adequate weight, also known as eutrophic), overweight and obese.

It can be seen that the proportion of normal-weight individuals decreases and that of overweight and obese individuals increases over the period of analysis. In the 2023 results, the proportion of overweight individuals exceeded that of those with normal weight for the first time in the survey's history.



Graph 1.1 Time series of the percentage of people with Normal weight, Overweight, Obesity, Brazil, 2006 to 2023, Vigitel.

Graph 1.2 shows that, in 2010 and 2011, the proportion of excess body weight people was similar to the proportion of normal weight people in the Brazilian capitals and that, from 2012 onwards, it exceeded the proportion of normal weight people.

https://onscience.com.br



Graph 1.2 Time series of the percentage of people with normal weight and with Excess body weight, Brazil, 2006 to 2023, Vigitel.

Graphs 2.1 to 2.3 show the differences in body weight categories by age group. These are 18 to 24 years, 25 to 59 years and 60 years and over. It is quite clear that the extreme groups have quite different characteristics from the situation in Brazil as a whole. The population aged 25 to 59 has a distribution over time that is very similar to the Brazil figure (average). For the younger age group, the increase in the proportion of overweight and obesity over the years stands out, although the prevalence of both is still lower than that observed in adults aged 25 to 59 and in the elderly. For the elderly, the proportion of overweight and normal weight individuals has been similar since 2009 and in 2015 it became higher than that of normal weight individuals and remained so until the end of the series.



Graph 2.1 Series of the percentage of young adults (18 to 24 years old) with Normal weight, Overweight, Obesity, 2006 to 2023, Vigitel



Graph 2.2 Series of the percentage of Adults (25 to 59 years old) with Normal weight, Overweight, Obesity, 2006 to 2023, Vigitel.



Graph 2.3 Series of the percentage of elderly people (aged 60 or over) with Normal weight, Overweight, Obesity, 2006 to 2023, Vigitel.

Graphs 3.1 and 3.2 show the differences in the proportions of body weight categories by gender. Although the trend is similar between the sexes, the difference in the prevalence of normal weight and overweight people for men is practically non-existent from 2014 onwards. On the other hand, the proportion of obese women was higher than the same proportion of men throughout the period studied. The fact is that for both sexes there has been a significant increase in the proportion of obese people over the years.

REGIONAL ANALYSIS

Northern Region

Among the capitals of the Northern region there are similarities for most of the period, and from 2015 onwards there is generally some proximity in the proportions of the three categories (especially between normal weight and overweight), something that did not happen with the people who answered these surveys in the city of Palmas.



Graph 3.1 Series of the percentage of normal weight, overweight and obese males, 2006 to 2023, Vigitel.









Graph 4.2 Series of the percentage of people in Manaus (AM) with Normal weight, Overweight, Obesity, 2006 to 2023, Vigitel.



Graph 4.3 Series of the percentage of people in Macapá (AP) with Normal weight, Overweight, Obesity, 2006 to 2023, Vigitel.





Graph 4.5 Series of the percentage of people in Porto Velho (RO) with Normal weight, Overweight, Obesity, 2006 to 2023, Vigitel Graph 4.6 Series of the percentage of people in Boa Vista (RR) with Normal weight, Overweight, Obesity, 2006 to 2023, Vigitel.



Graph 4.7 Series of the percentage of people in Palmas (TO) with Normal weight, Overweight, Obesity, 2006 to 2023, Vigitel.

Northeast Region

In the capitals of the Northeast region, the general pattern is of a drop in the proportion of normal weight and an increase in overweight and obesity over the years. In recent years, the proportion of normal-weight and overweight individuals has been very close in the region's capitals, with the exception of the capital of Maranhão.



Graph 5.1 Series of the percentage of people in Maceió (AL) with Normal weight, Overweight, Obesity, 2006 to 2023, Vigitel.

Graph 5.2 Series of the percentage of people in Salvador (BA) with Normal weight, Overweight, Obesity, 2006 to 2023, Vigitel.



Graph 5.3 Series of the percentage of people in Fortaleza (CE) with Normal weight, Overweight, Obesity, 2006 to 2023, Vigitel.



Graph 5.4 Series of the percentage of people in São Luís (MA) with Normal weight, Overweight, Obesity, 2006 to 2023, Vigitel.



Graph 5.5 Series of the percentage of people in João Pessoa (PB) with Normal weight, Overweight, Obesity, 2006 to 2023



Graph 5.7 Series of the percentage of people in Teresina (PI) with Normal weight, Overweight, Obesity, 2006 to 2023, Vigitel. Graph 5.6 Series of the percentage of people in Recife (PE) with Normal weight, Overweight, Obesity, 2006 a , Vigitel. 2023, Vigitel.



Graph 5.8 Series of the percentage of people in Natal (RN) with Normal weight, Overweight, Obesity, 2006 to 2023, Vigitel.



Graph 5.9 Series of the percentage of people in Aracaju (SE) with Normal weight, Overweight, Obesity, 2006 to 2023, Vigitel

Southeast Region

Across the capitals of the Southeast region, the overall pattern shows a decline in the proportion of individuals with normal weight and increasing rates of overweight and obesity over time, with normal weight and overweight categories converging. There was an apparent reversal of this behavior in the penultimate year of the survey, when there was an increase in the proportion of normal weight individuals and a drop in overweight and obesity for three of the four capitals in the region. However, in 2023, the pattern of a drop in the proportion of normal weight and an increase in excess weight (especially the overweight component) once again predominated in the states of the Southeast region.













Southern Region

In the capitals of the southern region, the general pattern is one of a drop in the proportion of normal weight and an increase in overweight and obesity over the years. In recent years, the proportion of normal-weight and overweight individuals has been very close in all three capitals, especially in Porto Alegre, and the proportion of obese people has been progressively approaching both.





Graph 7.2 Series of the percentage of people in Porto Alegre (RS) with Normal weight, Overweight, Obesity, 2006 to 2023, Vigitel.



Graph 7.3 Series of the percentage of people in Florianópolis (SC) with Normal weight, Overweight, Obesity, 2006 to 2023, Vigitel.

Central-West Region

In the capitals of the Central-West region, the general pattern is of a drop in the proportion of normal weight and an increase in overweight and obesity over the years. In recent years, the proportion of normal-weight and overweight individuals has been very close in all four capitals. In Cuiabá, the proportion of overweight people even exceeded that of normal weight people in 2020.









Graph 8.3 Series of the percentage of people in Campo Grande (MS) with Normal weight, Overweight, Obesity, 2006 to 2023, Vigitel.



When comparing regions, we observed similar magnitudes and trends for the portions of the three weight categories studied, with a decrease in the proportion of normal weight and an increase in overweight and obesity.

During the period from 2006 to 2021, it is clearly visible that the rate at which the proportion of Brazilians with a weight considered healthy is decreasing exceeds the rate at which the proportion of those who are overweight or obese is increasing. When comparing the groups that deviate from normal weight, it is clear that the rate of acceleration appears to be more significant among individuals classified as obese than among those who are overweight. In the three capitals of the region and in the Federal District, the proportion of overweight and normal weight individuals are very similar, with the former exceeding the proportion of normal weight in Campo Grande in 2023.

Graph 9 shows the behavior of the time series of the proportions of each weight category. In general, the behavior of the Brazilian regions was similar in the three weight categories studied.



Graph 9. Time series comparing the proportions of body weight types, according to regions, 2006 to 2023, Vigitel.

According to the current Vigitel time series, Rio Branco was the first Brazilian capital whose proportion of people with overweight exceeded those of normal weight, which happened in 2016. When comparing the capitals, Rio Branco and Manaus ranked first and second, respectively, in the average ranking among all the states studied, both over the entire period studied and in more recent years (Table 2). An analysis of Table 2 shows that some of the top positions for the longest time window are repeated for the last five years of the time series. Rio Branco, Manaus, Cuiabá, Campo Grande and Rio de Janeiro, which maintained the highest proportions of individuals with excess body weight for the period, remained consistently in 7th place in the most recent period of analysis. It should also be noted that the cities at the bottom of the ranking generally remained in similar positions in both periods of analysis.

	Capit	Capitals			
Rank	2006 - 2023	2018 - 2023			
1º	Rio Branco	Rio Branco			
2º	Manaus	Manaus			
39	Cuiabá	Porto Velho			
4º	Campo Grande	Recife			
5⁰	Porto Velho	Porto Alegre			
6º	Rio de Janeiro	Cuiabá			
7º	Porto Alegre	Belém			
82	Fortaleza	Fortaleza			
9º	Recife	Campo Grande			
10º	Macapá	São paulo			
11º	Maceió	Maceió			
12º	Natal	Rio de Janeiro			
13º	São Paulo	Macapá			
14º	Belém	João Pessoa			
15º	João Pessoa	Aracaju			
16º	Boa Vista	Boa Vista			
17º	Aracaju	Natal			
18º	Curitiba	Belo Horizonte			
19º	Salvador	Distrito Federa			
20º	Florianópolis	Salvador			
21º	Vitória	Florianópolis			
22º	Belo Horizonte	Goiânia			
23º	Distrito Federal	Curitiba			
24º	Goiânia	Teresina			
25º	Teresina	Vitória			
26º	Palmas	Palmas			
279	São Luis	São Luis			

Table 2 - Ranking of capital cities in descending order of the proportion of excess body weight in the population interviewed, Vigitel

Table 3 shows the proportions of normal-weight, overweight and obese individuals among those interviewed by cell phone and by landline in 2023. Table 4 shows the BMI averages of normal weight, overweight and obese individuals among those interviewed by cell phone and landline in 2023.

Table 3 - Proportion of individuals with normal weight, overweight and obesity, with respective 95% confidence intervals, among individuals interviewed by landline and cell phone in 2023 in VIGITEL.

Type of collection		Classification	
	Normal	Overweight	Obesity
Mobile phone	38,48 (38,46-38,5)	37,53(37,51-37,55)	24(23,99-24,01)
Landline phone	38,14(38,13-38,15)	37,87(37,86-37,88)	24(23,99-24,01)

Table 4 - Average BMI of individuals with normal weight, overweight and obesity, with respective 95% confidence intervals, among individuals interviewed by landline and cell phone in 2023 in VIGITEL.

Type of collection		Classification	
	Normal	Overweight	Obesity
Mobile phone	22,23(22,16-22,3)	27,31(27,26-27,35)	34,23(34,05-34,4)
Landline phone	22,17(22,1-22,24)	27,21(27,17-27,25)	34,5(34,31-34,69)

DISCUSSION AND CONCLUSIONS

This analysis of the time series of the Vigitel survey shows a worrisome scenario in the Brazilian capitals, with a progressive increase in the proportion of obesity and overweight and a decrease in normal/healthy weight. Although there are variations in each capital, the general scenario is quite similar.

Considering all the capitals studied together, between 2010 and 2011 the proportion of individuals with excess body weight became similar to the proportion of normal weight individuals in the Brazilian capitals and from 2012 onwards it surpassed the proportion of normal weight individuals. And finally, in the 2023 results for Brazil as a whole, for the first time the proportion of overweight individuals exceeded that of those with normal weight.

Although it also showed variability by gender and age group, in general this same behavior also appeared in the three age groups studied and between men and women. Obesity was more prevalent in women than men over the period studied, corroborating results from international literature (7). On the other hand, in Brazil, the prevalence of overweight was higher in men throughout the period studied here. With regard to age groups, the lower prevalence of overweight and obesity in younger people was expected, but the increases seen in the prevalence of both over the time series are worrying by the long period of exposure to this risk factor throughout life and its future consequences in increased incidences of diseases associated with them (8).

Although the relevance, timeliness and national scope of the results presented here should be emphasized, some limitations must be considered. Vigitel goes into the field once a year, through telephone interviews, using a non-probabilistic sample of adults (over 18) living in households with a landline telephone in the state capitals and the Federal District. The aforementioned characteristics of the study sample - both with regard to the restriction to state capitals and the Federal District, and those relating to landlines - may affect the representativeness of the data collected and, consequently, the generalization of the results to the entire Brazilian population should be done with caution. However, there are initiatives to mitigate these problems.

The Vigitel survey uses the raking method to compensate for sample weights due to the use of the telephone method of collecting information. Since this sample is not originally considered a probabilistic sample, the raking method is useful when there are imbalances between the sample and the population in terms of known characteristics. It is necessary to adjust the sample weights so that the results obtained in the collection are as similar as if they had been taken from a probabilistic sample. This method tends to improve the accuracy of estimates and reduce biases. The raking method aims to correct the information collected from individuals with access to landlines between 2006 and 2021. In this case, there is concern about its ability to comprehensively represent the entire population. Furthermore, it is important to note that in 2023, half of the survey sample was made up of individuals with cell phones and the results were similar to those interviewed by landline for the variables analyzed here, as shown in Tables 2 and 3.

In addition to this aspect, it is essential to consider the fact that this survey is only conducted in the capital cities. Although quantitatively the Brazilian population is very concentrated in the capitals - 24.2% according to the IBGE 2021 estimate (9) - and their respective metropolitan regions, it should be borne in mind that the results obtained from their inhabitants may differ from the patterns found in the rest of the country. In the international literature on research in low-income countries, obesity is generally more prevalent among middle-aged adults from wealthy and urban environments, while in high-income countries there is a tendency for prevalence to be disproportionately high in disadvantaged groups (7). In Brazil, between 2006 and 2019, the largest average increases in excess body weight were observed mainly among young people with a high level of education (10).

The results presented here point to the need for public health and intersectoral measures to tackle the progressive increase in the prevalence of overweight and obesity in the country.

CONFLICT OF INTEREST

None declared

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