

# Rural characteristics associated with excess weight among adolescents

## *Características rurais associadas com excesso de peso entre adolescentes*

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### ABSTRACT

#### Objective

This study aimed to verify the association between rural characteristics and the nutritional status of adolescents from the rural area of *Macaé*, a municipality in *Rio de Janeiro*, Southeast Brazil.

#### Methods

This is a cross-sectional study based on secondary anthropometric data, collected at the *Macaé* Municipal Department of Education between 2013 and 2014. The database refers to the total number of adolescents in the only high school in the rural area of the city. Poisson logistic regression was performed, having excess weight (overweight or obesity- Body Mass Index-for-age equal to or greater than one Z-score) as the dependent variable, used dichotomously. The independent variables were sex, socioeconomic status and three “yes or no” variables that express rural characteristics.

#### Results

The adolescents (total=109) were between 14 and 18 years old (mean=16.6 years), 64.2% were girls, 52.3% had vegetable gardens or orchards in their household, 19.4% had animal breeding for consumption purposes and 17.6% had parents/guardians working in the agricultural sector. The prevalence of excess weight was 18.0% in boys and 20.0% in girls. Having a garden/orchard implied a significantly higher chance of having excess weight, both in the bivariate analysis and in the sex-adjusted model (Prevalence Ratio=2.95; Confidence Interval=1.17-7.44).

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## Conclusion

Based on a significant association at the municipal level, the results highlight nutritional differences between local and large-scale studies, as well as variations within the same rural area. These findings point out the need to evaluate rural aspects in more detail in studies on underlying determinants of nutritional status.

**Keywords:** Adolescent. Food Habits. Nutrition, Public Health. Nutritional Status. Rural Population.

## RESUMO

### Objetivo

*Este trabalho visou verificar a associação entre as características rurais e o estado nutricional de adolescentes da zona rural do município de Macaé, RJ.*

*Trata-se de um estudo transversal com dados antropométricos secundários, coletados no âmbito da Secretaria Municipal de Educação de Macaé entre 2013 e 2014. A base de dados refere-se ao total de adolescentes da única escola de ensino médio do meio rural da cidade. Fez-se regressão logística de Poisson, tendo o excesso de peso (sobrepeso ou obesidade – Índice de massa-corporal-para-idade igual ou maior que um escore-Z) como variável resposta, usada de forma dicotômica. As variáveis independentes foram: sexo, situação socioeconômica e três variáveis “sim ou não”, que expressam características rurais.*

### Resultados

*Os adolescentes (total=109) tinham idade entre 14 e 18 anos (média=16,6 anos); 64,2% eram meninas, 52,3% apresentavam com horta ou pomar em seus domicílios, 19,4% possuíam criação de animais para fins de consumo e 17,6% tinham pais/responsáveis com ocupação agrícola. A prevalência de excesso de peso foi 18,0% nos meninos e 20,0% nas meninas. Ter horta/pomar implicou em significativa maior chance de excesso de peso, tanto na análise bivariada quanto no modelo ajustado por sexo (Razão de Prevalência=2,95; Intervalo de Confiança=1,17-7,44).*

### Conclusão

*Com base em uma associação significativa em nível municipal, os resultados ressaltam diferenças nutricionais entre estudos locais e de maior âmbito, bem como variações dentro de uma mesma área rural. Estes achados apontam a necessidade de se avaliar mais detalhadamente aspectos rurais em estudos sobre determinantes causais do estado nutricional.*

**Palavras-chave:** População Rural. Estado Nutricional. Adolescente. Nutrição em Saúde Pública. Hábitos Alimentares.

## INTRODUCTION

Adolescence consists of a process of intense physiological and psychosocial changes, which, from a biomedical perspective, ends when the body growth and sexual maturation are completed [1]. As it covers the age range from 10 to 19 years, adolescence includes important habit formation, especially food habits, which can influence nutritional status and health, not only in youth but also in adulthood [2-5].

Besides, adolescence is a historically constructed social category that embraces a plurality of cultural practices and ways of living among teenagers in different social, geographical, and political contexts [1,6,7]. Adolescents in rural areas, compared to those from other settings, may express singular ways of thinking, feeling, and acting [8,9]. It is quite common for teenagers in Brazil to migrate from rural areas to urban centers for educational and work opportunities [10]. This movement is often related to the appreciation of the urban lifestyle by rural youth, which can interfere with adolescents' habits and thus be relevant to understanding their nutritional profile.

It is also important to consider the rural sociability peculiarities, which often require working together as a family and interacting in backyards or in other spaces where people can share their lives and build strong social bonds [9,11]. From this perspective, food, occupational and leisure practices are related to the social environment and social values.

Regarding the nutritional profile, the frequencies of overweight and obesity have increased among young Brazilians [12-14]. In the age group from 10 to 19 years, 21.7% of Brazilian boys and 19.4% of girls had overweight or obesity from 2008 to 2009 and 23.7% of the country's students, aged 13 to 17 years, had overweight or obesity in 2015 [12,13]. These percentages are disturbing in terms of public health, since there is a direct correlation between overweight/obesity and the development of Chronic Non-Communicable Diseases (CNCD), such as cardiovascular problems and diabetes mellitus [3,14-16].

Regarding food patterns in Brazil, the consumption of fruits and vegetables has been below the recommendations; traditional products of Brazilian cuisine, such as rice and beans, have been less consumed, while ultra-processed foods have been more prevalent in the diet, even in rural households [17,18]. These products typically have low nutritional value, contain large amounts of sodium and sugar, and are frequently consumed by Brazilian adolescents [19,20].

With the intention of understanding the determinants of overweight and obesity, the number of studies that analyze food availability and consumption and environmental characteristics in Brazilian urban settings has increased [21-23]. When it comes to rural environments, however, literature is scarce, though there are a few studies that have examined the relationship between food production and consumption, as well as discussed food and nutrition security [24-26].

It is worth mentioning that most information on nutrition in rural Brazil comes from nationwide surveys, in which the rural condition is determined in accordance with political and administrative criteria of the municipalities. These studies are important because they provide general information at a large scale, but they do not allow the evaluation of local rural aspects, which may be underlying determinants of nutritional status [27].

In order to add local information about rurality and nutrition to the literature, this study aimed to verify the association between rural characteristics and the nutritional status of adolescents from the rural area of the municipality of *Macaé*, in the north of the state of *Rio de Janeiro*, Southeast Brazil.

## METHODS

This is a cross-sectional study based on secondary data collected at the *Macaé* Municipal Department of Education between 2013 and 2014. The data were collected by nutritionists from this department and by trained undergraduates, who integrated an extension project of the *Universidade Federal do Rio de Janeiro*.

*Macaé* is located near the ocean and its main economic activity is offshore oil-gas exploration; it contains a mountainous region that corresponds to its rural area, where there are various vegetable crops, waterfalls and trails. The database refers to the total number of adolescents in the only high school in the rural area of the city – a municipal public school that was built to be an agricultural high school. However, until the time of this study, the institution was not providing this specialized training and was only offering classes in the morning.

In the database provided by the municipality, there were 129 records, one per student. Due to incomplete information, 19 students were excluded from the analysis, as well as one student over 20 years old. In total, 109 records were analyzed, representing 85.2% of the eligible students.

Data included the date of birth, sex, height (cm), weight (kg) and waist circumference (cm) of all students enrolled in the school. The data set included two measurements for height and waist circumference, with an accuracy of 1 mm; the mean of the two measurements was calculated for analysis purposes. The weight record had an accuracy of 100g. Students' age was calculated according to the dates of birth and to assessment dates recorded in the database.

Furthermore, the database had information on material assets and educational level of the heads of the adolescents' families, which was used to evaluate socioeconomic status (SES), according to the criterion of the *Associação Brasileira de Empresas de Pesquisa* (ABEP) [28]. This was a national criterion effective until 2014, which classified the population into eight strata: E, D, C2, C1, B2, B1, A2 and A1. We verified the frequency of adolescents in these strata and, due to the small number of individuals in the extreme categories, we decided to work only with two SES groups: low (E+D+C2+C1) and high (B2+B1+A2+A1).

In addition to the name of the neighborhood of the adolescents' residence, three dichotomous variables that refer to rurality aspects were also obtained from the database: presence/absence of vegetable gardens or orchards in the adolescent's household; presence/absence of animal breeding in the household for consumption purposes; and the adolescent has/does not have parents or guardians working in the agricultural sector.

The nutritional profile was evaluated according to Height-for-age (H/A) and Body Mass Index-for-age (BMI/A). These indicators were expressed as Z-scores, calculated according to the World Health Organization (WHO) growth standards [29]. For both indicators, Z-scores lower than two negative Standard Deviations (SD) were considered nutritional deficits. Adolescents with BMI/A equal to or greater than one SD were classified as having excess weight (overweight or obesity). The teenagers with BMI/A equal to or greater than two SD fell into the obesity subcategory. Waist Circumference per Height Ratio (WHR) was also calculated. Adolescents with WHR equal to or greater than 0.5 were considered at increased risk for CNCD [30].

Descriptive statistics of anthropometric variables by sex, SES and rurality were analyzed in Stata Data Analysis and Statistical Software, version 12.0. Poisson multivariate logistic regression was also performed. The prevalence of excess weight was the dependent variable, used dichotomously based on BMI/A classification (smaller/equal to or greater than one Z-score). The independent variables were: "Sex" (Female/Male); "SES" (Low/High); "Garden-orchard" (Yes/No); "Agricultural occupation" (Yes/No); "Animal breeding" (Yes/No). The Prevalence Ratio (PR) and respective 95% Confidence Intervals (CI) were calculated for regression models, considering a significance level of 5%.

## RESULTS

The adolescents were between 14 and 18 years old (mean=16.6 years;  $\pm 0.92$  SD), and 64.2% were girls (Table 1). The frequency of adolescents in the eight socioeconomic strata, from lowest to highest, was 0.0%, 2.9%, 9.5%, 24.8%, 40.0%, 21.0%, 1.9% and 0.0%, respectively. Thus, 37.1% of the individuals were in the low and 62.9% were in the high SES category.

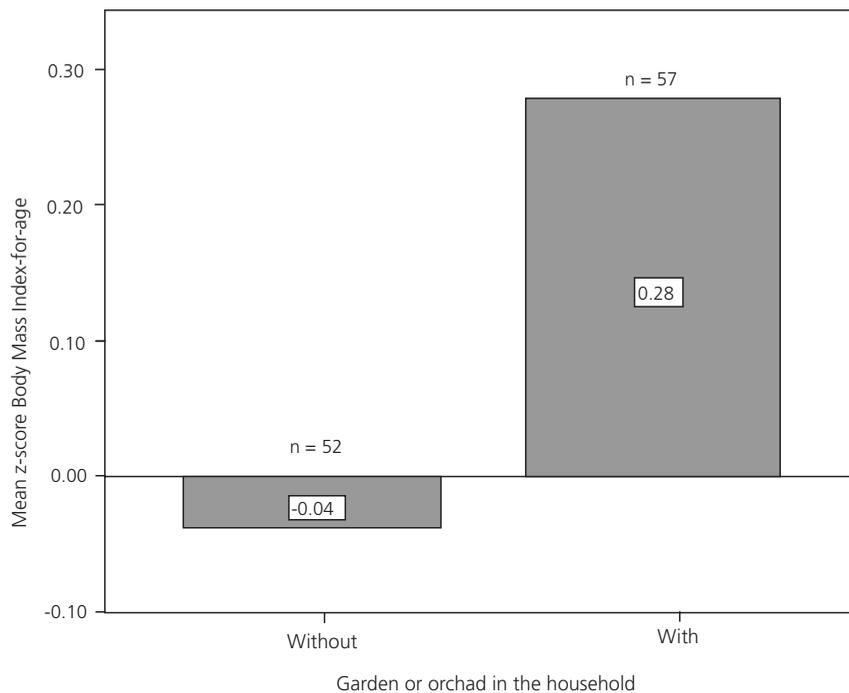
All adolescents lived in rural Macaé and approximately half of them (52.3%) had a vegetable garden or orchard in their household. The most frequent cultivars recorded in the database were seasonings (for instance chives and pepper), leafy vegetables (for instance collard and lettuce), cassava and wide-ranging fruit trees, such as avocado, orange and guava. There was animal breeding in the household of 19.4% of the adolescents, including poultry, pigs, and cattle. Only 17.6% of the teenagers had parents/guardians working in agriculture. Family farmer, salaried farmer and farm manager were the recorded occupations.

Boys presented greater height mean than girls (172.1cm vs. 162.3cm). The mean WHR was 0.4 ( $\pm 0.05$ ) and there was no difference by sex, although the prevalence of WHR indicative of increased risk for CNCD was higher among girls (13.2%) than in boys (7.7%) (Table 1).

**Table 1** – Nutritional characteristics according to sex and socioeconomic status of adolescents from the rural area of *Macaé* (RJ) Brazil, 2013/2014.

Variables	Boys (n=39)		Girls (n=70 <sup>a</sup> )		Total (n=109 <sup>b</sup> )		Socioeconomic Status			
							Low (n=39)		High (n=66 <sup>c</sup> )	
	μ	SD	μ	SD	μ	SD	μ	SD	μ	SD
Age (years)	16.5	0.87	16.7	0.95	16.6	0.92	16.7	0.84	16.6	0.99
Weight (kg)	64.2	10.94	57.9	12.78	60.2	2.47	60.9	14.89	59.8	10.78
Height (cm)	172.1	4.71	162.3	6.62	165.8	7.62	165.6	8.51	165.7	7.17
Waist (cm)	74.1	7.62	71.2	9.96	72.2	9.25	73.3	10.79	71.6	8.16
Waist/Height Ratio	0.4	0.04	0.4	0.06	0.4	0.05	0.4	0.06	0.4	0.05
H/A (SD)	-0.23	0.63	-0.05	0.96	-0.12	0.86	0.05	1.12	-0.21	0.69
BMI/A (SD)	0.15	1.00	0.12	1.19	0.13	1.12	0.16	1.16	0.14	1.07
Prevalence %										
H/A deficit (H/A <-2)	0.0		2.9		1.8		2.6		1.5	
Excess Weight (BMI/A ≥+1)	18.0		20.0		19.3		15.4		21.2	
Obesity (BMI/A ≥+2)	5.1		7.1		6.4		12.8		3.0	
Waist/Height Ratio (≥0.5)	7.7		13.2		11.2		12.8		9.2	

Note: <sup>a</sup>n=69 (Height and Waist) and n=68 (Waist/Height Ratio); <sup>b</sup>n=108 (Height and Waist) and n=107 (Waist/Height Ratio); <sup>c</sup>n=65 (Waist and Waist/Height Ratio). μ: Mean; BMI/A: Body Mass Index/Age. H/A: Height/Age; SD: Standard Deviation.



**Figure 1** – Mean of Z-scores of Body Mass Index-for-age according to presence/absence of vegetable gardens or orchards in the household of adolescents from the rural area of *Macaé* (RJ), Brazil, 2013/2014.

Regardless of any categorization proposed in this study, the means of H/A were close to zero, and H/A distribution overlapped with the WHO reference curves. The prevalence of H/A deficit was zero among boys and 2.9% among girls.

Body Mass Index-for-age means ranged from -0.04 to 0.28 SD, depending on sex, SES, and rurality categories. The prevalence of excess weight and obesity were respectively 18.0% and 5.1% in boys, and

**Table 2** – Nutritional characteristics according to rural aspects of adolescents from the rural area of *Macaé* (RJ), Brazil, 2013/2014.

Variables	Presence of vegetable garden or orchard in the household				One of the parents/guardians has agricultural occupation				Animal breeding for consumption			
	Yes (n=57 <sup>a</sup> )		No (n=52)		Yes (n = 19)		No (n = 89 <sup>b</sup> )		Yes (n = 21)		No (n = 87 <sup>c</sup> )	
	μ	SD	μ	SD	μ	SD	μ	SD	μ	SD	μ	SD
Age (years)	16.7	0.91	16.6	0.94	16.6	0.97	16.6	0.92	16.7	0.90	16.6	0.94
Weight (kg)	62.6	13.82	57.5	10.29	58.5	11.19	60.7	12.67	61.0	9.94	60.2	12.97
Height (cm)	166.8	6.73	164.8	8.43	163.4	7.23	166.3	7.65	167.4	6.44	165.4	7.87
Waist (cm)	72.9	10.30	71.5	8.01	70.0	7.84	72.8	9.47	72.0	8.83	72.4	9.38
Waist/Height Ratio	0.4	0.06	0.4	0.05	0.4	0.04	0.4	0.06	0.4	0.05	0.4	0.05
H/A (SD)	-0.02	0.75	-0.22	0.97	-0.23	0.81	-0.10	0.88	0.08	0.83	-0.17	0.87
BMI/A (SD)	0.28	1.22	-0.04	0.98	0.19	0.91	0.14	1.14	0.16	0.92	0.15	1.14
Prevalence (%)												
H/A deficit (H/A < -2)	0.0		3.9		5.3		1.1		0.0		2.3	
Excess Weight (BMI/A ≥ +1)	28.1		9.6		21.1		19.1		9.5		21.8	
Obesity (BMI/A ≥ +2)	8.8		3.9		0.0		7.9		9.5		5.8	
Waist/Height Ratio (≥ 0.5)	14.6		7.7		5.3		12.5		9.5		11.6	

Note: <sup>a</sup>n=56 (Height and Waist) and n=55 (Waist/Height Ratio); <sup>b</sup>n=88 (Waist/Height Ratio); <sup>c</sup>n=86 (Waist/Height Ratio). μ: Mean; BMI/A: Body Mass Index/Age; H/A: Height/Age; SD: Standard Deviation.

**Table 3** – Prevalence Ratio and respective 95% Confidence Intervals identified by Poisson multivariate logistic regression analysis of excess weight among adolescents from the rural area of *Macaé* (RJ), Brazil, 2013/2014.

Models	Independent Variables (category of reference)	Response-Variable Excess Weight (BMI/A ≥ +1)		
		PR	CI	
Final model (sex-adjusted) n=109	Presence of vegetable garden or orchard in the household (No)	Yes	2.95*	1.17-7.44
	Sex (Male)	Female	1.19	0.54-2.61
Exploratory model (adjusted for all independent variables) n=105	Presence of vegetable garden or orchard in the household (No)	Yes	3.15*	1.25-7.97
	Sex (Male)	Female	1.47	0.61-3.54
	One of the parents/guardians has agricultural occupation (No)	Yes	0.57	0.19-1.71
	Animal breeding for consumption (No)	Yes	0.47	0.12-1.87
Bivariate exploratory models	Socioeconomic status (high)	low	0.74	0.31-1.74
	Presence of vegetable garden or orchard in the household (No) n=109	Yes	2.97*	1.17-7.54
	Sex (Male) n=109	Female	1.11	0.49-2.53
	One of the parents/guardians has agricultural occupation (No) n=108	Yes	1.10	0.42-2.91
	Animal breeding for consumption (No) n=108	Yes	0.44	0.11-1.73
	Socioeconomic status (High) n=105	Low	0.73	0.30-1.73

Note: \*Significant association (p-value <0.05); BMI/A: Body Mass Index/Age.

20.0% and 7.1% in girls. When comparing the two SES groups, the means of anthropometric parameters were similar, as were the frequencies of nutritional deviations.

Adolescents who had a garden or orchard in their household presented higher mean of BMI/A than those who did not (0.28 vs. -0.04 SD) (Figure 1). Additionally, they had higher prevalence of excess weight (28.1% vs. 9.6%), obesity (8.8% vs. 3.9%) and WHR risk status (14.6% vs. 7.7%) (Table 2). Regarding occupation, adolescents whose parents/guardians worked in agriculture had a slightly higher prevalence of excess weight (21.1% vs. 19.1%), although they had lower proportion of obesity (0.0% vs. 7.9%) and

WHR risk status (5.3% vs. 12.5%). The prevalence of obesity was higher among adolescents with animal breeding (9.5% vs. 5.8%), even though the prevalence of excess weight was lower (9.5% vs. 21.8%), as well as WHR risk status (9.5% vs. 11.6%).

No significant effect of "Sex" was observed in the logistic regression. "Garden-orchard" was significantly associated with excess weight status. Having a vegetable garden or orchard in the household implied higher chance of having excess weight, both in the bivariate analysis (PR=2.97; CI=1.17-7.54) and in the sex-adjusted model (PR=2.95; CI=1.17-7.44). No significant effect was found in the analysis with other variables (Table 3).

## DISCUSSION

This study examined the nutritional status of adolescents from the rural area of *Macaé* and found an important association between rural characteristics and excess weight. Teenagers with vegetable gardens or orchards in their households presented a significantly greater risk of having excess weight than other adolescents in the same rural area. This study also points out nutritional differences between the adolescents of rural *Macaé* and their Brazilian counterparts evaluated in large-scale studies.

The prevalence of nutritional deficit in this study was low, equivalent to the expected in the reference population. On the other hand, the prevalence of excess weight and obesity were overall similar to the national estimates for adolescents in Southeastern Brazil, which are, respectively, 20-25% and 5-9%, depending on the research of reference [12-14].

When analyzing sexes separately, boys presented lower frequency of excess weight (18.0 vs. 24.5%) and obesity (5.1 vs. 7.6%) than their counterparts of the urban Southeast. This was an expected result because, as a rule, these frequencies have been higher in Brazilian urban areas [12]. It is noteworthy, however, that the prevalence of excess weight among boys in this study was also lower than among boys of the rural Southeast (18.0 vs. 23.6%), although the proportion of obesity was the same. When comparing the present research with the few local studies that are comparable in terms of age and locality, it is notable that excess weight among the boys of *Macaé* is less frequent than among schoolboys of rural areas of the municipality of *Carmo* (30.8%), also located in a mountainous region of the state of *Rio de Janeiro* [31].

In contrast, the girls in this study presented prevalence of excess weight similar to their counterparts from the Southeast, whether urban (20.9%) or rural (20,3%); the prevalence of obesity was substantially higher (7.1 vs. 4.8% urban; vs. 3.6% rural) [12]. This result is surprising, not just because a higher proportion of obesity in urban areas is expected on a national scale, but also because the magnitude of the prevalence was more than double that estimated for girls in the rural Southeast. In the research in *Carmo*, the prevalence of obesity among schoolgirls (8.7%) was even higher than in this study [31].

Such differences between local and larger-scale studies corroborate the view that rural characteristics at local level may be associated with nutritional status and have not been captured in large-scale studies [27]. An important issue, for example, is understanding which local aspects may be contributing to greater obesity prevalence among the girls in this study when compared to their counterparts in the rural Southeast.

It is remarkable that excess weight and obesity in this study were more frequent in females, which is another inverse characteristic to that observed in nationwide surveys [12-14]; and also contrary to that identified in the research in *Carmo* [31]. A more pronounced presence of overweight and obesity in females has been characteristic of the nutritional profile only of Brazilian adults [12,32].

Adolescence can cover important sociological aspects of adulthood [1,7]. This is particularly relevant in rural contexts because of early entry into the labor market during adolescence, often within the family [8-10,33]. Such processes of adultization can influence daily habits and worldviews and, therefore, expose adolescents to adulthood determinants of health and nutrition. From this perspective, it is possible to consider that the nutritional profile of the teenagers in this study may be in line with what is observed in adult populations in Brazil.

High prevalence of obesity was observed among women in an in-depth study with adults of farming families in *Petrópolis*, RJ, where working the land was a primarily male activity [24]. The routine of female work included essentially stationary activities, such as cleaning and tying vegetables in bundles, in addition to domestic services that required low energy expenditure. Given that farming in *Macaé*, as well as in *Petrópolis*, happens in mountainous regions with a heavy reliance on production of leafy greens, it is possible that such gender occupational differences are also relevant for understanding excess weight in this study.

In the rural Southeast, it is also common to find multi-active families, in which typically only men work in agriculture, while adult or young women work in nearby cities, often in the service sector [33,34]. Such disparate work activities may expose men and women to different factors related to excess weight.

A prominent result of this study was that, although all adolescents lived in rural *Macaé*, the nutritional status was significantly different by rural characteristics. Teenagers with vegetable gardens or orchards in their yard had higher BMI/A average and proportions of anthropometric deviations, including greater prevalence of WHR indicative of high risk for CNCD. Above all, adolescents with a vegetable garden or orchard in their household were more likely to fall into the excess weight category. This finding suggests that, despite widely held expectations, living in close proximity to agricultural cultivation does not necessarily imply better health and nutrition conditions. Several factors may influence the choices and values of individuals and groups, such as income, education, media exposure and globalization of food and consumer goods [35-37]. In *Macaé*, this list of factors also includes economic fluctuations in the oil-gas chain, which interfere with a wide-range of aspects in the municipality, especially social and health conditions [38].

An important fact in contemporary times is the migratory trend of peasant youth to urban centers, driven by a socially naturalized logic, which dictates that the city is the world of possibilities, while the rural area is backward [9-11]. This logic has been strengthened as there is precarious incentive for family farming in favor of agribusiness and large-scale agricultural production; moreover, there is a lack of access to education and professional qualification by rural youth, among other processes that promote symbolic depreciation of the countryside and peasants [8,33].

Inserted in this scenario, rural youth tend to value the city ways of living, as well as city consumer products and goods, including food. This process can trigger the construction of a new identity by these young people, which is comprised not only of individual and local issues, but also of social trends and globalized references. The identity construction of a young Brazilian today, whether in rural or in urban areas, is part of a capitalist dynamic that disseminates global models of behavior and consumption, which end up being desired and incorporated, even in the most distant places [7,9,39]. Food choices and habits – central determinants of nutritional status – are immersed in this dynamic [35,36,40]. It is worth mentioning that, in terms of food availability in both urban and rural Brazilian households, whether urban or rural, the prevalence of ultra-processed foods, which are produced mostly by global food corporation, has increased [18,41,42].

Although we observed different prevalence of excess weight and obesity by Animal breeding and Agricultural occupation, the direction of these differences was not clear, and these variables did not show a significant association in the regression analyses. The proportion of individuals with animal breeding

and parents/guardians working in the agricultural sector was small, which limits statistical analyses and interpretations about these variables. However, this unexpected low percentage is a particularly interesting result, because it points out the relevance of observing rural characteristics in more detail. Even within the same area, rural residents may be heterogeneous and closely connected to urban centers. The simplistic “yes or no” – often used to define what is rural in studies on nutrition – may be inadequate to capture the complex ways people live and work in today’s world [27,43,44].

Even adjusting for socioeconomic status and sex, a significant association remained in the model, attributed to the Garden-orchard variable. Thus, this study highlights that rural aspects may be underlying determinants of health and nutrition, associated to a greater or to a smaller risk of developing a specific condition, such as excess weight.

These findings are helpful for future comparisons with studies in other locations. As it happened at the municipal level, results should not be generalized to the variety of rural realities in Brazil. Another limitation of this study is that it does not investigate food consumption or physical activity, which are central determinants of the nutritional status and might help to understand the rural differences observed.

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## CONCLUSION

Girls in this study presented higher prevalence of excess weight and obesity than boys, which is a contrary characteristic to that found in nationwide surveys. Obesity prevalence among these girls was greater than among their counterparts from the Southeast, whether rural or urban.

Although all teenagers lived in rural Macaé, they were heterogeneous, and excess weight prevalence differed by rural characteristics. Especially, having a garden or orchard implied a significantly higher risk of having excess weight, regardless of sex and socioeconomic status.

The findings of this study cannot be extrapolated to the diversity of all rural scenarios in Brazil, but based on a significant association at the municipal level, these results highlight nutritional differences between local and large-scale studies, as well as variations within the same rural area.

Thus, this study points out the need to evaluate rural characteristics in more detail. Rural aspects at the local level may be underlying determinants of nutrition, but have not been captured in large-scale studies.

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## CONTRIBUTORS

AEP Lourenço designed the study. TCS Duarte and TJP Pinto analyzed the database. All authors worked jointly on writing and revising the manuscript.

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