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ARTICLE

Self-reported weight and height are valid measures to determine weight status: results from the *Brazilian National Health Survey* (PNS 2013)

Peso e altura autorreferidos são medidas válidas para determinar o estado nutricional: resultados da *Pesquisa Nacional de Saúde* (PNS 2013)

El peso y altura autoinformados son medidas válidas para determinar el estado nutricional: resultados de la *Encuesta Nacional de Salud Brasileña* (PNS 2013)

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Abstract

Self-reported measures have been used to obtain weight and height information in some epidemiological surveys. The validation of such information is necessary to guarantee data quality. This study assessed the validity of self-reported weight and height to determine weight status. Data were obtained in the Brazilian National Health Survey, *a Brazilian household-based nationwide survey carried out in 2013. In this survey, 40,366 individuals (aged ≥ 18 years) provided self-reported and measured information about weight and height. Student's paired t-test was used to verify the differences between self-reported and measured data. The agreement between measurements was obtained using the intraclass correlation coefficient (ICC) and Bland-Altman method. To evaluate variations in weight status categorizations, the weighted kappa coefficient and exact agreement were used. Sensitivity and specificity were estimated for the self-reported information to classify overweight and obese individuals. There was high agreement between self-reported and measured weight, height, and body mass index (ICC > 0.88). The mean agreements estimated by the Bland-Altman method were 99.6% for weight and 100.6% for height. The weighted kappa coefficient showed substantial agreement among the weight status categories (> 0.66); the exact agreement was 77%. Sensibility and specificity for overweight (83% and 87.5%, respectively) and obesity (73.4% and 96.7%, respectively) were considered high for the sociodemographic characteristics evaluated. According to our results, self-reported measurements of weight and height can be used cautiously as valid alternatives to determine weight status.*

Self Report; Anthropometry; Health Surveys; Reproducibility of Results

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Introduction

Population-based health surveys have been widely used to evaluate morbidity, lifestyles, and health system performances, among others. It is important to design and evaluate interventions and policies in this area [1]. Such studies are useful to supplement information obtained through health information systems.

Recently, the Brazilian government has made substantial investments to obtain nationally representative data on various stages of life, including *National Household Sample Survey* (PNAD), *Risk and Protective Factors Surveillance Systems for Chronic non-Communicable Diseases Through Telephone Interview* (Vigitel), the *National Household Budget Survey* (POF), the *National School Health Survey* (PeNSE), the *National Survey on Demography and Health* (PNDS), and the first *National Health Survey* (PNS), which was carried out in 2013 [1,2]. These surveys assess and monitor the occurrence of major chronic diseases and their risk factors, especially overweight and obesity, which are among the five most important causes of death worldwide and are the third most significant cause of death in developing countries [3]. These surveys also can assess the impact of interventions on a large scale to study the primary prevention of these diseases [4].

The methods for data collection in national health surveys have improved recently, resulting in increased flexibility and lower costs [5]. Self-reported methods may be used when there are practical, logistical, or financial limitations to obtaining direct measurements. For example, height and weight are costly and time-consuming direct measurements. Thus, height and weight information may be self-reported by the participants. The validation of such self-reported measures is crucial to guarantee data quality and avoid bias because of misclassification.

Self-reported weight and height have been considered valid proxies of information obtained by anthropometric measurements for weight status diagnosis in epidemiological studies and population surveys [6,7,8]. In addition, validity studies have shown a high correlation between self-reported and measured weight and height, in the classification of weight status [8,9,10,11,12]. However, sociocultural, demographic, and economic characteristics, as well as differences in study design and sampling, could produce differences in the agreement between self-reported and measured data, thus limiting the inference of the results for specific population groups [9,13,14,15].

The aim of this study was to evaluate the validity of self-reported weight and height to determine weight status according to selected demographic and socioeconomic variables used to assess participants in the PNS.

Methods

Study design

This study used data from the PNS 2013, which is a Brazilian household-based nationwide survey carried out by the Ministry of Health and by the Brazilian Institute of Geography and Statistics (IBGE) [16,17]. The number of households selected for the sample was greater than the minimum necessary to compensate for non-response and incorrect classifications of the units in the selection register [18]. Thus, the number of households selected for the sample was 81,357, with 62,658 households expected to be interviewed. Of these, the total number of occupied households with a resident selected for the interview was 69,954. The response rate of the selected residents was 86%. Thus, the total number of households interviewed was 60,202.

Interviewees were at least 18 years old. They were selected using stratified sampling and a three-stage clustering process: census tracts (primary stage), households (second stage), and adults (third stage) [18]. Only participants who had complete information for self-reported and measured weight and height (n = 40,366) were included in this study. More details about the study design, data collection [16,17], and sampling design [18] have been published elsewhere. For this study, a database was extracted on June 30, 2016 from the IBGE website (http://www.ibge.gov.br/home/estatistica/populacao/pns/2013/default_microdados.shtm) and participants were not identified.

PNS was approved by the National Ethics Commission for Research Involving Human Beings of the Ministry of Health (report number 10853812.7.0000.0008). Informed consent was obtained from all participants in all stages of the survey.

Data collection

PNS data were collected using a questionnaire that was divided into three parts: (1) characteristics of the household; (2) social and economic characteristics of all household inhabitants, including education level, income, and health status; and (3) characteristics of the individual respondent, focusing on morbidity and lifestyle. The first two parts were answered by the same adult from the household. The third part was collected from an adult who was selected with equal probability from all adult residents in the household. Details about the questionnaires were published by Damacena et al. [17] and Szwarcwald et al. [16]. The questionnaire is available from the PNS website (http://www.pns.icict.fiocruz.br).

Self-reported and measured anthropometric data

Self-reported weight and height information were obtained from a questionnaire about lifestyle during an in-person interview using the following questions, with answers recorded in kilograms (kg) and meters (m): "Do you know how much you weight (approximately)?" and "Do you know how tall you are (approximately)?".

The measures were obtained according to the protocols followed by the POF (IBGE). Body weight and height were performed twice using portable scale and stadiometer, respectively, with individuals wearing light clothes and no shoes. Body weight was measured with individuals standing fully upright on the scale platform, the weight equally distributed on both feet, arms freely alongside the body. Individuals were also instructed to remove accessories and items from their pockets on pants, skirt, or shirt. For the stature measure, individuals were positioned in the stadiometer, maintaining the head in the Frankfurt plane with hands facing the body and with their heels, calves, hips and the back of the head touching the back support [19].

The mean of the two measurements was used when the differences between them were ≤ 0.5kg for weight and ≤ 1cm for height. All field researchers were trained by the Laboratory of Nutritional Assessment of Populations at the School of Public Health of the University of São Paulo [16,17].

Body mass index (BMI, kg/m^2) was estimated for both self-reported and measured weight and height. For adolescents (subjects younger than 20 years old), sex- and age-specific BMI z-scores were calculated and classified into the following categories: underweight (< -2 z-scores), normal weight (≥ -2 to ≤ +1 z-scores), overweight (> +1 to ≤ +2 z-scores), and obese (> +2 z-scores), as proposed by the World Health Organization [20]. For adults (between 20 and 59 years old), BMI was classified into the following categories: underweight (< 18.5kg/m^2), normal weight (≥ 18.5 to < 25kg/m^2), overweight (≥ 25 and < 30kg/m^2), and obese (≥ 30kg/m^2) [21]. For elderly individuals (60 years or older), BMI classifications were as follows: underweight (< 22kg/m^2), normal weight (≥ 22 to < 27kg/m^2), overweight (≥ 27kg/m^2) [22].

Data analysis

Continuous variable distributions were verified using the Kolmogorov-Smirnov test. To compare self-reported and measured weight, height, and BMI mean values, we used a paired Student's t-test for all individuals and then stratified by sex, age group, education level and household location.

The agreement between self-reported and measured weight and height was evaluated using the intraclass correlation coefficient (ICC) and respective 95% confidence interval (95%CI). The ICC estimates the proportion of the total variability that can be attributed to the variability between individuals. Agreement was considered high when the ICC was greater than 0.75 [23].

The Bland-Altman method was used to evaluate the mean difference between self-reported and measured data (mean agreement) and provide an interval that contains 95% of the individual differences between the two data (limits of agreement, LOA). Additionally, linear regression was

performed to investigate if the agreement between self-reported and measured weight and height values was influenced by their magnitude. For these analyses, the difference between the data was considered the dependent variable and the mean value of the anthropometric information was the independent variable [24].

The agreement between weight status (underweight, normal weight, overweight, and obese; classified according to BMI estimated from self-reported and measured data) was determined using a weighted kappa coefficient, which was categorized as follows: no agreement (0.00 or less), poor agreement (0.01-0.20), slight agreement (0.21-0.40), fair agreement (0.41-0.60), good agreement (0.61-0.80), very good agreement (0.81-0.92), and excellent agreement (0.93-1.00) [25]. Moreover, exact agreement (in the same category) for self-reported and measured weight status categories was also estimated. Sensitivity and specificity were calculated for self-reported BMI to classify individuals as overweight (BMI ≥ 25kg/m^2) and obese (BMI ≥ 30kg/m^2). The BMI obtained from measured anthropometric data was considered the reference value.

We included the following co-variables in the analysis: sex, age group (adolescents: 18-19 years, adults: 20-59 years, elderly individuals: ≥ 60 years), education level (no education/some elementary school, elementary school/some high school, high school/some college, college degree), and household location (urban area and rural area).

All estimates considered the complex sample and study design effect. Statistical analyses were performed using the IBM SPSS for Windows (IBM Corp., Armonk, USA) and SAS (version 9.3; SAS Inst., Cary, USA).

Results

Weighted percentages indicate that 52.9% of the individuals were women and 77.1% were adults. The most frequently reported level of education was no education/some elementary school (38.9%).

Weight, height, and BMI distributions were symmetric ($p > 0.05$; Kolmogorov-Smirnov test). Table 1 shows the mean values of measured and self-reported weight, height, and BMI according to sociodemographic characteristics. There were negligible significant differences between self-reported and measured weight, height and BMI for all characteristics analyzed ($p < 0.001$). On average, women and adolescents slightly underestimated their weights by 1% and 1.1%, respectively, while, elderly respondents overestimated their height by 1.23%. Among women and elderly individuals, these differences resulted in underestimated BMI variations that were greater than 2%. Individuals with college degree underestimated their weight by 1.28%.

Table 2 shows the agreement between self-reported and measured weight, height, and BMI. ICC values indicate high agreement (> 0.88, BMI for elderly individuals) for all sexes, age groups, education levels, and household location.

According to the Bland-Altman method (Table 3), the mean agreement was 99.6% for weight (LOA: 82% and 120.9%), 100.5% for height (LOA: 95.3% and 105.9%), and 98.6% for BMI (LOA: 80% and 121.6%). Similar results were observed across all categories of evaluated variables. Table 3 also shows that the agreement between self-reported and measured data may be somewhat influenced by the magnitude of weight ($\beta = -0.011$; $p < 0.01$), height ($\beta = 0.008$; $p < 0.01$), and BMI ($\beta = -0.025$; $p < 0.01$).

The weighted kappa coefficient revealed good agreement (kappa varied from 0.66 to 0.74 across the categories of analyzed variables) for weight status categories classified from self-reported and measured data for all independent variables evaluated. For the total sample, the exact agreement between the weight status categories was 77%, with low variation among sociodemographic characteristics (Table 4).

Table 4 also shows the sensitivity for determining overweight and obesity from self-reported weight and height. Sensitivity was found to be high for all participants (83% to detect overweight and 73.4% to detect obesity), although it was higher for men (85.1% and 75.7%) than for women (80.8% and 71.6%), higher for adults (84.4% and 73.8%) than for adolescents (70.6% and 55.7%) and elderly respondents (75.6%, no obesity classification). By education level, the sensitivity for the detection of overweight status was lower for individuals with no education/some elementary school (81.7%)

Table 1

Mean, difference and relative difference between measured and self-reported weight, height, and body mass index values, according to the variables of interest from the 2013 *Brazilian National Health Survey* (n = 40,366).

Characteristics	Weight (kg)		Height (m)		Body mass index (kg/m²)	
	Measured	Self-reported	Measured	Self-reported	Measured	Self-reported
Total	71.59	71.27	1.65	1.66	26.48	26.12
Sex						
Male	76.68	76.75	1.72	1.72	26.28	26.17
Female	66.88	66.21	1.59	1.60	26.70	26.06
Age						
Adolescents	64.52	63.82	1.68	1.68	22.94	22.68
Adults	72.51	72.12	1.66	1.67	26.55	26.23
Elderly	69.27	69.37	1.62	1.64	27.06	26.46
Education level						
No education/Some elementary school	69.94	69.74	1.63	1.65	26.79	26.41
Elementary school/Some high school	71.38	71.14	1.65	1.66	26.43	26.08
High school/Some college	72.54	72.31	1.67	1.67	26.28	25.99
College degree	73.84	72.89	1.67	1.68	26.42	25.89
Household location						
Urban area	72.10	71.79	1.66	1.66	26.56	26.19
Rural area	68.11	67.71	1.64	1.65	25.79	25.43

	Weight (kg)		Height (m)		Body mass index (kg/m²)	
	Difference *	Relative difference (%)	Difference *	Relative difference (%)	Difference *	Relative difference (%)
Total	-0.32	0.45	0.01	0.61	-0.36	1.38
Sex						
Male	0.07	0.09	0.00	0.00	-0.11	0.43
Female	-0.67	1.00	0.01	0.63	-0.64	2.37
Age						
Adolescents	-0.70	1.08	0.00	0.00	-0.26	1.10
Adults	-0.39	0.53	0.01	0.60	-0.32	1.22
Elderly	0.10	0.14	0.02	1.23	-0.60	2.25
Education level						
No education/Some elementary school	-0.20	0.28	0.02	1.23	-0.38	1.40
Elementary school/Some high school	-0.24	0.33	0.01	0.60	-0.35	1.31
High school/Some college	-0.23	0.32	0.00	0.00	-0.29	1.12
College degree	-0.95	1.28	0.01	0.60	-0.53	2.07
Household location						
Urban area	-0.31	0.43	0.00	0.00	-0.37	1.39
Rural area	-0.40	0.59	0.01	0.61	-0.36	1.40

* Self-reported minus measured weight as tested by paired Student's t-test. All differences had p-values of < 0.01.

Table 2

Intraclass correlation coefficient, 95% confidence interval (95%CI) and correlation between self-reported and measured weight, height, and body mass index according to the variables of interest from the 2013 *Brazilian National Health Survey* (n = 40,366).

	Weight ICC		Height ICC		BMI ICC	
	Value	95%CI	Value	95%CI	Value	95%CI
Total	0.94	0.94-0.94	0.95	0.95-0.95	0.90	0.90-0.90
Sex						
Male	0.93	0.93-0.93	0.92	0.92-0.92	0.90	0.90-0.90
Female	0.92	0.92-0.92	0.90	0.90-0.90	0.90	0.90-0.90
Age						
Adolescents	0.95	0.95-0.95	0.95	0.95-0.95	0.91	0.91-0.91
Adults	0.93	0.93-0.93	0.95	0.95-0.95	0.90	0.90-0.90
Elderly	0.93	0.93-0.93	0.92	0.92-0.92	0.88	0.88-0.88
Education level						
No education/Some elementary school	0.92	0.92-0.92	0.91	0.91-0.91	0.88	0.88-0.88
Elementary school/Some high school	0.95	0.95-0.95	0.95	0.95-0.95	0.91	0.91-0.91
High school/Some college	0.94	0.94-0.94	0.96	0.96-0.96	0.91	0.91-0.91
College degree	0.94	0.94-0.94	0.97	0.97-0.97	0.91	0.91-0.91
Household location						
Urban area	0.93	0.93-0.93	0.95	0.95-0.95	0.90	0.90-0.90
Rural area	0.94	0.94-0.94	0.92	0.92-0.92	0.90	0.90-0.90
	Weight Correlation		Height Correlation		BMI Correlation	
	r	p-value	r	p-value	r	p-value
Total	0.88	< 0.001	0.90	< 0.001	0.82	< 0.001
Sex						
Male	0.87	< 0.001	0.85	< 0.001	0.82	< 0.001
Female	0.85	< 0.001	0.82	< 0.001	0.82	< 0.001
Age						
Adolescents	0.91	< 0.001	0.90	< 0.001	0.84	< 0.001
Adults	0.88	< 0.001	0.91	< 0.001	0.82	< 0.001
Elderly	0.86	< 0.001	0.85	< 0.001	0.78	< 0.001
Education level						
No education/Some elementary school	0.85	< 0.001	0.84	< 0.001	0.79	< 0.001
Elementary school/Some high school	0.90	< 0.001	0.90	< 0.001	0.84	< 0.001
High school/Some college	0.89	< 0.001	0.92	< 0.001	0.83	< 0.001
College degree	0.89	< 0.001	0.93	< 0.001	0.81	< 0.001
Household location						
Urban area	0.88	< 0.001	0.90	< 0.001	0.82	< 0.001
Rural area	0.89	< 0.001	0.85	< 0.001	0.82	< 0.001

BMI: body mass index; ICC: intraclass correlation coefficient.

compared with all other levels of education. However, for the detection of obesity, sensitivity values were higher for individuals who had a college degree (76.6%). According to the household location, the sensitivity to detect overweight status was higher for individuals that lived in urban areas than for those in rural areas (83.3% versus 79.3%), for the detection of obesity the sensitivity was lower in urban areas (74.2% versus 73.4%).

Table 3

Mean agreement and limits of agreement (LOA) of measured and self-reported weight and height according to the variables of interest from the 2013 *Brazilian National Health Survey* (n = 40,366)

	Mean agreement (%)	LOA *	β **	p-value ***
Weight #				
All	99.6	82.0-120.9	-0.011	< 0.01
Sex				
Male	100.3	83.5-120.4	-0.032	< 0.01
Female	98.9	80.8-121.2	-0.021	< 0.01
Age				
Adolescents	99.1	83.2-117.9	-0.043	< 0.01
Adults	99.5	82.1-120.6	-0.005	0.04
Elderly	100.1	81.4-123.0	-0.033	< 0.01
Education level				
No education/Some elementary school	99.7	80.7-123.1	-0.009	0.02
Elementary school/Some high school	99.6	82.3-120.5	-0.010	0.07
High school/Some college	99.5	82.7-119.8	-0.008	0.03
College degree	99.1	81.9-119.8	0.000	0.94
Household location				
Urban area	99.5	81.6-121.4	-0.008	< 0.01
Rural area	99.4	82.5-119.6	-0.012	0.02
Height *				
All	100.5	95.3-105.9	0.008	< 0.01
Sex				
Male	100.3	95.5-105.4	0.037	< 0.01
Female	100.7	95.2-106.4	0.056	< 0.01
Age				
Adolescents	100.2	95.3-105.3	0.014	0.25
Adults	100.4	95.5-105.5	0.016	< 0.01
Elderly	101.1	94.8-107.9	0.009	0.23
Education level				
No education/Some elementary school	100.7	94.3-107.5	0.028	< 0.01
Elementary school/Some high school	100.5	95.2-106.0	0.014	0.02
High school/Some college	100.4	96.0-105.0	0.002	0.63
College degree	100.3	96.3-104.5	-0.010	0.03
Household location				
Urban area	100.5	95.4-105.9	0.002	0.35
Rural area	100.5	94.7-106.7	0.033	< 0.01
BMI #				
All	98.6	80.0-121.6	-0.025	< 0.01
Sex				
Male	99.7	82.0-121.2	-0.026	< 0.01
Female	97.7	78.4-121.7	-0.024	< 0.01
Age				
Adolescents	98.7	81.9-119.0	-0.069	< 0.01
Adults	98.8	80.3-121.5	-0.024	< 0.01
Elderly	97.9	78.1-122.6	-0.018	0.03

(continues)

Table 3 (continued)

	Mean agreement (%)	LOA *	β **	p-value ***
BMI #				
Education level				
No education/Some elementary school	98.5	78.3-123.9	-0.014	0.02
Elementary school/Some high school	98.7	80.0-121.9	-0.033	< 0.01
High school/Some college	98.8	81.1-120.3	-0.031	< 0.01
College degree	98.5	80.9-119.9	-0.022	< 0.01
Household location				
Urban area	98.7	80.0-121.6	-0.025	< 0.01
Rural area	98.5	79.9-121.3	-0.024	0.01

BMI: body mass index.

* LOA was determined the mean difference ± 1.96 x standard deviation of the differences.

** Slope of the differences between the methods regressed on the averages of the methods (H0: β = 0; α = 0.05);

*** Statistical significance of β;

Data were log-transformed for the agreement analysis.

Table 4

Agreement (weighted kappa) and correlation of weight status * classification, sensitivity and specificity using self-reported and measured weight and height, according to the variables of interest from the 2013 *Brazilian National Health Survey* (n = 40,366).

	Kappa **	Exact agreement (%)	Sensitivity		Specificity	
			Overweight (%)	Obesity (%)	Overweight (%)	Obesity (%)
Total	0.70	77.0	83.0	73.4	87.5	96.7
Sex						
Male	0.71	78.0	85.1	75.7	86.2	96.5
Female	0.70	76.0	80.8	71.6	88.9	96.8
Age						
Adolescents	0.68	87.0	70.6	55.7	95.1	99.2
Adults	0.70	77.0	84.4	73.8	86.4	95.7
Elderly	0.66	76.0	75.6	***	89.3	***
Education						
No education/Some elementary school	0.68	75.0	81.7	73.9	85.6	96.8
Elementary school/Some high school	0.71	78.0	83.6	72.6	88.5	95.8
High school/Some college	0.71	78.0	83.9	72.2	87.6	93.9
College degree	0.74	81.0	83.0	76.6	90.2	97.5
Household location						
Urban area	0.70	77.4	83.3	73.4	87.5	96.7
Rural area	0.68	75.7	79.3	74.2	87.8	96.3

* By body mass index;

** p < 0.01;

*** The weight status classification does not consider obesity for elderly individuals.

Conversely, the specificity for the detection of non-overweight and non-obesity was also considered high for the whole sample (87.5% and 96.7%, respectively). The values obtained were higher for women (88.9% and 96.8%) than for men (86.2% and 96.5%) and for adolescents (95.1% and 99.2%) compared with adults (86.4% and 95.7%) and elderly respondents (89.3%). By education level, the

specificity for the detection of non-overweight status was lower for individuals with no education/some elementary school (85.6%) compared with other education levels; for the detection of non-obesity, specificity was higher for individuals who had a college degree (97.5%) (Table 4). By the household location, the specificity was similar among urban and rural areas for the detection of non-overweight (87.5% and 87.8%, respectively) and non-obesity (96.7% and 96.3%, respectively).

Discussion

This study demonstrated that self-reported weight and height can be used as proxies of measured values in the Brazilian population ≥ 18 years old. High agreement was observed between measured and self-reported anthropometric information, according to various statistical methods for assessing agreement with small variations across the categories of sex, age group, education level, and household location. Comparable results were observed in studies conducted in Brazil [14,26,27,28,29] and in the United States [30], which showed high agreement between self-reported and measured values. Each self-reported anthropometric variable that we examined was informative about actual height and weight data and could be used to conduct epidemiological analyses in Brazil.

According to the Bland-Altman method, the agreement between self-reported and measured weight and height values may be influenced by their magnitude, although this influence seems to be negligible (β = -0.025). The Bland-Altman test emphasized the variability of the differences between values under comparison. This approach is not always used in the validation of measurements; however, it is essential to evaluate the magnitude of any problems resulting from the use of self-reported weight and height to estimate of weight status [14,26].

Good agreement was observed for the classification of weight status estimated from self-reported and measured weight and height examined by the weighted kappa coefficient, even when stratified by sociodemographic variables. Our study showed no trend by age, but agreement was directly related to education level. The exact agreement observed in this study between the categories of weight status was considered high (77%), with low variations based on sociodemographic characteristics (from 75% to 87%). These results are similar to a study that reported an exact agreement of 83.4% [30]. Comparable studies in Brazil and in US also found good agreement [14,30] for the weight status classification, although moderate agreement was observed for elderly individuals and people with low education levels [14].

In general, in our study, self-reported weight and height were satisfactory in the classification of weight status using the BMI, since sensitivity and specificity to detect overweight and obesity were considered high consonant with findings observed in other national [13,14,26,27,28,31] and international studies [9,30]. However, adolescents had the lowest sensitivity to detect obesity (55.7%), differently from the sensitivity to detect overweight (70.6%). Adolescents may be influenced by variations in anthropometric measures because of the growth process in course during this phase of life. Adolescents reported their measures based on a previous measurement, therefore, there may have been variation in weight and height between the last measurement and the time of the study. Additionally, it is reasonable to suppose that anthropometric variables may not have been taken frequently. Thus, the combination of growth and long time since the last measurement may result in an outdated information on weight and height and may have influenced the classification of the weight status and the sensitivity to detect obesity. Thus, when the goal of a study is to detect obesity in this age group, self-reported measures should be interpreted with caution.

Regarding sociodemographic characteristics, both sensitivity and specificity showed high values to detect overweight (sensitivity > 70.6%; specificity > 85.6%) and obesity (sensitivity > 71.6%, except for adolescents, which was 55.7%; specificity > 93.9%), similarly to findings of other studies [9,14,26,27,32]. Therefore, individuals can report reliably their weight status independently of sex, age group, education level and household location, except in the case of adolescents, for whom the detection of obesity presented less sensitivity and for low-educated individuals. Comparable results concerning age and sex were observed in other studies [9,14,26,27,31], nevertheless, Oliveira et al. [31] estimated sensitivity of 91.2% for low-educated individuals and of 75% for high-educated ones in the detection of overweight. However, the authors indicated that their study presented limitations, as it was based on

a non-probabilistic sample and there was a considerable time gap between the measured and self-reported measures.

Although statistically significant, proportional differences between measured and self-reported information were negligible for weight, height, and BMI (lowest difference: 0.09%; greatest difference: 2.37%) and could be influenced by the sample size. These findings were similar to those observed in other studies [13,14,26,28,30,32,33,34,35].

Adolescents and individuals with college degree underestimated their weight. As for adolescents, similarly to studies carried out in Spain [36] and Brazil [15], this discrepancy could be related to dissatisfaction with body image [15,36] and/or a lack of knowledge regarding current weight because of the rapid body changes that are characteristic in this life stage [15]. Individuals who had a college degree may be subjected to greater sociocultural pressure to achieve the desirable standards of thinness [37]. On the other hand, elderly people overestimated their height. This inaccuracy in self-reported height may be associated with age-related changes in height because of the compression of intervertebral discs and diminished vertebral bone mineral content. Furthermore, elderly people generally do not measure regularly their height [26].

Our study had some limitations. First, the results should be applied with caution when considering other explanatory variables or other categories of exposure not evaluated in this study. Additionally, the use of these self-reported measures should be considered as continuous variables or for testing associations due to the possibility of misclassification, as well as possible bias in the results due to variability in the differences between the measured values. Caution is recommended when the objective is to diagnose obesity in adolescents using self-reported measures. Moreover, minor differences observed between self-reported and measured anthropometric variables may be related to the report of a measure obtained in the past. Therefore, data that include the date of the last direct measurement may be useful for adjustment of the estimators. Additionally, anthropometric measures were performed in the households of the participants at different moments of the day and did not follow rigid protocols that recommend, for example, fasting and emptied bladder for standardized weight measurement. Finally, the age categories (adolescents, adults and elderly) used in this study might hinder the comparison with studies that classify as adults those individuals older than 18 years old.

The strengths of our study are the use of a nationally representative sample and of different statistical methods to analyze the validity of self-reported weight and height across categories of sociodemographic variables. These results could be helpful in planning and developing new surveys focused on health and anthropometric data.

In conclusion, our study supports that self-reported weight and height can be used as valid alternatives to estimate the weight status of a Brazilian population ≥ 18 years old when financial or logistic restrictions prevent the collection of measured weight and height, considering the sociodemographic characteristics evaluated in this study.

Contributors

N. F. Moreira contributed in the article concept, design, analysis, interpretation of data, and drafting of the manuscript. V. G. Luz and C. C. Moreira contributed in the interpretation of data and drafting of the manuscript. R. A. Pereira, R. Sichieri and M. G. Ferreira contributed in the critical revision of the manuscript for important intellectual content. A. P. Muraro contributed in the article concept and critical revision of the manuscript for important intellectual content. P. R. M. Rodrigues contributed in the article concept, design, analysis, interpretation of data, and critical revision of the manuscript for important intellectual content.

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Resumo

As medidas autorreferidas têm sido utilizadas em alguns inquéritos epidemiológicos para obter informações sobre peso e altura. A validação dessas informações é necessária para garantir a qualidade dos dados. Este estudo avaliou a validade do peso e altura autorreferidos para determinar o nível de peso corporal. Os dados foram obtidos da Pesquisa Nacional de Saúde *(PNS), um inquérito domiciliar com abrangência nacional, realizado em 2013. Na PNS, 40.366 indivíduos (idade ≥ 18 anos) forneceram dados autorreferidos sobre peso e altura. O teste t de Student foi usado para verificar as diferenças entre os dados autorreferidos e os diretamente mensurados. A concordância entre as medidas foi obtida pelo coeficiente de correlação intraclasse (CCI) e pelo método de Bland-Altman. Para avaliar as categorizações de peso corporal, foram utilizados o coeficiente kappa ponderado e a concordância exata. Foram estimadas a sensibilidade e a especificidade dos dados autorreferidos na classificação dos indivíduos com sobrepeso e obesidade. Houve alta concordância entre peso, altura e índice de massa corporal auto-referidos e os mesmos indicadores medidos diretamente (CCI > 0,88). As médias de concordância estimadas pelo método de Bland-Altman foram 99,6% para peso e 100,6% para altura. O coeficiente kappa ponderado mostrou concordância substancial entre as categorias de peso corporal (> 0,66); a concordância exata era 77%. A sensibilidade e especificidade para sobrepeso (83% e 87,5%, respectivamente) e obesidade (73,4% e 96,7%, respectivamente) foram consideradas altas para as características sociodemográficas avaliadas. De acordo com nossos resultados, o peso e altura autorreferidos podem ser utilizados com cautela, enquanto alternativas válidas para determinar o nível de peso corporal.*

Autorrelato; Antropometria; Inquéritos de Saúde; Reprodutibilidade dos Testes

Resumen

Las medidas autoinformadas se han usado para obtener información sobre el peso y altura en algunas encuestas epidemiológicas. La validación de tal información es necesaria para garantizar la calidad de la información. Este estudio evaluó la validez del peso y altura autoinformados para determinar el estado de peso. Los datos fueron obtenidos en la Encuesta Nacional de Salud Brasileña, *una encuesta a nivel nacional, realizada en los hogares brasileños y llevada a cabo en 2013. En esta encuesta, 40.366 individuos (con una edad de ≥ 18 años) proporcionaron información autoinformada sobre su peso y altura. Se usó una prueba t de Student con el fin de verificar las diferencias entre los datos autoinformados y los datos con medición. La concordancia entre las medidas se obtuvo usando un coeficiente de correlación intraclase y el método de Bland-Altman. Para evaluar las variaciones en las categorizaciones del estado de peso, se usó coeficiente ponderado de kappa y la concordancia exacta. La sensibilidad y la especificidad se estimaron por la información autoinformada para clasificar a los individuos con sobrepeso y obesos. Hubo una alta concordancia entre quienes lo autoinformaron y a quienes se les tomó el peso y la altura, además de su índice de masa corporal (CCI > 0,88). El promedio de concordancia estimado por el método de Bland-Altman method fue de un 99,6% para el peso y 100,6% para la altura. El coeficiente de kappa ponderado mostró una concordancia sustancial entre el estado de las categorías de peso (> 0,66); la concordancia exacta fue de un 77%. La sensibilidad y especificidad para el sobrepeso (un 83% y 87,5%, respectivamente) y la obesidad (un 73,4% y 96,7%, respectivamente) fueron consideradas altas por las características sociodemográficas evaluadas. De acuerdo con nuestros resultados, las medidas autoinformadas de peso y altura pueden ser usadas con precaución como alternativas válidas para determinar el estado nutricional.*

Auto Relato; Antropometría; Encuestas Epidemiológicas; Reproducibilidad de Resultados

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