


Comparison between self-image and body mass index among children living in a slum in Rio de Janeiro, Brazil, 2012*

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Abstract

Objective: To analyze agreement/discrepancy between body self-image and Body Mass Index (BMI), according to variables related to type of food and environment influence. **Methods:** This was a cross-sectional analysis of 195 prepubescent children (≥ 5 years), attending a Primary Health Care service in Manguinhos, Rio de Janeiro. Z-scores were applied to classify BMI. Self-image was collected using the figure rating scale (silhouettes) validated for children. A multinomial model was used to estimate covariate association with the underestimated/overestimated BMI outcome in relation to self-image. **Results:** Overweight children underestimated their BMI, as compared with self-image, more often (58.6%) than obese children (22.0%) and children with adequate BMI (49.0%). This dissociation was correlated to participation in a cash transfer program (OR=2.01 – 95%CI 1.04;3.90) and daily consumption of sugar-sweetened foodstuffs (OR=3.88 – 95%CI 1.05;14.39). **Conclusion:** Underestimation of BMI among overweight children should be taken into account by Primary Health Care services, in order to enhance intervention practices.

Keywords: Body Image; Childhood Obesity; Body Mass Index; Primary Health Care.

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Introduction

Childhood obesity prevalence has been increasing globally since 1980. Low-income groups in developing countries are especially affected by this phenomenon.^{1,2} The main strategy in Primary Health Care (PHC) service routines for care provision to overweight children is giving guidance to their families on choosing adequate food after these children have undergone nutritional assessment. This is not, however, a simple task. Parents frequently underestimate their children's body mass index (BMI), see their large bodies as being healthy, according to a culturally conditioned perception.^{3,4-12} Children's body image is also a product of the influence of their families, either because adults who are closer to them have body types with which children identify, or because adults encourage specific self-perception, through praise or criticism.⁵

Body image results from physical appearance and mental representation of the size and shape of one's body, arising from experiences, actions, words or attitudes directed towards it.

Body image results from physical appearance and mental representation of the size and shape of one's body, arising from experiences, actions, words or attitudes directed towards it. Symbolic and subjective aspects, such as affection, values and life history, are also present in body image rating. In addition, where overweight is highly prevalent, popular culture will tend to be based on BMI ratings above those recommended as being healthy.

Assessment of agreement/discrepancy between body image and BMI is essential, both in relation to overestimation, common among adolescents,^{6,7} and also in relation to underestimation, to the extent that body image and BMI can influence actions intended to promote healthy weight. Gender is the main aspect of self-perception in all domains.⁸ Composition of the family and cultural context is related to body image rating. Higher levels of maternal schooling and higher

income are factors associated with perception of body image closer to measured BMI.⁵

Other factors should be taken into consideration when planning interventions aimed at families, in order to promote adoption of healthy eating habits. In the majority of developing countries, traditional diets have been abandoned in favor of industrialized and predominantly ultra-processed products,⁹ partly due to a profound change in the role of women in those societies. In poorer regions, women are more frequently the financial providers of their households, with little time available for domestic chores, including cooking.⁸ Moreover, access to industrialized foods can symbolize a process of social climbing and improved living conditions: for example, despite the availability of balanced and varied food in Brazilian state schools, the number of children who refuse free school meals is higher among groups with higher relative income.¹⁰ Advertising, whether direct or subliminal, encourages the desire for industrialized and processed foods, as a representation of health and happiness, associated with images of perfect, healthy and happy bodies.¹¹

The relationship between factors associated with children being overweight and mistaken perception of their weight status is little studied in developing countries. In Brazil, research shows how body culture values large bodies.¹² Higher self-esteem has also been found among overweight children who underestimate their body mass.⁶ A study conducted in 2012 in the Manguinhos *favela*, a neighborhood in Rio de Janeiro, found variable overweight between sexes/ages: 36% among women aged 20-29 years old; and 55% among men aged 30-59 years old.¹³ Among children aged 5-9 years old in the same community, 24.8% had above adequate weight.¹⁴

As far as we have been able to find, no article has been published assessing body image in low-income communities, although this is precisely the population at greater risk of obesity. A better understanding of children's perceptions could contribute to better care provision by primary health care centers, as a positive space for intervention due to their capillarity and integrality.

The objective of this study was to analyze agreement/discrepancy between body image and BMI classification among children living in a slum (*favela*), according to type of food and influence of the environment.

Methods

This is a cross-sectional study of an open cohort of 5-9 year-old children beginning in 2004, which sought to detect cardiovascular risk factors in adults. It studied children attending two PHC centers located in Manguinhos, Rio de Janeiro, RJ. This neighborhood is in 122th place with regard to its Human Development Index rating in relation to the municipality's 126 regions. The cohort of children has already been described in another article.¹⁴

To start with, the study's exclusion criterion was being pubescent, which was determined by self-assessment using the Tanner scales¹⁵ with the assistance of the researcher. This study consisted of the analysis of data on pre-pubescent children aged 5 or over who were interviewed in 2012, when they answered the food frequency questionnaire. Due to the length of this instrument, it was not possible to administer it with 158 (47.5%) out of the total number of children, so that in the end there were 195 child respondents. The data analyzed are available in a supplementary file.

BMI was classified according to the World Health Organization z-scores,¹⁶ by sex and age: underweight (z-score <-2); adequate weight (z-score >-2 and <+1); overweight (z-score >+1 e <+2); and obesity (z-score >2). Anthropometric assessment was performed when the study data were collected. Weight was measured using Filizola™ scales, with 100g grading, with children wearing light clothes and no shoes.

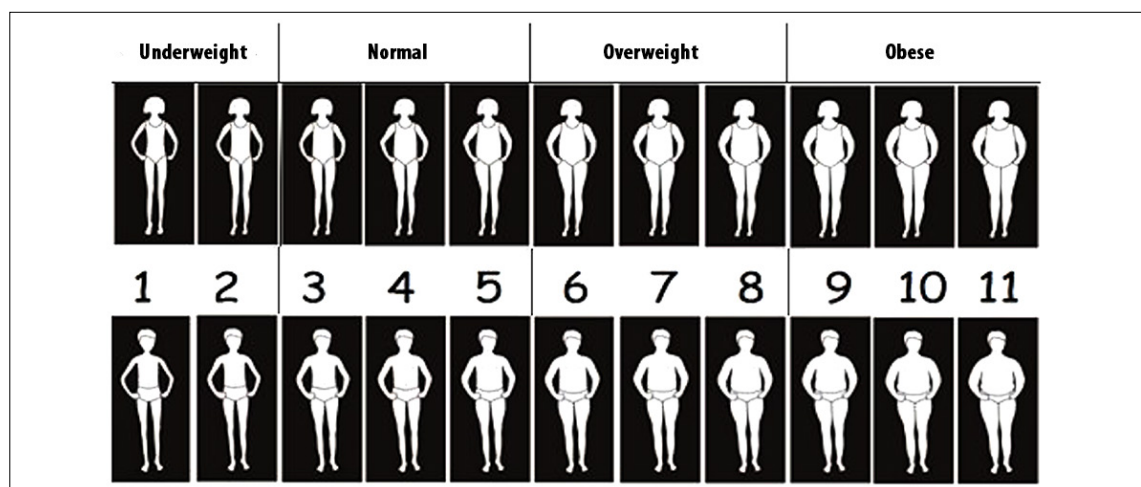
Height was measured with an anthropometric tape measure, with 1mm grading, fastened to the wall with the child against it and with its head positioned as per the Frankfurt plane.

Body image was obtained using a figure (silhouette) rating scale for children, this being a research instrument developed and assessed by Kakeshita et al.,¹⁷ comprised of 11 silhouettes representing children's bodies with BMI varying between 12 and 29.85kg/m². Classification was based on the BMI intervals adopted by Kakeshita's scale, and these values were compared with the World Health Organization 2007 reference for BMI values (Figure 1). In this way it was possible to associate the self-image chosen by each child with the BMI detected for them. The silhouettes were positioned on cards, starting with the smallest size through to the largest, and the children were invited to choose the silhouette they considered to be the closest to their bodies.

In this way, each child's BMI classification was compared with its body self-image classification, thus identifying overestimation (self-image >BMI), underestimation (self-image <BMI) and adequate classification (self-image = BMI).

Factors potentially related to the degree of compatibility between body image and BMI were selected, and are described below, taking as a reference the theoretical model developed in a previous study.¹⁸

Maternal schooling (in years of study: less than 4; between 4 and 11; 12 years or more), indicative of



Source: Adapted from Kakeshita et al.¹⁷

Figure 1 – Children's figure rating scale based on body mass index (BMI) intervals

access to information, followed the usual levels of the Brazilian education system, later consolidated into two categories (up to 11; 12 or over).

Being registered with the *Bolsa Família* cash transfer program identified extreme poverty. The following were selected to describe family structure: mother having a paid job (yes; no); presence of father in the household (yes; no); presence of grandmother in the household (yes; no).

Access to the internet at home and having school meals were used to assess consumer profile. This latter variable, inferred by the combination of information on the frequency and place of each meal, indicates not only an increase in purchasing power, but also attributes a value to ability to purchase industrialized food products.¹⁰

Eating patterns were based on frequency (daily or not daily) with which children consumed the following foods, taken from the qualitative questionnaire on food frequency as validated by Sichieri¹⁹ and used previously:¹⁸ fatty industrialized meat, industrialized sweet products and sugar-sweetened drinks, all of which were considered to be ultra-processed products.⁹

Trained researchers administered an electronic questionnaire with the participants. The descriptive analysis was stratified by sex. Association between the selected variables and degree of compatibility between body image and BMI was tested using Pearson's chi-square test, taking a 0.10 level of significance. This level of significance, in view of sample size, is the level that is possible and acceptable in an exploratory study. Association between the covariables – selected in this way – and the 'overestimated' or 'underestimated' nutritional status outcomes was estimated using a multinomial logistic regression model, taking body image adequacy and BMI as the base category. Odds ratios (OR) were estimated with 95% confidence intervals (95%CI). Comparison between self-image adequacy and BMI categories (adequate, overestimated and underestimated) was presented in graphs. R software was used for all the statistical analyses.²⁰

The initial study project was approved by the Research Ethics Committee of the 'Fernandes Figueira' National Women, Child and Adolescent Health Institute (CEP/IFF/Fiocruz: Process No. 001/2004) and by the Research Ethics Committee of the Sergio Arouca National Public Health School (CEP/ENSP/Fiocruz: Process No. 071/2007), with Certificate of Submission

for Ethical Appraisal No. 0072.0.031.013-07 issued on June 13th 2007. A project addendum, approved by CEP/ENSP/Fiocruz in 2007, authorized the participation of children in the 2012 study, provided their legal guardians signed a Free and Informed Consent form.

Results

One hundred and ninety-five pre-adolescent children were assessed, being 88 males and 107 females, all of whom were 5 years old or more.

Prevalence of overweight/obese children was 34.9%, and was proportionally higher among girls. Although no underweight children were detected in the sample, 20.0% of the children self-assessed themselves as being underweight and 34.3% considered themselves to be overweight or obese, more frequently among females (Tables 1).

The majority of the mothers had between 4 years (literacy only) and 11 years of study, the latter corresponding to complete middle school education (57.9%). Half the families were registered with the *Bolsa Família* program (50.3%). 47.7% of mothers had paid jobs outside the home. 89.2% of the children lived with their mothers. The father was present in 49.7% of the children's households, as were 21.5%, of their grandmothers. 44.1% of the children did not eat school meals. Daily consumption of sweet food products and sugar-sweetened drinks was found for 70.3% and 67.7% of the children, respectively. Traditional fatty meat was consumed daily by only 20.5% of the children.

Figure 2 shows agreement/discrepancy between body image and BMI, according to BMI classification categories. When comparing boys and girls in each of these categories, behavior was found to be similar, although the proportions of body image adequacy were always higher among boys.

Discrepancy between body image and nutritional assessment was greater in the group classified as being overweight. Body image classification among obese children was closer to their BMI in both sexes. More children classified as being in the normal BMI group self-assessed themselves to be underweight than overweight.

Only three variables were associated with discrepancy between body self-image and BMI, all of them in the sense of underestimation (Figure 3): being registered with the *Bolsa Família* program (p-value = 0.067),

Table 1 – Description of the characteristics of the sample of children (n=195) attending a Primary Health Care center, Manginhos, Rio de Janeiro, RJ, 2012

Variables	Male (88)		Female (107)		Total		p-value ^a
	n	%	n	%	n	%	
Nutritional assessment							0.279
Adequate	59	67.0	68	63.0	127	65.1	
Overweight	15	17.0	13	12.0	28	14.4	
Obesity	14	15.9	26	24.1	40	20.5	
Body image							0.160
Underweight	15	17.0	24	22.2	39	20.0	
Normal	48	54.5	41	38.0	89	45.6	
Overweight	12	13.6	21	19.4	33	16.9	
Obesity	13	14.8	21	19.4	34	17.4	
Maternal schooling (years of study)^b							0.832
<4	14	15.9	19	17.6	33	16.9	
4-11	53	60.2	60	55.6	113	57.9	
≥12	20	22.7	27	25.0	47	24.1	
Registered with the <i>Bolsa Família</i> program							0.835
No	45	51.1	52	49.1	97	49.7	
Yes	43	48.9	55	50.9	98	50.3	
Mother works outside the home^c							0.518
No	43	55.7	47	50.0	90	52.3	
Yes	39	44.3	54	50.0	93	47.7	
School meals							0.285
No	43	48.9	43	40.2	86	44.1	
Yes	45	51.1	64	59.8	109	55.9	
Lives with mother^d							0.635
Yes	77	87.5	97	89.8	174	89.2	
No	11	11.5	10	9.3	21	10.8	
Lives with father^d							0.346
Yes	40	45.5	57	53.3	97	49.7	
No	48	54.5	50	46.7	98	50.3	
Lives with grandmother^d							0.214
Yes	23	26.1	19	17.6	42	21.5	
No	65	73.9	88	88.2	153	78.5	
Fatty meat consumption							0.066
Not daily	68	77.3	87	87.3	155	79.5	
Daily	20	22.7	20	18.7	40	20.5	
Consumption of sweet products							0.918
Not daily	27	30.7	31	29.0	58	29.7	
Daily	61	69.3	76	71.0	137	70.3	

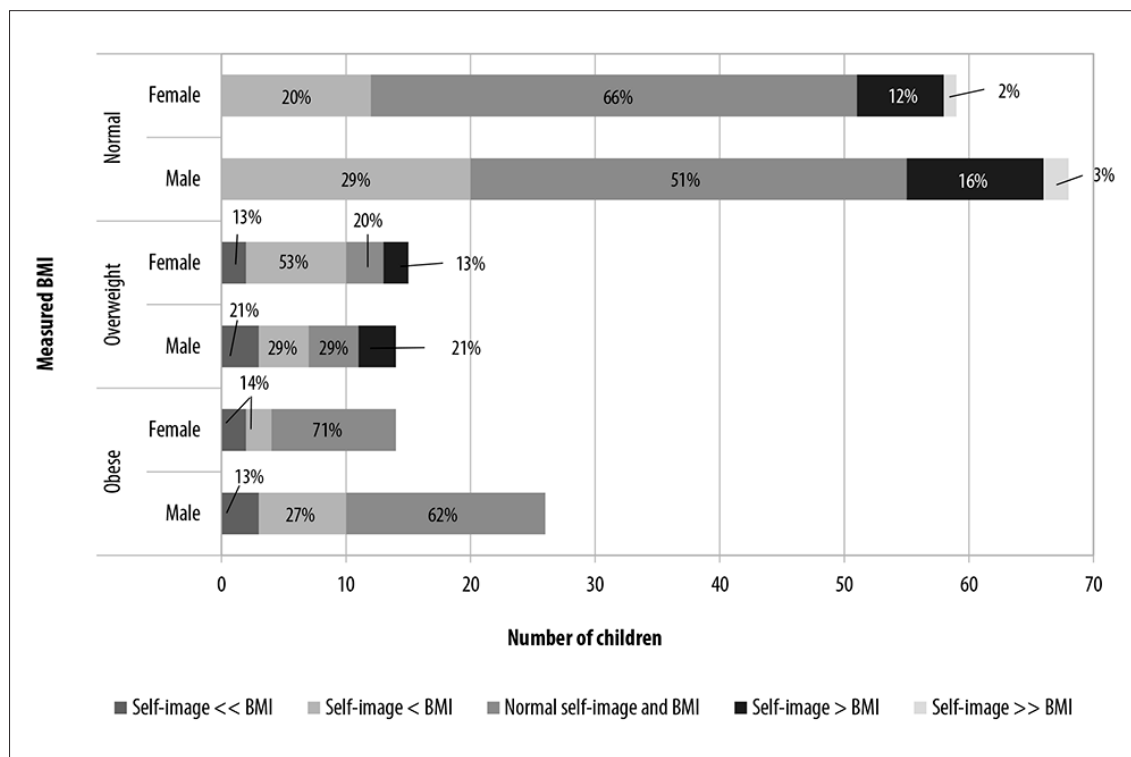
To be continue

Continuation

Table 1 – Description of the characteristics of the sample of children (n=195) attending a Primary Health Care center, Mangunhos, Rio de Janeiro, RJ, 2012

Variables	Male (88)		Female (107)		Total		p-value ^a
	n	%	n	%	n	%	
Consumption of sugar-sweetened drinks							1.000
Not daily	28	31.8	35	32.7	63	32.3	
Daily	60	68.2	72	67.3	132	67.7	

Notes: a) Teste do qui-quadrado de Pearson; b) Duas informações faltantes; c) 12 informações faltantes; d) A presença de cada familiar contada separadamente, para cada criança.



Note: a) BMI: body mass index.

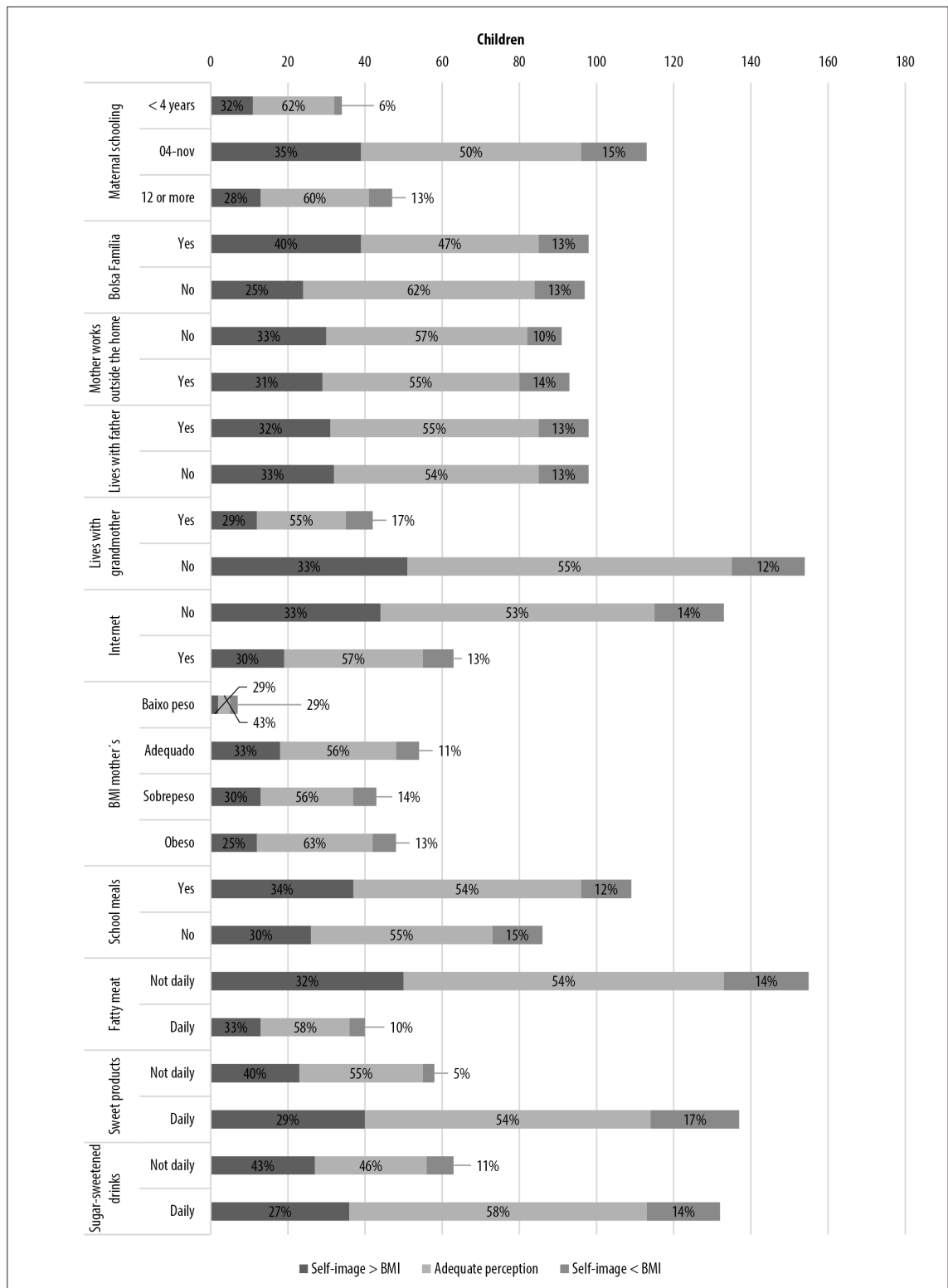
Figure 2 – Comparison between body image representation and BMI,^a by sex

daily consumption of industrialized sweet food products (p-value = 0.064) and sugar-sweetened drinks (p-value = 0.094).

BMI underestimation was most frequent among children whose families were registered with the *Bolsa Família* program. Children whose mothers had lower levels of education were those who most underestimated their BMI, although the difference was not statistically significant. However,

when the two categories of lower schooling were aggregated, the group with high school/university education had a greater proportion of adequate self-perception. Discrepancy between body image and BMI was slightly more frequent among children who ate school meals, although this association was not significant (Figure 3).

Over half the mothers worked outside the home. Mothers' job status did not result in differences between



Note: a) BMI: body mass index.

Figure 3 – Association of agreement/discrepancy between body self-image, BMI^a and selected variables, of children (n=195) attending a Primary Health Care center in Manguinhos, Rio de Janeiro, RJ, 2012

Table 2 – Association between overestimated or underestimated nutritional classification and selected variables among children (n=195) attending a Primary Health Care center, Manguinhos, Rio de Janeiro, RJ, 2012

Response categories	Overestimation versus adequate classification			Underestimation versus adequate classification		
	n	OR ^a	95%CI ^b	n	OR ^a	95%CI ^b
Registered with the <i>Bolsa Família</i> program (Yes)	13	1.60	0.67;3.80	39	2.01	1.04;3.90
Consumption of sweet products (daily)	23	3.88	1.05;14.39	40	1.02	0.50;2.07
Consumption of sugar-sweetened drinks	19	0.88	0.33;2.39	36	0.54	0.27;1.06

Notes: a) OR: odds ratio; b) 95%CI: 95% confidence interval.

agreement/discrepancy between self-perception of body and BMI. There was also no difference with regard to the presence of father or grandmother in the household, nor for use of the internet.

Consumption of ultra-processed food was frequent among the children assessed; and among those who did not consume these products every day, a substantial part (approximately 40.0%) underestimated their BMI classification. No association between body image and BMI agreement/discrepancy was found for consumption of more traditional fatty foods, such as sausages, mortadella, pork crackling etc. (Figure 3).

Table 2 shows the results of the multinomial logistic regression. Children whose families were registered with the *Bolsa Família* program, when compared to those who were not registered, were twice as likely to underestimate their BMI, when compared according to adequacy between self-image and BMI (OR=2.01 – 95%CI 1.04;3.90). In turn, among children who ate sweet food products every day, underestimated BMI was almost four times greater (OR=3.88 – 95%CI 1.05;14.39) when compared to children who consumed this type of food less frequently.

Discussion

This study was conducted using data on children living in a low-income community and found dissociation between body image – subjective assessment – and classification of nutritional status based on BMI – objective measurement.

The majority of studies assess children's body image according to their carers⁵ as well as mothers' perceived images of their children; moreover, only a few studies assess children in this age range. According to this study, overweight children underestimated their weight more frequently than obese children, in contrast to

other studies, in which obese children underestimated their BMI more frequently. Furthermore, sex was not associated with agreement/discrepancy between body image and BMI, this being a further difference in relation to other studies which found association between discrepancy/agreement and sex.^{7,21}

It should be noted that the figures forming the scale used were based on body images, built according to BMI values. They have been validated in Brazil and have high correlation with this indicator.¹⁷ One relevant aspect drew our attention: the cognitive ability of children to identify their body size with ideal body size when aged between 3 and 5 years old. Studies with Afro-American mothers showed preference for their children being overweight, valuing large bodies and underestimating degree of overweight.²² Individuals whose parents or colleagues are overweight are more likely to perceive themselves as being underweight²¹ and a large proportion of mothers underestimate the extent to which their children are overweight.⁴

Other studies have found association between lower socioeconomic status and underestimated weight.^{7,22} As the population assessed is predominantly poor, the main variable that enables differentiation between socioeconomic status is being a beneficiary of the *Bolsa Família* cash transfer program, an indicator of extreme poverty. In Brazil, individuals can qualify for this benefit if their family income *per capita* is below US\$ 1.78/day (exchange rate at the time the study's initial field work began). With effect from 2002, relevant social programs were implemented in Brazil, contributing to increased family purchasing power. This in turn led to the emergence of a social group whose body representations do however need to be studied.²³

Nutritional status reflects an improvement in the population's living conditions:²⁴ child malnutrition in the Southeast region decreased from 13.4% in 1975 to just 4.1% in 1989.²⁵ In Manguinhos, 2.0% were undernourished and 21.7% were overweight.¹⁴ In this context it is possible that a thin body may be associated with insufficient food and/or health problems.

Maternal schooling, another socioeconomic indicator, was not significantly associated with agreement/discrepancy between subjective perception and BMI, although higher levels of education did show more agreement, a finding similar to that of other studies.^{5,6} In China, however, a national survey conducted in 2010 with primary school children found that overweight boys whose mothers had higher levels of education were more likely to have an adequate self-image.⁷

In popular culture, body image does not follow the standards of beauty commonly portrayed by the mass media, i.e. usually tall, slim and White men and women, not representative of hegemonic physical attributes found in local reality. Unfortunately, the characteristics of the children's carers were not analyzed in this study, as there was a lot of missing information about their mothers' BMI. The race/skin color variable was included in the first and second stages of the cohort study,¹⁴ but as it was not related to any other socioeconomic or nutritional indicator, it too was not included in the follow-up analyzed here. Nevertheless, as the children were to be asked about their body image, it would also have been appropriate to ask about their race, but assessment of race in this age range does not exist.

Statistical significance was also not found for some variables related to the family environment, principally the presence of the grandmother in the household, which could have represented a legacy of traditional eating habits and, possibly, a perception that thin bodies are not healthy, thus encouraging overweight.²⁶ However, grandmothers are usually very young in this community where motherhood begins mostly in adolescence.²⁷ Moreover, as this study was conducted in just one neighborhood, it was not possible to assess the environmental context.

Family structure, in the sample studied, did not include the presence of the father in half the households, indicating a non-nuclear family model, this being why it was not possible to verify association of presence of

the father with inadequate perception of self-image in relation to BMI. However, the proportion of women on the cleaning job market continues to grow in this socioeconomic group, bringing two complementary issues with it: increased income when women work outside the home, and reduction in the time available to do domestic chores.⁸ As a consequence, they cook less at home and turn to ready food instead.

Another important issue was the reduction in eating school meals in this community, also demonstrated in a previous study, which found a decrease in this habit from 73.3% in 2004 to 48.7% in 2012.²⁴ Less consumption of school meals was found among children who underestimated their BMI. Eating school meals is traditionally associated with extreme poverty,¹⁰ and an increase in purchasing power may explain its reduction. Replacement of school meals with ready-to-serve snacks, principally ultra-processed products, valued by advertising aimed at children, may be a marker of social attribution of value,²⁸ besides which, children with an inadequate perception of their weight may have unhealthy eating behavior, such as high intake of sweet products and salted snacks.²⁹

Understanding dissociation between body image and BMI goes beyond the field of biological measurements and diagnoses, and consideration therefore needs to be given to more subjective dimensions of the perceptions that each child builds about its body, based on its relationship with the family and society surrounding it. These notions are studied in more depth in Social Sciences, by authors such as Pierre Félix Bourdieu (1930-2002), for whom the relationships between physical and social bodies are mediated by economic, cultural and social capital, the 'symbolic capital' of individuals in their relationships with the world. In order to analyze these phenomena, both formulation of complex models and adoption of research methods that aggregate different fields of knowledge, such as Epidemiology and Social Sciences, are complementary and powerful strategies. This article presents an exploratory analysis of these questions, and interpretations of them are benefitted by the qualitative approaches of a study that captured in more depth the meanings and symbols involved in body image.³⁰

Despite the small sample of children, in the multiple multinomial model two variables were significantly associated with two kinds of discrepancy:

being covered by the *Bolsa Família* program; and eating sweet products daily. Children benefitted by the *Bolsa Família* program were twice as likely to underestimate BMI. This result corroborates those of other studies, according to which families registered with the program, precisely the poorest families, had large bodies, leading their children to perceive their own bodies as being smaller than they really were, regardless of them being classified as being obese, overweight or with normal weight. The fact of these children underestimating their BMI is relevant for PHC workers, given the growing number of overweight people in Brazil.^{1,2} Notwithstanding, children who ate sweets every day assessed themselves as being bigger than the objective BMI measurement showed them to be.

Despite the acknowledged limitation of its small sample size, this is the first study in Brazil to look into the discrepancy between body image and an objective measurement of children living in low-income neighborhoods, where child obesity is a growing problem.³

Overweight children underestimating their BMI is of concern, since it can indicate self-image with future impacts with regard to weight gain. Understanding factors associated with body image is essential for preparing types of interventions that are appropriate for the context, with the aim of achieving healthy diet

and healthy weight. Interventions to avoid overweight that are exclusively normative, without taking people's perceptions into consideration, are ineffective. Other issues, above all body dissatisfaction among children and adolescents, also need to be studied better in low-income populations.

This population group is currently undergoing profound social changes, including massive access to ultra-processed food, reduction in time for preparing meals and adoption of lifestyles representative of culturally valued higher social status. New Primary Health Care approaches need to be developed, with respect for autonomy, building capacity to make healthy choices, self-care and development of participative and less authoritarian or impositional educational practices.

Authors' contributions

Gama SR and Cardoso LO contributed to the concept and design of the article, data analysis and interpretation and drafting the first version of the manuscript. Engstrom EM and Carvalho MS contributed to data analysis and interpretation and critically reviewing the manuscript. All the authors have approved the final version and are responsible for all aspects thereof, including the guarantee of its accuracy and integrity.

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