

Temporal variation in the prevalence of weight and obesity excess in adults: Brazil, 2006 to 2009

Varição temporal na prevalência do excesso de peso e obesidade em adultos: Brasil, 2006 a 2009

Denise Petrucci Gigante^I

Giovanny Vinícius Araújo de França^{II}

Luciana Monteiro Vasconcelos Sardinha^{III}

Betine Pinto Moehlecke Iser^{IV}

Gustavo Velasquez Meléndez^V

^I Universidade Federal de Pelotas (UFPel) – Pelotas (RS), Brazil

^{II} Universidade Federal de Pelotas (UFPel) – Pelotas (RS), Brazil

^{III} Secretary of Health Surveillance, Health Ministry – Brasília (DF), Brazil

^{IV} Secretary of Health Surveillance, Health Ministry – Brasília (DF), Brazil

^V Universidade Federal de Minas Gerais (UFMG) – Belo Horizonte (MG), Brazil

Financial Support: none.

Correspondence to: Denise Petrucci Gigante – Epidemiology Post Graduation Program – Universidade Federal de Pelotas – Rua Marechal Deodoro, 1.160 – 3rd floor – CEP: 96020-220 – Pelotas (RS), Brazil – E-mail: denisepgigante@gmail.com

Conflict of interests: nothing to declare.

Abstract

Overweight and obesity are public health issues that affect an important part of the world population. This study aims at describing the trends in overweight and obesity prevalence rates from 2006 to 2009, by means of telephone surveys in 27 Brazilian cities, with a population aged 18 years or older. The body mass index (BMI) was calculated by the reported height and weight; overweight and obesity were considered as BMI ≥ 25 kg/m² and ≥ 30 kg/m², respectively. Temporal variation in overweight and obesity prevalence is presented for men and women, according to age group, schooling, stable relationship, and skin color. Poisson regression was used for the analysis. Overweight prevalence was 43.0, 42.7, 44.2 and 46.6%, for each year of the period from 2006 to 2009, respectively. For obesity, in the same period, the trend was: 11.4, 12.7, 13.2 and 13.8%. The temporal trend varied in relation to some demographic and socio-economic variables. The prevalence was higher among women and young adults. The temporal trend was independent of the relationship status of the interviewees, but the prevalence was higher among white women and those with less years of schooling. The results in this study confirmed the urgent need for effective prevention and control measures, as the increasing trend is occurring in a short period of time, especially among youngsters.

Keywords: obesity; overweight; prevalence; time series studies; body mass index; adult.

Resumo

Excesso de peso e obesidade são problemas de saúde pública que atingem parcela importante da população mundial. Este estudo tem o objetivo de descrever as tendências nas prevalências do excesso de peso e da obesidade, no período de 2006 e 2009, obtidas por meio de entrevistas telefônicas em 27 cidades brasileiras com uma população de 18 anos ou mais. O índice de massa corporal (IMC) foi calculado a partir do peso e altura referidos; o excesso de peso e obesidade foram definidos por $IMC \geq 25 \text{ kg/m}^2$ e $\geq 30 \text{ kg/m}^2$, respectivamente. A variação temporal das prevalências do excesso e peso e de obesidade é apresentada para homens e mulheres, de acordo com grupo etário, escolaridade, união estável e cor da pele. A regressão de Poisson foi utilizada na análise. As prevalências do excesso de peso foram 43,0, 42,7, 44,2 e 46,6%, para cada ano do período de 2006 a 2009, respectivamente. Para obesidade, no mesmo período, foram encontradas as seguintes prevalências: 11,4, 12,7, 13,2 e 13,8%. A tendência temporal variou em relação às variáveis demográficas e econômicas. O aumento nas prevalências ocorreu nas mulheres e entre os mais jovens. A tendência temporal foi independente do estado civil dos entrevistados, mas o aumento nas prevalências ocorreu em mulheres brancas e com menor escolaridade. Os resultados do presente estudo confirmam a urgência da necessidade de medidas efetivas de prevenção e controle, uma vez que a tendência do aumento está ocorrendo em um curto intervalo de tempo, especialmente entre os jovens.

Palavras-chave: obesidade; sobrepeso; prevalência; estudos de séries temporais; índice de massa corporal; adultos.

Introduction

Overweight and obesity are considered as increasing world health problems, especially in the urban areas of countries with middle and low incomes¹. According to estimates from the World Health Organization (WHO), 2.3 billion adults will be overweight and more than 700 million will become obese by 2015¹.

In Brazil, the prevalence of overweight and obesity in adults has increased since the studies conducted in the 1970s; nevertheless, even children and adolescents have presented higher prevalence rates lately². As to the relation between childhood and adult obesity^{3,4}, it is quite likely that such public health issue will become even more serious in the next decades.

Considering the increasing overweight and obesity prevalence rates in the Brazilian population in a period of 34 years, it is observed that such trends have differences as to gender, household region and income. Although both genders presented such increase, it was more prevalent among men of all income levels in the five regions of Brazilian. Among women, the increasing trend was interrupted from 1989 to 2002-2003 in some regions, and in higher income levels, but the scenario changed from 2008 to 2009².

Since 2006, the Telephone-based Surveillance of Risk and Protective Factors for Chronic Diseases (VIGITEL) has been annually conducted with the population aged 18 years or more. As national studies to assess nutritional status by means of the collection of anthropometric measurements in household interviews with a representative sample of the Brazilian population cannot be conducted in a short period, the alternative of telephone surveys conducted in the Brazilian capitals enables the analysis of the evolution of overweight and obesity. Therefore, it is possible to identify the population groups with a more defined increasing trend. Thus, it is also possible to propose immediate preventive and control measures. This paper aims to describe the

prevalence trends related to overweight and obesity in the period from 2006 to 2009, also assessing these trends considering some characteristics of the interviewees.

Methods

In 2006, VIGITEL was established in the 26 Brazilian state capitals and the Federal District with the objective of monitoring the frequency and distribution of the main factors related to chronic non-communicable diseases (CNCD). Since then, it has been conducted annually, and this study presents the evolution of overweight and obesity prevalence rates from 2006 to 2009.

The sampling procedures adopted by VIGITEL are the same for all assessed years and aim to reach representative samples of the adult population living in households with at least one telephone line. In order to estimate the prevalence of risk factors for CNCD, with a 95% confidence level and error of three percentage points, the sample was comprised of 2,000 individuals aged 18 years or more to be interviewed in each city. The first phase of this process includes the systematic draw of 5,000 telephone lines per city. This draw is carried out from electronic registers provided by telephone companies with broad coverage in each region of the country, from residential phone lines in the capitals, which are drawn again and divided in 25 replicates of 200 lines. This phase is necessary to reach 2,000 surveys, once it is not possible to previously estimate the proportion of active residential lines. More details on the sampling process can be seen in other publications⁵⁻⁸.

Telephone surveys carried out by VIGITEL in 2006, 2007, 2008 and 2009 consisted of the application of a questionnaire. The computer was used to read the questions and immediately register the responses. In these years, 53,882, 53,802, 53,895 and 53,908 people aged 18 years or more were interviewed, respectively. Besides demographic and economic characteristics, other information such as reported weight and height were obtained.

The outcomes of this study were defined by the body mass index (BMI), which is a result of the division of reported weight, in kilos (kg), by height, in squared meters (m²), and also reported by the interviewee. Overweight was observed when BMI was equal or superior to 25 kg/m², and 30 kg/m² was the cut off value to define obesity according to WHO⁹.

The trends in overweight and obesity prevalence rates are presented for men and women and according to age group (in six age categories: 18 to 24; 25 to 34; 35 to 44; 45 to 54; 55 to 64; and 65 years or more), years of schooling (until 8; 9 to 11 and 12 years or more), being married (stable relationship) or single (including divorced and widow) and skin color reported by the interviewee.

Overweight and obesity prevalence rates and their respective 95% confidence intervals are presented for the following categories: age group, years of schooling, stable relationship and skin color. Poisson regression was used to analyze the trends from 2006 to 2009. Overweight and obesity were considered as dependent variables, and year of the survey was considered as an explanatory variable - 2006 was used as reference. Trends are presented for each category of the studied variables. The weighting factor was considered in all analyses. Households with more than one telephone line and fewer inhabitants had a higher chance at the draw. This factor was also used to adjust the sociodemographic distribution of the sample selected for VIGITEL in relation to the distribution of the adult population of the 27 cities participating in Census 2000, considering population weight of each city from the stratification in 36 demographic characteristics, according to gender (male; female), age group (18 to 25, 30 to 39, 40 to 59, and 60 years or more), and years of schooling of 0 to 8, 9 to 11 and 12 or more years. As for the sampling procedures, the same weighting process was conducted for all assessed years.

VIGITEL was approved by the National Commission of Ethics in Research with

Table 1. Temporal variation in the prevalence of excess weight in the set of adult men from the Brazilian State capitals and the Federal District, in the period from 2006 to 2009, according to demographic and economic* characteristics. VIGITEL 2006, 2007, 2008 and 2009

Tabela 1. Variação temporal na prevalência do excesso de peso no conjunto de homens adultos das capitais dos estados brasileiros e Distrito Federal, no período de 2006 a 2009, segundo características demográficas e econômica*. VIGITEL 2006, 2007, 2008 e 2009

Characteristics	2006	2007	2008	2009	p**
	% (95%CI)	% (95%CI)	% (95%CI)	% (95%CI)	
TOge (years)					
18 to 24	24.9 (21.0–28.8)	26.4 (22.1–30.7)	25.1 (21.1–29.1)	37.3 (26.7–47.9)	0.05
25 to 34	48.1 (44.8–51.4)	48.4 (45.0–51.8)	47.9 (44.4–51.5)	48.9 (45.2–52.7)	0.83
35 to 44	56.7 (53.7–59.8)	56.9 (54.1–59.6)	57.5 (54.7–60.3)	56.9 (53.8–60.0)	0.99
45 to 54	58.8 (55.5–62.1)	61.3 (57.9–64.7)	62.3 (59.1–65.5)	59.1 (55.9–62.4)	0.37
55 to 64	55.9 (51.0–60.8)	57.4 (53.1–61.8)	60.3 (56.2–64.4)	59.6 (55.4–63.8)	0.48
65 and more	50.1 (45.7–54.5)	49.4 (45.1–53.6)	51.6 (47.1–56.1)	55.7 (51.4–60.1)	0.04
Schooling (years)					
0 to 8	46.0 (43.3–48.8)	47.1 (44.5–49.7)	45.6 (42.7–48.5)	51.4 (47.4–55.5)	0.08
9 to 11	45.5 (43.2–47.7)	45.0 (43.0–47.1)	48.3 (46.2–50.3)	46.3 (44.2–48.4)	0.41
12 and more	54.6 (51.8–57.5)	57.9 (55.4–60.5)	59.2 (56.6–61.8)	58.1 (55.6–60.6)	0.95
Marital status					
Married or in a stable relationship	55.9 (54.0–57.8)	56.0 (54.0–58.0)	57.4 (54.7–60.1)	59.1 (56.0–62.1)	0.10
Single/Divorced	36.2 (33.5–39.0)	38.2 (35.5–40.8)	37.6 (35.2–39.9)	40.4 (37.3–43.5)	0.27
Skin color					
White	49.2 (46.7–51.7)	50.9 (48.3–53.4)	50.1 (47.6–52.5)	52.2 (49.6–54.7)	0.49
Black	45.5 (38.6–52.5)	44.9 (37.8–51.9)	49.4 (42.5–56.4)	54.5 (44.9–64.0)	0.11
Mixed	46.1 (43.7–48.4)	47.0 (44.8–49.1)	48.0 (45.4–50.5)	49.8 (46.2–53.3)	0.18
Total	47.3 (45.6–49.0)	48.3 (46.7–49.9)	48.6 (46.8–50.4)	51.0 (48.7–53.4)	0.06

* Weighed percentage to adjust sociodemographic distribution of the VIGITEL sample to the distribution of the adult population in each city, according to the Census 2000, and to consider population weight in each city. ** Linear trend test adjusted as to weighting factor.

* Percentual ponderado para ajustar a distribuição sociodemográfica da amostra VIGITEL à distribuição da população adulta de cada cidade, no Censo Demográfico de 2000, e para levar em conta o peso populacional de cada cidade. ** Teste de tendência linear ajustado para o fator de ponderação

Human Beings, of the Ministry of Health. Informed consent form was replaced by a verbal consent, obtained during telephone survey.

Results

The post-stratification sample was comprised of 53% of women, and more than two thirds of the participants (69%) were less than 45 years old. In 2006, 35% had not finished Elementary School (eight or more years of schooling), and this proportion reached almost 32% in 2009. More than half of the interviewees were married and referred as having mixed skin throughout the period. The analysis of the latter variables, which were not considered for weighting process, shows there was a larger proportion of participants who reported having a partner in the household and

having brown skin in 2008, when compared to 2006. This shows that the samples were different as to marital status and skin color.

Overweight prevalence rates were 43.0, 42.7, 44.2 and 46.6% for each year, from 2006 to 2009, respectively. As to obesity, the following rates were found for the same period: 11.4, 12.7, 13.2 and 13.8%. Frequency of overweight and obesity were different for men and women, but the increased prevalence was observed in the whole group and women.

Temporal variation in overweight prevalence rates for men and women and as to age group is demonstrated in Tables 1 and 2, respectively. From 2006 to 2009, overweight prevalence rates tended to increase especially for older men (65 years old or more). Among the youngest (18 to 24 years old), although such prevalence was 50% higher in 2009 than in 2006, this result was at the limit of significance ($p=0.05$). Younger women aged

Table 2. Temporal variation in the prevalence of excess weight in the set of adult women from the Brazilian State capitals and the Federal District in the period from 2006 to 2009, according to demographic and economic* characteristics. VIGITEL 2006, 2007, 2008 and 2009

Tabela 2. Variação temporal na prevalência do excesso de peso no conjunto de mulheres adultas das capitais dos estados brasileiros e Distrito Federal, no período de 2006 a 2009, segundo características demográficas e econômica*. VIGITEL 2006, 2007, 2008 e 2009

Characteristics	2006	2007	2008	2009	p**
	% (95%CI)	% (95%CI)	% (95%CI)	% (95%CI)	
Age (years)					
18 to 24	17.1 (14.0–20.3)	14.3 (12.0–16.6)	22.6 (18.4–26.8)	24.9 (19.4–30.4)	<0.001
25 to 34	29.4 (26.8–32.0)	30.7 (28.1–33.4)	32.8 (30.2–35.5)	35.4 (32.1–38.7)	0.03
35 to 44	43.2 (40.7–45.8)	41.5 (39.0–44.0)	42.7 (40.3–45.1)	45.7 (43.2–48.3)	0.02
45 to 54	53.5 (50.4–56.5)	51.0 (48.3–53.7)	50.4 (47.7–53.0)	52.8 (49.9–55.8)	0.36
55 to 64	59.1 (55.5–62.6)	58.2 (54.9–61.4)	58.3 (54.9–61.2)	59.8 (56.6–63.0)	0.49
65 and more	55.4 (52.2–58.6)	51.6 (47.9–55.3)	55.8 (52.7–58.9)	55.0 (51.8–58.1)	0.18
Schooling (years)					
0 to 8	46.8 (44.5–49.0)	44.7 (42.6–46.8)	47.6 (45.2–50.1)	49.7 (47.1–53.4)	0.003
9 to 11	30.8 (29.1–32.5)	29.9 (28.3–31.6)	32.6 (31.0–34.2)	36.9 (35.2–38.7)	<0.001
12 and more	28.7 (26.5–30.9)	30.3 (28.2–32.4)	30.9 (28.9–32.9)	30.8 (28.9–32.8)	0.72
Marital status					
Married or in a stable relationship	45.6 (43.7–47.6)	44.6 (42.8–46.4)	47.2 (45.1–49.3)	48.2 (46.0–50.3)	0.01
Single/Divorced	31.9 (30.2–33.6)	30.2 (28.7–31.8)	33.5 (31.8–35.3)	36.5 (34.3–38.6)	<0.001
Skin color					
White	37.6 (35.7–39.5)	35.2 (33.4–37.0)	39.4 (37.4–41.3)	42.2 (40.0–44.4)	<0.001
Black	46.0 (40.0–51.9)	39.2 (34.3–44.2)	42.0 (36.7–47.3)	46.3 (41.0–51.6)	0.10
Mixed	38.8 (37.0–40.7)	39.6 (37.8–41.3)	40.4 (38.4–42.5)	42.0 (39.8–44.2)	0.05
Total	38.8 (37.5–40.1)	37.2 (36.0–38.5)	40.0 (38.6–41.3)	42.3 (40.8–43.8)	<0.001

* Weighed percentage to adjust sociodemographic distribution of the VIGITEL sample to the distribution of the adult population in each city, according to the Census 2000, and to consider population weight in each city. ** Linear trend test adjusted as to weighting factor.

* Percentual ponderado para ajustar a distribuição sociodemográfica da amostra VIGITEL à distribuição da população adulta de cada cidade, no Censo Demográfico de 2000, e para levar em conta o peso populacional de cada cidade. ** Teste de tendência linear ajustado para o fator de ponderação

less than 45 years contributed the most for the increased overweight prevalence rates from 2006 to 2009 (Table 2).

In Table 1 it is also possible to observe there were no differences in overweight prevalence rates among men in relation to years of schooling, marital status or skin color; this increasing trend was also not significant for the whole group ($p=0.06$).

The increasing trend in overweight prevalence rates was observed mainly in women with fewer years of schooling (less than 12 years) and those who reported having white skin. Just as this increasing trend was observed for all women ($p<0.001$), and although married people or those who are in a stable relationship presented higher overweight rates, the increasing trend in women does not depend on marital status (Table 2).

In Table 2, it is demonstrated that there was no prevalence increase as to obesity

from 2006 to 2009 for men, considering the analyzed group ($p=0.82$). However, it is observed that obesity prevalence rates in 2009 were higher than in previous years ($p=0.04$) for young men (18 to 24 years old). An increasing trend in obesity prevalence rates for all women is observed from 2006 to 2009 ($p=0.001$), and such increase was different according to the categories: age, schooling, marital status and skin color (Table 4). Thus, there was an increasing trend in obesity prevalence rates, especially among women aged 35 to 44 years, as well as among those with fewer years of schooling (<12 years), white or brown. In Table 4 it is also possible to see the clear increasing trend among single or divorced women. For married women or those who are in a stable relationship, this trend was at the limit of significance ($p=0.05$).

Table 3. Temporal variation in the prevalence of obesity in the set of adult men of the Brazilian State capitals and the Federal District in the period 2006-2009, according to demographic and economic* characteristics. VIGITEL 2006, 2007, 2008 and 2009

Tabela 3. Variação temporal na prevalência de obesidade no conjunto de homens adultos das capitais dos estados brasileiros e Distrito Federal, no período de 2006 a 2009, segundo características demográficas e econômica*. VIGITEL 2006, 2007, 2008 e 2009

Characteristics	2006	2007	2008	2009	p**
	% (95%CI)	% (95%CI)	% (95%CI)	% (95%CI)	
Age (years)					
18 to 24	4.1 (2.9–5.3)	4.5 (3.1–5.8)	5.5 (3.7–7.2)	7.6 (4.7–10.6)	0.04
25 to 34	11.8 (9.4–14.1)	13.1 (10.9–15.4)	12.7 (10.1–15.2)	13.6 (10.5–16.7)	0.79
35 to 44	13.6 (11.7–15.4)	17.9 (15.6–20.2)	16.0 (13.9–18.1)	16.0 (13.8–18.2)	0.25
45 to 54	16.7 (14.0–19.3)	19.6 (16.8–22.3)	18.5 (15.7–21.2)	16.6 (14.2–19.0)	0.11
55 to 64	13.0 (10.2–15.9)	18.5 (15.5–21.6)	18.2 (15.0–21.4)	19.9 (16.4–23.4)	0.56
65 and more	11.0 (8.0–13.9)	10.3 (8.0–12.6)	11.7 (8.7–14.7)	12.4 (9.8–15.1)	0.23
Schooling (years)					
0 to 8	11.8 (10.2–13.3)	13.7 (12.1–15.3)	13.3 (11.6–15.1)	14.1 (11.9–16.3)	0.77
9 to 11	9.9 (8.8–11.1)	12.3 (11.0–13.6)	11.8 (10.6–13.1)	11.9 (10.6–13.2)	0.68
12 and more	11.7 (10.0–13.4)	15.2 (13.4–17.1)	14.7 (12.8–16.6)	15.7 (13.8–17.6)	0.73
Marital status					
Married or in a stable relationship	14.3 (13.0–15.6)	16.5 (15.2–17.9)	16.4 (14.9–18.0)	15.8 (14.1–17.6)	0.55
Single/Divorced	7.4 (6.0–8.7)	9.6 (8.1–11.0)	9.0 (7.4–10.5)	11.0 (9.0–13.0)	0.26
Skin color					
White	11.1 (9.6–12.6)	13.9 (12.2–15.5)	13.8 (12.2–15.3)	14.1 (12.0–16.1)	0.89
Black	13.9 (9.7–18.1)	15.0 (10.4–19.5)	17.4 (10.9–24.0)	17.3 (11.4–23.1)	0.55
Mixed	11.2 (10.0–12.5)	13.0 (11.7–14.3)	12.3 (10.9–13.7)	13.0 (11.3–14.7)	0.98
Total	11.3 (10.3–12.2)	13.5 (12.5–14.5)	13.1 (12.0–14.2)	13.7 (12.4–15.0)	0.82

* Weighed percentage to adjust sociodemographic distribution of the VIGITEL sample to the distribution of the adult population in each city, according to the Census 2000, and to consider population weight in each city. ** Linear trend test adjusted as to weighting factor.

* Percentual ponderado para ajustar a distribuição sociodemográfica da amostra VIGITEL à distribuição da população adulta de cada cidade, no Censo Demográfico de 2000, e para levar em conta o peso populacional de cada cidade. ** Teste de tendência linear ajustado para o fator de ponderação

Discussion

According to the results, it is possible to say that variations in overweight and obesity prevalence rates from 2006 to 2009 are different for men and women, especially according to characteristics such as: age, schooling, marital status and skin color of the participants of VIGITEL.

The main limitation to analyze these data is due to the fact that overweight and obesity prevalence rates were defined from reported weight and height information, since it was a telephone survey. Although some differences are observed when anthropometric measures are self-reported by the participant than when they are measured¹⁰, obtaining this information by telephone enables to assess annual variations in a faster, simpler and cheaper way. It is also important to observe that the results in this study, especially in relation to

men, were very similar to those found by the Consumer Expenditure Survey (Pesquisa de Orçamentos Familiares - POF) 2008-2009 with a representative sample of the urban and rural regions of the five Brazilian regions, aged 20 years or more². Even though there is a difference in age of inclusion as to this study (18 years old or more), and that only those living in state capitals and the Federal District were included, overweight prevalence rates for women in POF 2008-009 were 50.1%, which is very similar to those found in men participating in VIGITEL, in 2009 (51%). Among women, on the other hand, overweight (48%) and obesity (17%) prevalence rates found in POF 2009-2009 are six and three percentage points higher than those found in this study in 2009, respectively, even with the increasing trend found in the period from 2006 to 2009. This result is in accordance with a study on validation of reported weight and height¹⁰,

Tabela 4. Temporal variation in the prevalence of obesity in the set of adult women of the Brazilian State capitals and the Federal District in the period from 2006 to 2009, according to demographic and economic* characteristics. VIGITEL 2006, 2007, 2008 and 2009

Tabela 4. Variação temporal na prevalência de obesidade no conjunto de mulheres adultas das capitais dos estados brasileiros e Distrito Federal, no período de 2006 a 2009, segundo características demográficas e econômica*. VIGITEL 2006, 2007, 2008 e 2009

Characteristics	2006	2007	2008	2009	p**
	% (95%CI)	% (95%CI)	% (95%CI)	% (95%CI)	
Age (years)					
18 to 24	4.5 (2.8–6.2)	3.6 (2.2–5.0)	4.0 (2.7–5.3)	6.1 (3.8–8.4)	0.06
25 to 34	8.9 (7.1–10.6)	9.4 (7.7–11.2)	10.4 (8.7–12.2)	11.6 (9.4–13.7)	0.13
35 to 44	11.0 (9.5–12.6)	11.8 (10.1–13.6)	13.8 (12.1–15.5)	15.1 (13.2–17.0)	0.01
45 to 54	15.1 (12.9–17.3)	18.5 (16.3–20.6)	17.9 (15.9–19.9)	18.0 (15.9–20.1)	0.77
55 to 64	20.4 (17.2–23.6)	20.9 (18.2–23.6)	23.9 (20.8–26.9)	21.3 (18.8–23.9)	0.82
65 and more	19.7 (17.0–22.4)	15.9 (13.3–18.5)	21.6 (18.8–24.3)	20.4 (17.6–23.1)	0.22
Schooling (years)					
0 to 8	14.7 (13.2–16.2)	15.3 (13.9–16.7)	17.5 (16.0–19.0)	18.0 (16.2–19.8)	0.02
9 to 11	7.9 (7.0–8.9)	8.9 (7.9–9.9)	8.9 (8.0–9.9)	10.5 (9.5–11.6)	0.02
12 and more	7.8 (6.5–9.2)	7.5 (6.4–8.6)	8.6 (7.4–9.8)	8.6 (7.5–9.7)	0.17
Marital status					
Married or in a stable relationship	13.4 (12.1–14.7)	14.2 (12.9–15.6)	16.4 (15.0–17.7)	16.3 (14.8–17.8)	0.05
Single/Divorced	9.6 (8.5–10.6)	9.5 (8.6–10.4)	10.5 (9.5–11.4)	11.7 (10.5–12.8)	0.003
Skin color					
White	10.7 (9.5–11.8)	10.9 (9.8–12.0)	13.5 (12.2–14.8)	13.1 (11.7–14.6)	0.01
Black	14.9 (10.4–19.4)	15.9 (12.3–19.6)	16.2 (12.5–20.0)	17.1 (12.6–21.5)	0.69
Mixed	11.5 (10.4–12.7)	12.4 (11.2–13.7)	12.6 (11.5–13.7)	14.4 (13.1–15.7)	0.03
Total	11.5 (10.6–12.3)	11.8 (11.0–12.6)	13.2 (12.4–14.1)	13.9 (13.0–14.9)	0.001

* Weighed percentage to adjust sociodemographic distribution of the VIGITEL sample to the distribution of the adult population in each city, according to the Census 2000, and to consider population weight in each city. ** Linear trend test adjusted as to weighting factor.

* Percentual ponderado para ajustar a distribuição sociodemográfica da amostra VIGITEL à distribuição da população adulta de cada cidade no Censo Demográfico de 2000 e para levar em conta o peso populacional de cada cidade. ** Teste de tendência linear ajustado para o fator de ponderação

which suggests that BMI is underestimated in reports by women, whereas it is reliable when it comes to men.

While differences in overweight and obesity prevalence rates for men and women are presented in Brazilian studies which measure weight and height, the same does not occur when such information is reported by the participants¹¹. In this case, overweight was more prevalent among men (47%) than among women (39%), in 2006¹¹, and this difference continued until 2009. However, the obesity prevalence rate was not different between men and women in 2006 (11%)¹¹, and there was also no difference in obesity prevalence rates for between men and women in 2009 (14%).

Concerning the trend of overweight and obesity, since data obtained in 1974 and 1975 regarding the Brazilian population until the last POF², it is observed that such

prevalence rates increased in 34 years for both genders. While overweight prevalence rate increased almost three times (18.5% in 1974 and 1975 and 50.1% in 2008 and 2009) for men, this prevalence almost doubled among women (28.7% in 1974 and 1975 and 48.0% in 2008 and 2009). As to obesity, the increase for men was superior to four times (2.8% in 1974 and 1975 and 12.4% in 2008 and 2009), and the double among women (8.0% in 1974 and 1975 and 16.9% in 2008 and 2009)². On the other hand, this study shows the clear increasing trend in relation to overweight and obesity concerning women in four years. There was no difference in overweight prevalence rates among men from 2006 to 2009 (p=0.06). The trends observed in the Brazilian population are different from those in the United States, shown in national studies (National Health and Nutrition Examination Survey

- NHANES) conducted from 1999 to 2008. The analysis shows that obesity prevalence rates have been increasing among men, but not among women^{12,13}.

Concerning the trend by age group in men, while this study showed increasing overweight in extreme age groups, the increasing obesity in the United States was spread to all age groups¹³, especially people aged 40 years or more¹². However, increasing obesity from 2006 to 2009 among men interviewed by VIGITEL was observed for the group aged 18 to 24 years, and women aged 35 to 44 years.

The evolution in overweight and obesity prevalence rates according to the socio-economic situation in Brazil in a period of 34 years (1974 and 1975 to 2008 and 2009) shows that increasing trends were present in all income strata among men; as to women, the prevalence was among the ones in the first two-fifths of income distribution². A previous study with the Brazilian population, consisting of a period of 23 years (1974-75 to 1997) showed a substantial change in obesity trends in relation to schooling¹⁴. While the risk of obesity was increasing in all school levels from 1974 to 1975 until 1989, the obesity increase was higher in individuals with fewer years of schooling from 1989 to 1997. Obesity among women in groups with middle and high levels of schooling was stable and even decreasing¹⁴. In this study, increasing overweight and obesity were observed for women with fewer years of schooling (less than 12 years) and, as to men, no differences regarding schooling were found. This result is probably related to the temporal stability in overweight and obesity for men in the period of four years. It is important to describe that the separate analysis of each year shows that women with fewer years of schooling always present higher prevalence rates regarding overweight and obesity, but such association is not clear among men.

Higher overweight and obesity prevalence rates among people in a stable relation have been reported in a longitudinal national study, conducted for ten

years with the population in the United States¹⁵, just like the Brazilians who participated in VIGITEL, in 2006¹¹. However, the increasing trend in such prevalence rates was observed among women from 2006 to 2009, regardless of marital status.

In 2006, VIGITEL data showed that overweight and obesity prevalence rates were higher among black and brown women when compared to the white ones¹¹, while data from a telephone survey conducted in the United States (which was an example to studies conducted by VIGITEL) also showed such difference¹⁶. An increasing trend in prevalence rates regarding the black and Mexican population living in the United States has also been observed from a period of six¹² to ten years¹³. On the other hand, results in this study show an increasing trend of overweight and obesity prevalence rates among white and brown women.

Overweight and obesity prevalence rates have been increasing in the Brazilian population, and the temporal variation of VIGITEL data, from 2006 to 2009, confirms this fact. While more than half of Brazilian men are overweight, according to data from VIGITEL, women show lower prevalence rates than those found in POF 2008-2009², which could be related to the poorer report of increased weight by women. Classification errors caused by the self-report of anthropometric measures may also have occurred as to obesity. Thus, prevalence rates presented by VIGITEL are also a little lower than those recently presented by POF 2008-2009. However, even if women are not properly reporting their nutritional status, the increasing trend in these numbers in a short period of time is worrisome.

Considering the difficulty to treat obesity, which requires long term behavior changes, as well as the fact that it is a risk factor for different CNCDS, effective preventive and overweight control measures are extremely urgent and necessary. Such measures must be addressed to the population because, besides the fact that half the adult population is overweight, increasing trends are being observed in short period of time.

References

1. World health organization. Overweight and obesity. Fact sheet No. 311. Geneva: WHO; 2011.
2. Instituto Brasileiro de Geografia e Estatística – IBGE. Pesquisa de orçamentos familiares 2008-2009: antropometria e estado nutricional de crianças, adolescentes e adultos no Brasil. Rio de Janeiro: IBGE; 2010.
3. Serdula MK, Ivery D, Coates RJ, Freedman DS, Williamson DF, Byers T. Do obese children become obese adults? A review of the literature. *Prev Med.* 1993;22:167-77.
4. Whitaker RC, Wright JA, Pepe MS, Seidel KD, Dietz WH. Predicting obesity in young adulthood from childhood and parental obesity. *N Engl J Med.* 1997;337:869-73.
5. Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde. Secretaria de Gestão Estratégica e Participativa. VIGITEL Brasil 2009: vigilância de fatores de risco e proteção para doenças crônicas por inquérito telefônico. Brasília: Ministério da Saúde; 2010.
6. Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde. Secretaria de Gestão Estratégica e Participativa. VIGITEL Brasil 2006: vigilância de fatores de risco e proteção para doenças crônicas por inquérito telefônico. Brasília: Ministério da Saúde; 2007.
7. Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde. Secretaria de Gestão Estratégica e Participativa. VIGITEL Brasil 2007: vigilância de fatores de risco e proteção para doenças crônicas por inquérito telefônico. Brasília: Ministério da Saúde; 2008.
8. Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde. Secretaria de Gestão Estratégica e Participativa. VIGITEL Brasil 2008: vigilância de fatores de risco e proteção para doenças crônicas por inquérito telefônico. Brasília: Ministério da Saúde; 2009.
9. World Health Organization. Obesity: preventing and managing the Global Epidemic. Report on a WHO Expert Consultation on Obesity, 3-5 June 1997. Geneva; 1997.
10. Silveira E, Araújo CL, Gigante DP, Barros, AJ, Lima MS. Validação do peso e altura referidos para o diagnóstico do estado nutricional em uma população de adultos no Sul do Brasil. *Cad Saúde Pública.* 2005;21:235-45.
11. Gigante DP, Moura EC, Sardinha LMV. Prevalência de excesso de peso e obesidade e fatores associados, Brasil, 2006. *Rev Saúde Pública.* 2009;43:S83-9.
12. Ogden CL, Carroll MD, Curtin LR, McDowell MC, Tabak CJ, Flegal, KM. Prevalence of overweight and obesity in the United States, 1999-2004. *JAMA.* 2006;295:1549-55.
13. Flegal KM, Carroll MD, Ogden CL, Curtin LR. Prevalence and trends in obesity among US adults, 1999-2008. *JAMA.* 2010;303:235-41.
14. Monteiro CA, Conde WL, de Castro IR. The changing relationship between education and risk of obesity in Brazil (1975-1997). *Cad Saude Pública.* 2003;19:S67-75.
15. Sobal J, Rauschenbach B, Frongillo EA. Marital status changes and body weight changes: a US longitudinal analysis. *Soc Sci Med.* 2003;56:1543-55.
16. Mokdad AH, Ford ES, Bowman BA, Dietz WH, Vinicor F, Bales VS, et al. Prevalence of obesity, diabetes, and obesity-related health risk factors. *JAMA.* 2003;289:76-9.

Submitted on: 05/01/2011

Final version presented on: 12/03/2011

Accepted on: 23/03/2011