**ORIGINAL ARTICLE /** *ARTIGO ORIGINAL*

# Trends of self-rated health in relation to overweight in the adult population in Brazilian Midwest capitals

## Tendências da autoavaliação de saúde em relação ao excesso de peso na população adulta residente nas capitais do Centro-Oeste do Brasil

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**ABSTRACT:** *Objective:* To estimate the trends of self-rated health in relation to overweight in the adult population of the capitals of the Brazilian Midwest region and the Federal District. *Methods:* Cross-sectional study with a population aged 20 to 59 years, using data from the Telephone-based Surveillance of Risk and Protective Factors for Chronic Diseases (VIGITEL), performed between 2008 and 2014. The estimates using the complex sampling design were made using simple linear regression, trend graphs and Boxplot. *Results:* The categories "poor" and "very poor" didn't increase in the analyzed period. There was an average increase of 0.5 percentage point per year in the categories "fair" and "good" and an average decrease of 1.0 percentage point in the category "very good". The trend analysis of mean body mass index found there was a progressive growth in all cities. The worst health perceptions showed higher values of body mass index in both sexes. We observed the existence of obese people assessing their health positively. *Conclusion:* Self-rated health remained relatively constant whereas the body mass index continued to grow between 2008 and 2014. The self-rated health of individuals with high body mass index (>30 kg/m²) does not seem to be directly related to their weight. Therefore, it is important to analyze the association of these two variables controlling for morbidity, health behaviors (smoking and alcohol consumption, physical activity and diet), and sociodemographic factors.

*Keywords:* Overweight. Obesity. Self-assessment. Health Status Indicators. Interview.

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Conflict of interests: nothing to declare – Financial support: none.

**RESUMO:** *Objetivo:* Estimar as tendências da autoavaliação de saúde em relação ao excesso de peso na população adulta residente nas capitais da região Centro-Oeste e no Distrito Federal. *Método:* Estudo transversal com população entre 20 e 59 anos, utilizando dados de inquéritos telefônicos de base populacional do Sistema de Vigilância de Fatores de Risco e Proteção para Doenças Crônicas (VIGITEL), realizados entre os anos de 2008 e 2014. As estimativas foram feitas considerando o planejamento amostral complexo, utilizando-se regressão linear simples, gráficos de tendência e Boxplot. *Resultados:* As categorias "ruim" e "muito ruim" não tiveram alteração no período analisado. Observou-se aumento médio de 0,5 ponto percentual para as categorias "regular" e "bom", e diminuição média de 1,0 ponto percentual na categoria "muito bom". Na análise de tendência das médias do índice de massa corporal, verificou-se aumento progressivo em todas as cidades. Nas piores percepções de saúde, constatou-se valores mais elevados do índice de massa corporal em ambos os sexos. Observou-se a existência de pessoas obesas autoavaliando sua saúde de maneira positiva. *Conclusão:* A autoavaliação de saúde se manteve relativamente constante enquanto o índice de massa corporal seguiu tendência crescente entre 2008 e 2014 nas capitais do Centro-Oeste e no Distrito Federal. A autoavaliação de saúde dos indivíduos com índice de massa corporal elevado (> 30 kg/m²) parece não ter relação direta com seu peso. É importante analisar a associação dessas duas variáveis, controlando-as por morbidades, comportamentos de saúde (etilismo e tabagismo, atividade física e alimentação) e fatores sociodemográficos.

*Palavras-chave:* Sobrepeso. Obesidade. Autoavaliação. Indicadores básicos de saúde. Entrevista por telefone.

# INTRODUCTION

Self-rated health (SRH) is an important health indicator analyzed in population surveys. The theme started to be studied in the 1970s, as a demand from the Sociology field, in order to assess its association with mortality[1,2]. Epidemiological and qualitative studies brought consistent results that pointed to SRH as a useful indicator to diagnose the health status of the populations[3,4].

As a global health indicator, obtained from the perception of individuals coming from signs and meanings, based on the multidimensional aspects of human life[5], it is important to consider its relationship with factors that can establish the level of health status. The literature has studies about the relationship between SRH and morbimortality, as well as its association with socioeconomic, demographic, behavioral, among other factors[1-10]. Self-rated health is related to the social world and to psychological experiences, on the one hand, and to the biological world, on the other, showing the influence of the cognitive flow in the responses to the only question composing this indicator, usually asked as followed: "How is your health in general: excellent, very good, good, fair, or poor?". The individual first assesses what health is and which are its most relevant components; then, he or she considers some aspects, such as age, the situation of known people, health history and the expected development of health; and, finally, he or she decides which the best option is to describe the situation[11].

This study aimed at estimating the tendencies of SRH and body mass index (BMI), as well as the relationship between both from 2008 to 2014, in the Midwest region of Brazil.

Of the risk factors for noncommunicable chronic diseases (NCCD), the excess weight problem stands out, considered as a global epidemic[12].

The Midwest region was chosen considering some special characteristics related with the factors associated with SRH found in the literature, when compared to other Brazilian regions:

1. From 2000 to 2010, it was the region with the second highest population growth rate;
2. It presented the second highest gross domestic product (GDP) per capita;
3. It was the second largest region in average household income per capita;
4. It is the second largest region in terms of schooling;
5. Until 2006, it held the third position in the ranking of mortality rates due to the main causes associated with NCCD, in progressive growth; even if, in the aforementioned year, it has been surpassed by the Northeast.

Therefore, it is observed that the Midwest region is in an intermediate position in relation to the others in the mentioned aspects[13]. It is emphasized that Cuiabá was leader in the ranking of the prevalence of obesity in 2010 (18.7%) and 2013 (22.4%). Another aspect to mention regarding the region studied is the fact that is includes the Federal District, which is the capital of the country and has some particular features in relation to other federation units.

## METHODS

This is a cross-sectional, population study including all three capitals of the Midwest region and the Federal District. It uses data about the adult population aged between 20 and 59 years old (n = 38,151), in the Telephone-based Surveillance of Risk and Protective Factors for Chronic Diseases (VIGITEL), from the Ministry of Health in Brazil referring to the period of 2008 to 2014.

VIGITEL has collected the self-rated health status of individuals composing the samples representing the population in the Brazilian capitals and in the Federal District since 2006, together with information about health behaviors, socioeconomic status, reported morbidities and information about weight and height to obtain BMI[14].

The samples were composed to reach at least 2,000 people, aged more than 18 years, living in the city, and households with at least one landline. The sampling process is conducted in two steps. In the first one 5 thousand landlines are selected per city, using the records of telephone operators. The selected sample is divided in replicas similar to 200 landlines that reproduce the same proportion of landlines per region of telephone prefix[14]. The second stage is conducted at the interview, to identify the active landlines, therefore eligible for the System. For each eligible landline there is a consultation about the acquiescence of users to participate in the study. If positive, one person is selected amongst the ones who are older than 18 years of age in the household, and that person will be interviewed. [14].

To infer the estimations based on the population with landlines for the total adult population in each city, the following weights were attributed: the initial weight attributed to each

person was the product of the inverse of the number of landlines by the number of adults in the household of the interviewee. Afterwards, post-stratification weight was attributed, considering the sociodemographic variables sex, age group and schooling level using the "rake" technique, interactive process that generates weights in order to even the sociodemographic composition of the sample to that of the city's population[14].

The variable SRH was obtained with the following question: "Would you classify your health status as very good, good, fair, poor, really poor, do not know or did not want to inform". The categories "do not know" and "did not want to inform" were excluded from the analyses. The BMI variable was built based on data about reported weight and height, using the following formula: weight (kg)/height (m)². The cutoff points to classify the individuals in the samples were: low weight (BMI < 18.5 kg/m²); eutrophic (BMI between 18.5 and 24.9 kg/m²); overweight (BMI between 25.0 and 29.9 kg/m²) and obesity (BMI ≥ 30 kg/m²)[15]. The records corresponding to individuals aged less than 20 years old and older than 60 years old, as well as pregnant women, were excluded. At first, a single database was organized based on the sum of VIGITEL databases referring to the years 2008 to 2014. For that, all variables used were categorized and named the same in the seven databases. Records corresponding to ages lower than 20 and higher than or equal to 60 years, in this case, were also excluded.

The percentages of categories of SRH and BMI means were calculated for each year, according to sex and capitals in the Midwest region, with their respective 95% confidence intervals (95%CI). To calculate BMI means, initially the records of BMI > 50 (n = 58) were excluded in order to verify its impact on the mean, which did not happen; therefore, these discrepant values were maintained in the final calculation.

The behavior of the tendencies of BMI means and the SRH categories in the studied period was analyzed with trend line graphs. The vertical axis in the logarithmic scale was used for SRH, in order to prevent distortions and make relative comparisons between the several categories of this variable. For BMI, a graph using the 95%CI was used to show the temporal trend, as well as to allow comparisons between the means in the period.

Aiming at estimating the variation of SRH in the period between 2008 and 2014, this variable was grouped in two categories: "poor/very poor" and "very good/good/fair". Afterwards, a simple linear regression model was applied, and the outcome – dependent variable – was the percentage of adults who declared their health status to be "poor/very poor". The explanatory variable was the year of study, expressed as a quantitative variable.

Boxplot graphs were elaborated with the distribution of BMI, according to the categories of SRH for men and women in each year considered. The verification of possible differences between the categories was analyzed using the Kruskal-Wallis nonparametric test.

The software Stata, version 11, was used for data analysis, considering the design variables of the complex sample plan and the 0.05 significance level.

The free and informed consent to conduct the VIGITEL interviews was obtained orally, at the time of contacting the interviewees by telephone. The VIGITEL study was approved

in the National Human Research Ethics Commission from the Ministry of Health (CONEP – Report n. 355,590, from June 26, 2013, CAAE: 16202813.2.0000.008)[14]. This study was approved by the Ethics Committee of Hospital Júlio Muller in Cuiabá, Mato Grosso, report n. 568.889, from March, 26, 2014.

## RESULTS

The complete database was composed of 38,151 people, being 47.52% men, considering the weighted percentage distribution and mean age of 36.7 years (95%CI 36.5 – 36.9). The trend analysis of SRH (Figure 1) showed that, for the total capitals in the Midwest region, the categories "poor" (p = 0.495) and "very poor" (p = 0.133) did not show changes in the analyzed period. However, there was an average increase of 0.5 percentage point in the period for the categories "fair" (p = 0.010) and "good" (p = 0.027), whereas the category "very good" presented significant mean reduction of 1.0 percentage point per year (p < 0.001), going from 21.51% (20.18 – 22.90%) in 2008 to 17.07% (15.45 – 18.82%) in 2014. With the stratification per sex, poor or very poor SRH remained unaltered in the period, both for female (p = 0.416) and male individuals (p = 0.303), as well as for each one of the capitals (p > 0.05).



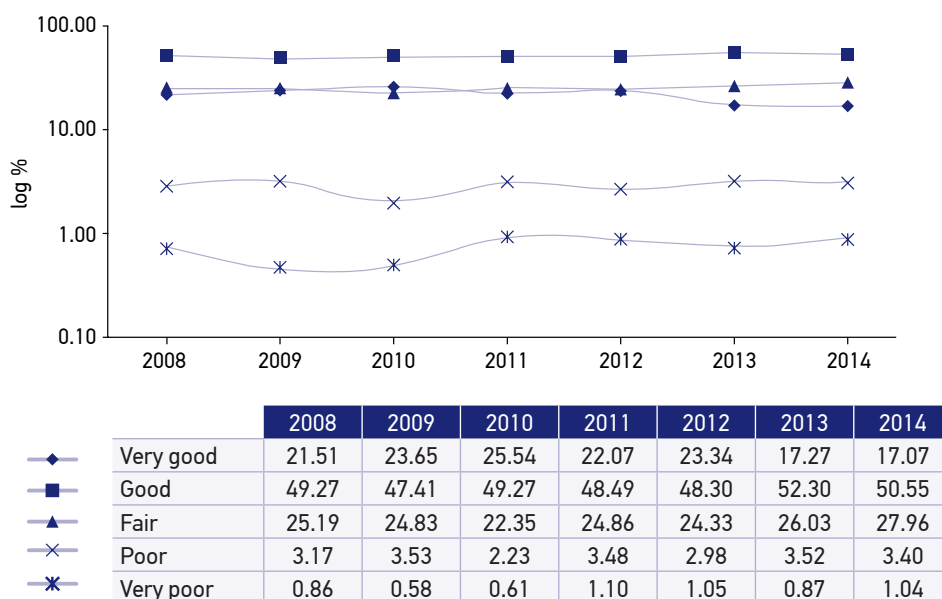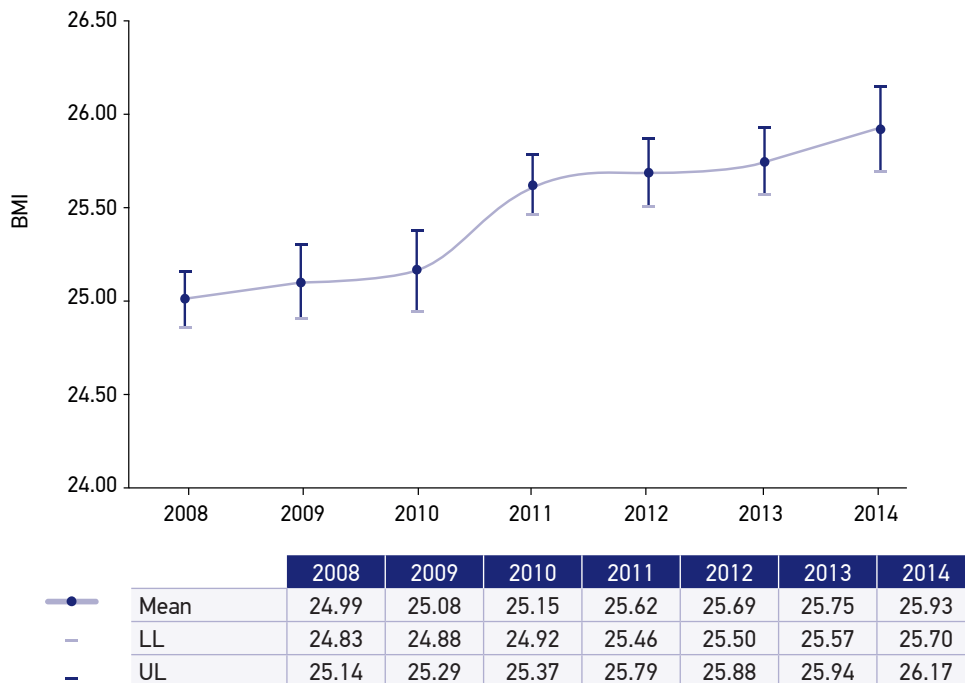|  |  | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|---|---|---|---|---|---|---|---|---|
| ◆ | Very good | 21.51 | 23.65 | 25.54 | 22.07 | 23.34 | 17.27 | 17.07 |
| ■ | Good | 49.27 | 47.41 | 49.27 | 48.49 | 48.30 | 52.30 | 50.55 |
| ▲ | Fair | 25.19 | 24.83 | 22.35 | 24.86 | 24.33 | 26.03 | 27.96 |
| ✕ | Poor | 3.17 | 3.53 | 2.23 | 3.48 | 2.98 | 3.52 | 3.40 |
| ✳ | Very poor | 0.86 | 0.58 | 0.61 | 1.10 | 1.05 | 0.87 | 1.04 |

Figure 1. Trend lines in the categories of self-rated health from 2008 to 2014 in the capitals of the Midwest and the Federal District, according to data from the Telephone Disease Surveillance System.

In the trend analysis of the BMI means, some differences were detected in the period of 2008 to 2014 (p < 0.001). In 2008, the mean BMI in the four capitals of the study was 24.99 kg/m², reaching 25.93 kg/m² seven years later (p < 0.001). By observing Figure 2, it is possible to see a significant increase (p < 0.001) between 2010 and 2011. After this year (2011), the Midwest region reached the overweight range, once the inferior 95%CI limit was higher than 25 kg/m².

In the stratification per city, the BMI differences in the period remained significant in the four capitals (p < 0.001), and there were similarities in the mean BMI growth for all of them; however, in different levels. The means of the pair formed by Cuiabá/Campo Grande were very similar in 2008, 2010, 2011 and 2012. Also, Goiânia/Brasília present similar means in practically all years (Figure 3).

In the analysis of the relationship between the BMI averages, according to SRH categories (Figure 4), the Boxplot graphs presented unusual values (outliers) in relation to almost all categories in the seven years analyzed and in both genders, especially above the upper axis. The interquartile range of BMI values for the total number of capitals was higher in the worse health perceptions, indicating an increasing variability of data



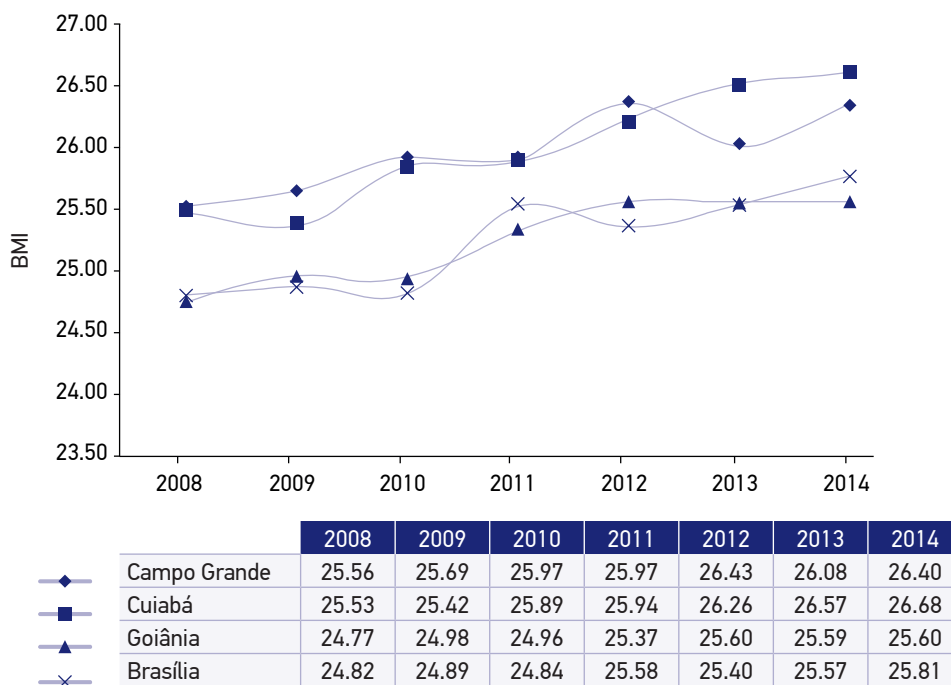|  |  | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|---|---|---|---|---|---|---|---|---|
| ●— | Mean | 24.99 | 25.08 | 25.15 | 25.62 | 25.69 | 25.75 | 25.93 |
| – | LL | 24.83 | 24.88 | 24.92 | 25.46 | 25.50 | 25.57 | 25.70 |
| – | UL | 25.14 | 25.29 | 25.37 | 25.79 | 25.88 | 25.94 | 26.17 |

BMI: body mass index; LL: lower limit; UL: upper limit.

Figure 2. Trend of the mean body mass index (with 95%CI in the points) from 2008 to 2014 in the capitals of the Midwest and the Federal District according to data from the Telephone Disease Surveillance System.

in this central range of values, in the worst SRH categories. Besides, the Kruskal-Wallis test showed that the distribution of BMI values, generally, was different between the SRH categories in all years. The worst health perceptions found higher BMI values in both genders in the periods analyzed ($p < 0.05$). In the analyzed period, the year 2012 stands out, when the biggest difference between BMI means for people with very good (24.50 kg/m² – 95%CI 24.19 – 24.81) and very poor SRH (33.13 kg/m² – 95%CI 27.45 – 38.82) was found.

## DISCUSSION

SRH remained relatively constant, whereas BMI had an increasing trend between 2008 and 2014, in the capitals of the Midwest and the Federal District.

There was an increasing trend in BMI means in the three capitals analyzed and in the Federal District. This increase is in accordance with the alert from the World Health Organization (WHO)[15] referring to the growing prevalence rates of obesity all over the world, both in developed and in developing countries, increasing the risks of NCCD. The four cities of the



| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|---|---|---|---|---|---|---|---|
| Campo Grande | 25.56 | 25.69 | 25.97 | 25.97 | 26.43 | 26.08 | 26.40 |
| Cuiabá | 25.53 | 25.42 | 25.89 | 25.94 | 26.26 | 26.57 | 26.68 |
| Goiânia | 24.77 | 24.98 | 24.96 | 25.37 | 25.60 | 25.59 | 25.60 |
| Brasília | 24.82 | 24.89 | 24.84 | 25.58 | 25.40 | 25.57 | 25.81 |

BMI: body mass index.

Figure 3. Trend of the mean body mass index from 2008 to 2014 according to capitals of the Midwest and the Federal District according to data from the Telephone Disease Surveillance System.
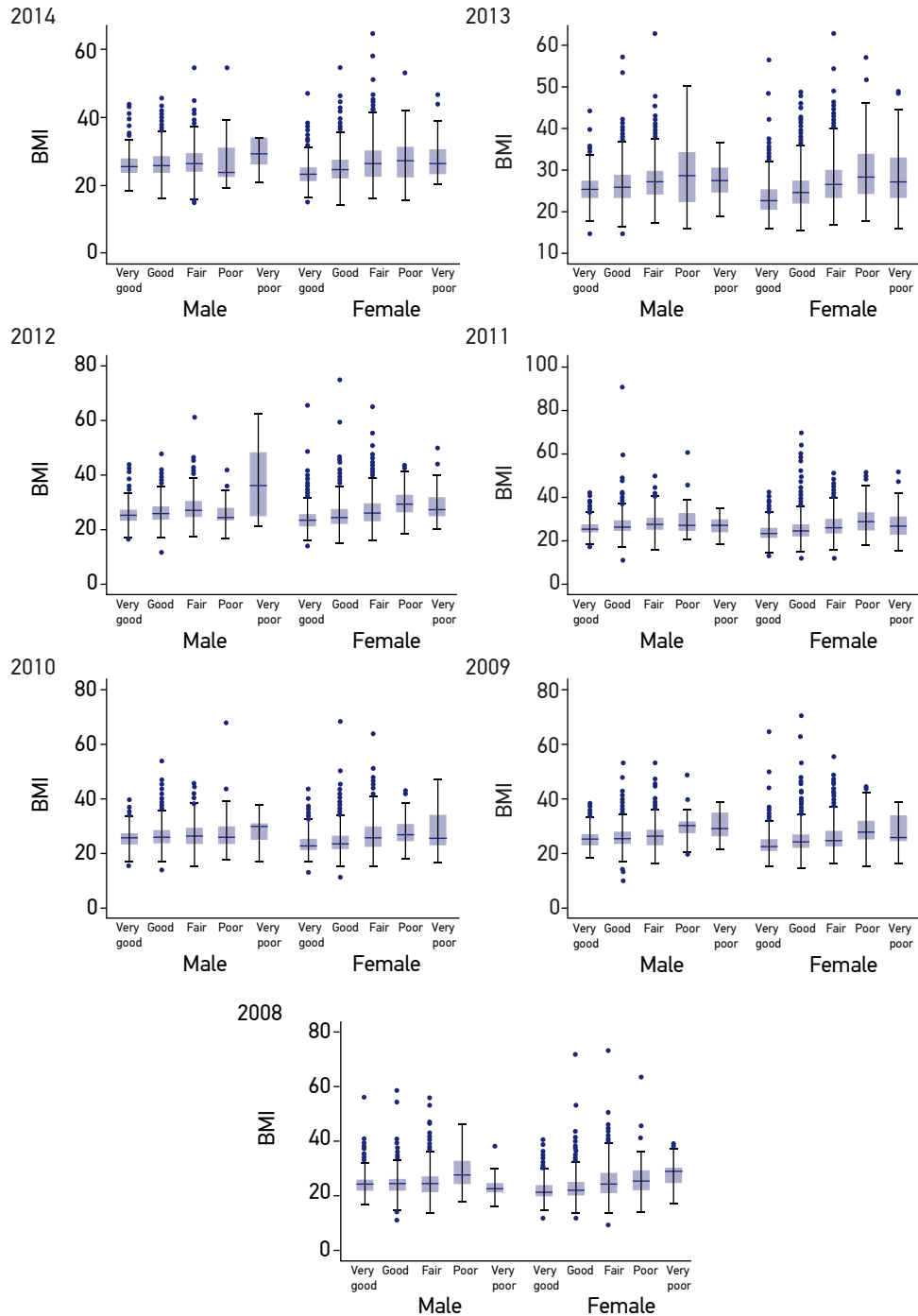
BMI: body mass index.

Figure 4. Boxplot of the body mass index regarding the categories of self-rated health for both genders, referring to the period of 2008 to 2014, based on the data from the Telephone Disease Surveillance System.

Midwest region presented similar growth in BMI means, pointing to a significant increase from 2010 to 2011, reaching the overweight category. It is important to mention that BMI can be considered to provide the measurement of obesity in a population level, even if indirectly, since it does not measure the body fat level, which effectively defines excess weight and obesity[12].

Both in developing and developed countries, the increasing overweight and obesity trends have been attributed to the so-called "obesogenic" environment, which essentially facilitates the intake of energy-dense foods, while restricting and inhibiting activities that require high energy waste. In Brazil, the higher increase of adult obesity was observed in families with lower income, showing the replacement of low nutrition with nutritional[16]. Urban diets are usually characterized by the intake of polished grains and by the intake of higher levels of fat and animal products, refined sugar, processed foods and foods consumed outside the household, especially in developing countries[17].

Regarding SRH, it was observed that the percentages in the categories "poor" and "very poor" remained without significant changes in the analyzed period. However, the percentages in the categories "good" and "fair" increased, whereas those in the category "very good" reduced throughout the years. Supposedly, part of the population that judged their health as "very good" began to consider it as "good" or "fair", possibly because of the high prevalence of noncommunicable diseases, which are also a result of the increasing BMI[12]. The research shows that the category "good" is prevalent over the others, probably because the answer "good" does not require such rigorous knowledge, besides being less compromising in comparison to another health assessment parameter. The two categories with worst evaluation – "poor" and "very poor" – had the lowest response percentages, which is not surprising, since this is an adult population including young adults at productive age, and in a sample representing the urban population. Pavão et al.[5] indicate that better socioeconomic conditions, health behaviors and lack of morbidities contribute to improve the health perception of the individuals.

Based on the results of the relationship of SRH and BMI, the existence of obese people with positive self-rated health is demonstrated. Among the 58 people identified with BMI $> 50$ kg/m$^2$, only 10 reported their health as "poor" or "very poor". Probably, the self-rated health of individuals with high BMI ($> 30$ kg/m$^2$) is not related to their weight, but with other morbidities, especially those resulting from the excess weight, such as diabetes and hypertension. Studies of multiple regression with the analyzed samples can clarify that question.

The samples from a survey conducted by landlines can lead to a limited representativeness since not all people have a landline. The sample size and the new statistical weights (rake) used in this study, based on the demographic Census and on more recent projections, correct possible flaws of representativeness in VIGITEL. Studies conducted to test the validity of telephone surveys concluded, based on the representativeness and reliability of the estimations obtained, that this instrument is adequate and can reach

good performance in Brazilian urban areas[18]. Even though all information is self-reported, including weight and height, this is considered as a relevant and efficient tool to monitor excess weight in the population [19].

The advantage of this study is that it studies population-based samples in four Brazilian cities, including the Federal capital. For that, we used a data base from an important survey tool of health surveillance, which basically uses the same questionnaire each year, so it is possible to estimate the trends. Even though seven years is still considered a short period from the statistical and epidemiological point of view, to analyze trends, the series studied allowed the verification of the evolution of SRH and BMI.

## CONCLUSION

SRH remained relatively constant, whereas BMI had an increasing trend between 2008 and 2014 in the capitals of the Midwest and the Federal District.

SRH of individuals with high BMI ($> 30 \, kg/m^2$) seems to have no direct relation with their weight. Therefore, it is important to analyze the association of these two variables by controlling them per morbidities, health behaviors (alcoholism and smoking, physical activities and diet) and sociodemographic factors.

## ACKNOWLEDGMENTS

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