

# Overweight and low height in children of urban, rural and indigenous communities

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## Abstract

Changes in lifestyle have led to an increase of overweight in the juvenile population. However, there are limited studies about this topic in relation to an indigenous population. The aim of this study is to verify the overweight and height deficit in children aged 8 and 9 years, of both sexes, from urban, rural and indigenous communities of the city of Nova Laranjeiras in the State of Paraná. The 277 (148 boys) students were divided into three groups: rural (n = 100), urban (n = 99) and Indian communities (n = 78). The measurements taken were body mass (kg), height (m) and body mass index. The statistics method was an analysis of covariance and chi-square test ( $P < .05$ ). Among the 277 schoolchildren, the prevalence of overweight was 14.6% in the rural area, 27.1% in urban area and 30.3% in the indigenous area in boys, and 15.7% in rural areas, 17.6% in urban and 20% in Indian girls. There was no difference in the frequency of overweight among groups for both sexes. The prevalence of height deficit was different between the groups; it was higher in indigenous children than urban and rural children. Among the Indians, 42.4% of boys and 51.1% girls had low stature. Only indigenous children were overweight and of low height, while being prevalent in 15.1% of boys and 11.1% girls. Low stature is frequent in indigenous populations, and it would be ideal to have more research to identify its causes and consequences. Children showed high rates of overweight in all regions, demonstrating that poor eating habits and a sedentary lifestyle are not only characteristics of urban centres.

**Keywords:** anthropometry, body composition, body mass index, obesity.

## INTRODUCTION

Obesity is a public health problem in all countries and age groups, related to globalisation - a result of the changes caused by the incorporation of technology in the everyday life of the industrialised societies<sup>1</sup>. From the mid-1970s to the 1990s, in Brazil, the nutritional transition process, characterised by inversion of the high prevalence of low birth weight and child malnutrition to a profile of overweight and obesity<sup>2</sup>, was caused primarily by the acquisition of unhealthy eating habits, as well as a less active lifestyle<sup>3</sup>. These habits have hit children and adolescents worldwide, in cities of large, medium and small sizes<sup>4</sup>. These changes can also be observed in indigenous

populations affected by a long process of government policies related to these people, especially those close to cities with a high population rate who have had difficulties with their livelihood, scarcity of land for planting, the introduction of processed foods and a sedentary lifestyle<sup>5</sup>.

According to the Survey of Family Budgets (POF/IBGE)<sup>6</sup>, held between 2008 and 2009 by the Ministry of Health, 33.5% of children between 5 and 9 years is overweight, representing an increase of 250% in relation to the year 1989. The excess weight of the juvenile population is a concern for the negative psychosocial impact and its association with co-morbidities and mortality<sup>7</sup>. On the other hand, in the same period, there was a reduction of 50% in the frequency of short stature in the Brazilian population,

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which reached 7.2% and 6.3% of boys and girls in 2008 and 2009, within that age group, according to the data of the POF/IBGE<sup>6</sup>. For indigenous populations, the data show a high prevalence of stunting<sup>8,9</sup>. Finally, studies on the nutritional condition of indigenous Brazilian children, when compared with the population of NCHS reference point for moderate and high frequency of stature in association with reduced frequencies of low weight for height<sup>9</sup>.

The precarious health situation of many indigenous people in Brazil is largely due to the food situation. This fact, caused by a combination of a shortage in productive areas for production, a rapid increase in population, and drastic socio-economic and cultural changes, with the loss of original economic alternatives and the introduction of new alimentation standards, is an important element in understanding the health-disease process of indigenous people<sup>10</sup>.

Most research on the indigenous population is geared toward growth and nutritional problems such as short stature<sup>8,9</sup>. However, there are some studies on indigenous ethnic groups that point to a possible increase in the prevalence of obesity and associated diseases<sup>11,12</sup>. The lack of studies on this population leaves important questions unanswered about public health and intervention programmes. In this sense, the objective of the present work is to verify the prevalence of overweight and short stature among children of 8 and 9 years old from three distinct areas: rural, urban and indigenous residents of the municipality of Nova Laranjeiras, Paraná, Brazil.

## METHODS

This is a descriptive and transversal study using quantitative variables. The sample was comprised of 277 schoolchildren of both genders, between 8 and 9 years of age, residing in three regions of the municipality of Nova Laranjeiras, Paraná, Brazil. The municipality has a population of 11,848, with 15.3% in urban and 84.7%<sup>13</sup> in rural areas.

Three regions were selected: 1) an urban area, 2) a rural area and 3) indigenous land (IL), Rio das Cobras. Urban and rural regions were defined according to the criteria of the municipal government and the National Indian Foundation (MGNIF/FUNAI) in the IL's case, promoting the official recognition of indigenous lands.

The children of the urban and rural areas were classified according to their rural or urban residence, although they attended two schools located in the urban area. These two schools were selected due to the concentration of the largest number of students from the municipality of the age group studied, as well as being close to IL. All Indian children lived in IL and frequented schools in this region.

In those schools, all 330 students enrolled were invited but only 277 students, who had parental consent and who attended on the data collection day, were evaluated. It was determined that the study would be for children between 8 and 9 years of age, because they are at an earlier stage of sexual maturation; moreover, they are children who have managed to overcome the difficulties of hostility and serve as an indicator for understanding the poten-

tial problems experienced by younger children. This study was approved by the Research Ethics Committee and by the National Council of ethics in research, CONEP, under case number 25000.096846/2004-08 and the National Indian Foundation (FUNAI).

The following anthropometric data were measured: body mass (Filizola mechanical scale), height (dry wall mounted stadiometer), arm and leg circumferences (Cardiomed inelastic tape measure), triceps skinfold, and subscapular, suprailiac and calf (Harpenden skinfold caliper). The measurements followed the recommendations published in a reference manual for anthropometric standardisation<sup>14</sup>, recorded for the right side of the body. The body mass index (BMI) was calculated using the following formula  $BMI = \text{weight}/(\text{height})^2$  in kg/m<sup>2</sup>. The BMI-Z score and short stature were assessed using the programme Antroplus from WHO (World Health Organisation).

The statistical procedure was analysis of variance (ANOVA) to compare anthropometric features depending on the local factor, using the Tukey test. For comparison of frequencies between the groups the Chi-square ( $\chi^2$ ) test was used. Analyses were performed with separation by gender. The significance level adopted for statistical tests was 5%.

## RESULTS

In this study, 277 children participated (148 boys) who attended school between 8 and 9 years of age, of both genders, living in three regions of the municipality of Nova Laranjeiras, Paraná, Brazil. The sample was divided into 100 children (48 boys) in the urban group, 99 (48 boys) from the rural area and 78 (33 boys) from the indigenous land (IL).

The anthropometric measurements between the three groups were compared by means of ANOVA. The averages and standard deviations of anthropometric variables are presented in Table 1. The indigenous group showed lower stature and body mass compared to the urban and rural groups for both genders. The BMI of the indigenous group was higher than the other two groups, for both genders. Age did not differ between the groups.

The frequency of short stature was higher in the indigenous group, followed by the urban and rural group, and the prevalence of 42.4%, 8.4% and 2.1%, respectively, in boys ( $x^2 = 27.8$ ;  $p = 0.000$ ). In indian girls was also more frequent short stature, when compared to the other two groups ( $x^2 = 44.2$ ;  $p < 0.000$ ), 51.1% reaching indigenous group, 7.7% in the urban group and 2% in the rural group. Graph 1 shows the percentage values of stunting and overweight by gender.

For the frequency of overweight among boys, there was no significant difference ( $x^2 = 3.33$ ;  $p = 0.188$ ). The prevalence was 14.6% in the rural area, 27.1% for the group in urban area, and 30.3% for the indigenous area. For the girls' group, there was no significant difference regarding overweight ( $x^2 = 0.31$ ;  $p = 0.856$ ). In the rural area, the prevalence was 15.7%, 17.6% in the urban area, and 20% in the IL.

**Table 1:** Anthropometric measures' medians, standard deviation and ANOVA

Variables	Mean	SD	Boys		Mean	SD	aDif.
			Rural (n = 48)	Urban (n = 48)			
Age (years)	9.11	0.53	9.09	0.59	9.02	0.55	-
Stature (cm)	131.25	4.38	130.88	6.45	121.26	5.53	1=2>3
Stature z-score	-0.50	0.70	-0.50	1.00	-2,10	0.80	1=2>3
Body mass (kg)	28.92	4.24	29.68	4.99	25.58	3.04	1=2>3
BMI (kg/m2)	16.74	1.97	17.25	1.93	17.34	1.02	1=2<3
Muscular area (cm)	20.19	1.92	20.00	2.95	18.78	2.67	-
Calf circumference (cm)	26.53	2.25	26.53	2.25	25.10	1.69	1=2>3
Folds summation (mm)	27.49	10.78	27.49	10.74	22.39	4.98	1=2>3

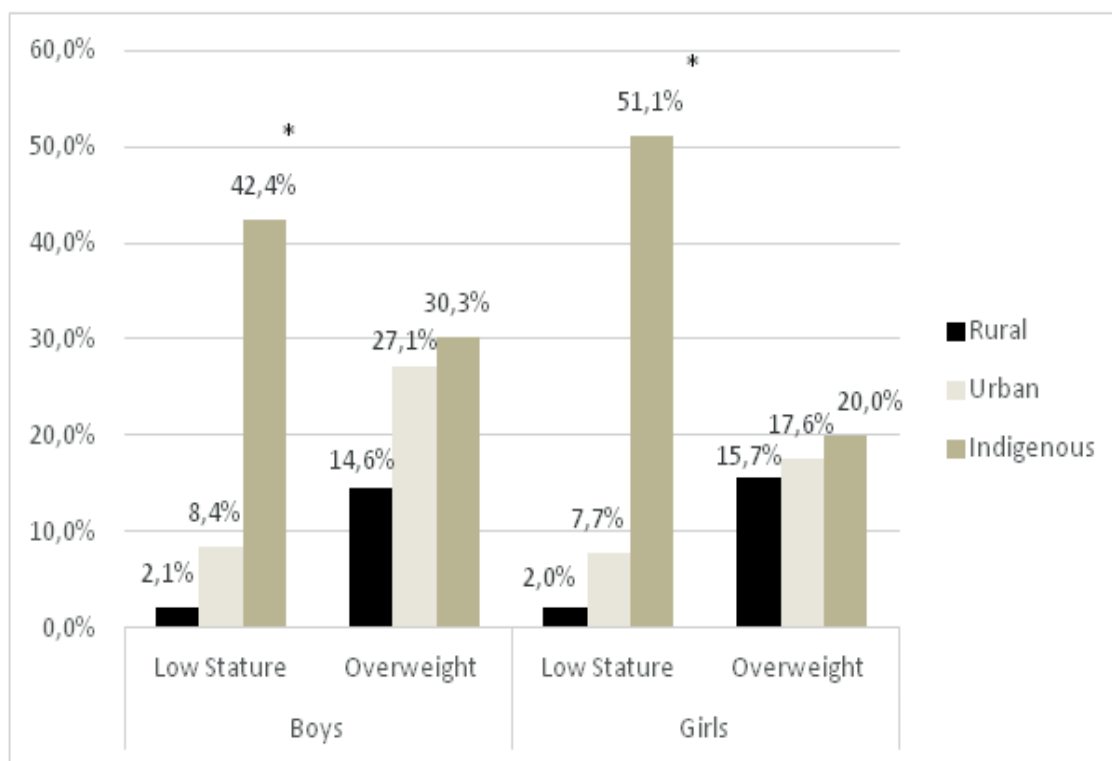
  

Variables	Mean	SD	Girls		Mean	SD	aDif.
			Rural (n = 51)	Urban (n = 52)			
Age (years)	8.89	0.57	9.01	0.53	8.84	0.59	-
Stature (cm)	129.04	6.46	129.70	6.64	119.22	5.15	1=2>3
Stature z-score	-0.60	1.10	-0.60	1.00	-2.20	0.80	1=2>3
Body mass (kg)	27.24	4.91	28.59	5.49	24.55	2.87	1=2>3
BMI (kg/m2)	16.28	2.08	16.88	2.09	17.23	1.19	1=2<3
Muscular area (cm)	18.24	3.32	18.89	3.05	18.84	2.29	-
Calf circumference (cm)	25.75	2.71	26.59	2.34	24.90	1.65	1=2>3
Folds summation (mm)	34.56	14.59	37.44	16.18	25.65	4.65	1=2>3

aDif. The numbers indicate the area, being rural (1), urban (2) and indigenous (3), with which there is a statistically significant difference ( $p < 0.05$ ); - indicates that of all the places, there is no significant difference ( $p < 0.05$ ).

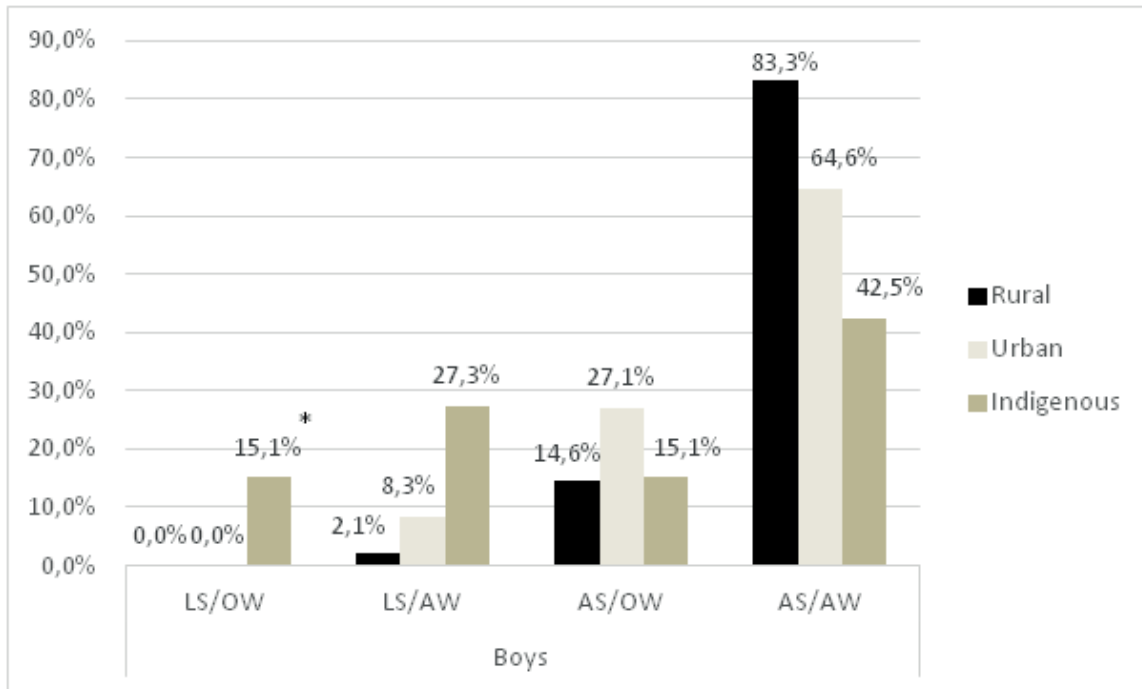
The combination of overweight and short stature was higher in the indigenous group, in both boys ( $\chi^2 = 3.75$ ;  $p = 0.000$ ) and girls ( $\chi^2 = 45.40$ ;  $p = 0.000$  girls) in relation to urban and rural groups. Only the indigenous

group presented children with both, and the prevalence of overweight and short stature of 15.1% in boys and 11.1% in girls. Table 2 presents the percentage values of clinical situations analysed for males, and Graph 3 for females.



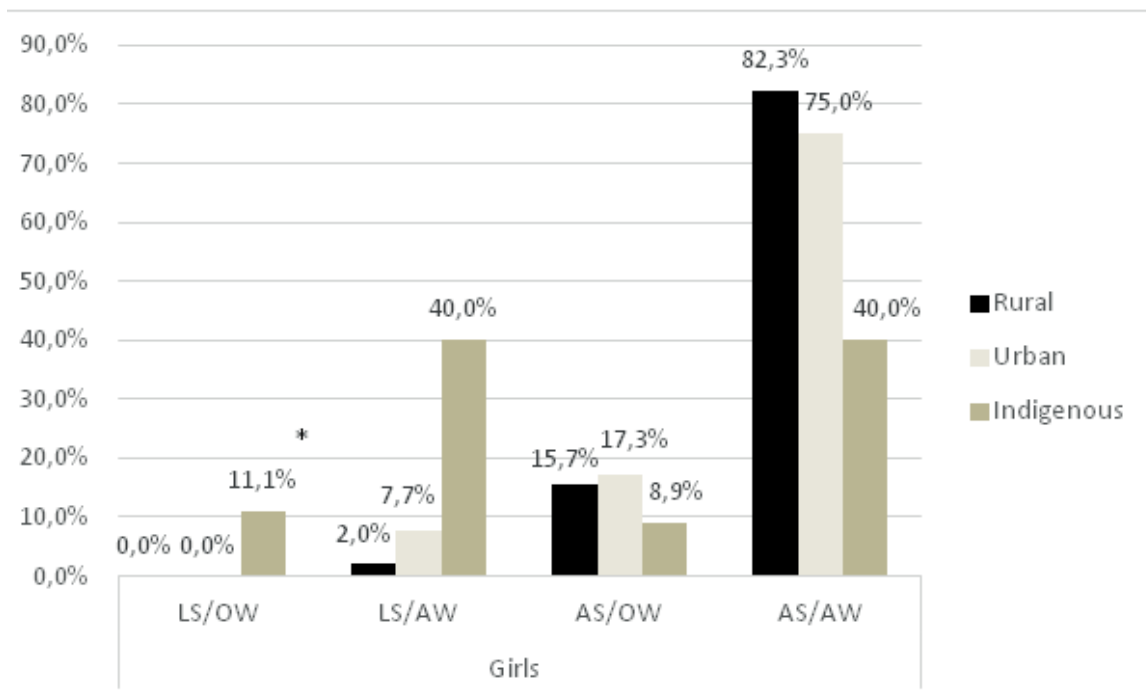
NOTE: \* $p > 0.00$

**Graph 1:** Frequency of short stature and overweight in all groups for both genders.



NOTE: LS/OW: Children with low stature and overweight; LS/AW: children with low stature and adequate weight; AS/OW: children with adequate stature and overweight; AS/AW: children with adequate stature and adequate weight;  $p < 0.000$ .

**Graph 2:** Frequency of clinical situations between groups for boys.



NOTE: LS/OW: Children with low stature and overweight; LS/AW: children with low stature and adequate weight; AS/OW: children with adequate stature and overweight; AS/AW: children with adequate stature and adequate weight;  $p < 0.000$ .

**Graph 3:** Frequency of clinical situations between groups for girls.

In the rural area most children presented appropriate stature and appropriate weight in both genders (83.3% boys; 82.3% girls), as well as in the urban area (64.6% boys; 75% girls). Indigenous girls presented a higher prevalence of short stature and appropriate weight, and 40% in both.

## ■ DISCUSSION

The results of anthropometric measurements for males and females (Table 1) indicate that the children of the urban and rural areas tend to have significantly higher stature and body mass in relation to indigenous children. Studies point to a consistent difference in favour of the urban areas in Europe<sup>15</sup> and Mexico<sup>16</sup>, while others point to similarities in Australia and the United States<sup>17</sup>. It is important to highlight the difficulty of defining and comparing urban and rural areas. In some places, the rural and urban areas can overlap, especially in small towns where the countryside is very close to the urban area, as is the case for this research.

In this study, the frequency of excessive weight did not differ between the groups, for both sexes. An increase of overweight in Brazilian children and adolescents was identified in all regions and ethnic groups. Among the group of indigenous boys, the prevalence of overweight was 30.3%, and for the group of indigenous girls it was 20%. A lower prevalence was observed in Chilean indigenous children (6 years), who showed 16% of obesity<sup>18</sup>. By analysing Xavante indigenous teenagers, the prevalence of overweight was lower for the boys and the girls, with 22.7% and 35.5%, respectively<sup>19</sup>. The difference stands out in the age group surveyed in both studies, noting that in adolescence, anthropometric differences between the sexes are more pronounced.

In this research, the prevalence of overweight of boys from the rural region was 14.6% and 27.1% was urban, among girls was 15.7% in 17.6% in urban and rural, not differed between the groups. On the other hand, a greater prevalence of overweight was found in urban areas (14%) than in rural areas (6.7%) in a study carried out in Santa Catarina State municipalities and of Rio Grande do Sul, Brazil<sup>20</sup>. Analysing by region, similar frequencies were presented in a study in the inner city of Paraná (Londrina-PR) with a sample of 4289 subjects of both genders and between the ages of 7 and 17 years. Ratios of 12.3% of overweight were found in boys and 13.7% in girls<sup>21</sup>. In a study done in northeastern Brazil, seeking to assess overweight and obesity in schoolchildren in Campina Grande, PB, it was found that the prevalence of overweight and obesity was 23.5%. It was more common among students of the private system (49.1%), than those of the public one (17.1%), and in boys (31.2%) than girls (16%)<sup>22</sup>. No studies have compared the prevalence of overweight in the three regions analysed.

The processes of social change in the last few centuries have influenced the current state of indigenous peoples, such as displacement of different ethnicities for the villages - near the tribal lands with cities due to urban sprawl - which has increased the demo-

graphic rate in restricted spaces, changes in habits and customs of ancient tradition, subsistence difficulties, a shortage of land for planting, the introduction of processed foods, and physical inactivity<sup>5</sup>. These transformations may have contributed to the similar prevalence of excess weight compared with other non-indigenous populations.

This relationship is shown in a study<sup>23</sup> that demonstrated the influence of changing cultural habits on the prevalence of hypertension and BMI values. The study found higher levels of blood pressure and BMI in indigenous people with some knowledge of Portuguese, than others without any knowledge—that is, those who had greater contact with the eating habits of industrialised societies.

The prevalence of stunting was different among groups, as the height of the indigenous group was shorter in relation to the urban and rural groups. Among the indigenous, 42.4% of boys and 51.1% of girls showed stunting. These results corroborate with another study done with the indigenous population, which shows, in general, an average stature that is less than that of the national population<sup>8,9</sup>.

When combining the presence of stunting and overweight, only the indigenous group presented the two clinical situations simultaneously, being prevalent in 15.1% of indigenous children, and 11.1% indigenous girls. These data suggest that short stature has influenced the high prevalence of overweight in the indigenous group, which is associated with environmental factors and lifestyle changes that have been taking place with indigenous peoples in the last century. The short stature of the indigenous population may be related to a genetic adaptive process, as ancestors from Asia<sup>24</sup>, and the hostile environment, including a poor diet, and health problems evidenced after European colonisation.

The relationship of genetics with other cardiovascular risk factors such as diabetes was investigated in indigenous peoples. Studies carried out on the population of Mbyá Guarani-Rio de Janeiro State indicated a risk for chronic diseases, showing that efforts are needed to control the risk factors.

Studying the genetic influence on obesity and its relationship with other risk factors in Brazilian indigenous children is of paramount importance. Therefore, it is suggested that studies evaluate genetic parameters associated with obesity in indigenous populations, in an attempt to elucidate issues on the development of obesity, and how this is influenced by changes in the lifestyle of these indigenous peoples, and the association with their genetic makeup.

In conclusion, the stunting of indigenous peoples is shown in different surveys, and can reflect processes of adaptation to the environment. However, further research is necessary in order to identify possible causes and analyse the consequences for this population. Regardless of the zone to which they belong, the children showed high levels of obesity. This fact reflects lifestyle changes, poor eating habits and a sedentary lifestyle in different urban and rural regions in the country and other regions of the world.

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## Resumo

**Introdução:** As modificações no estilo de vida têm favorecido o aumento do excesso de peso na população infanto-juvenil e há carência de estudos nesta área na população indígena.

**Objetivo:** verificar o excesso de peso e a baixa estatura em crianças de 8 e 9 anos, de ambos os sexos, provenientes das comunidades urbana, rural e indígena do Município de Nova Laranjeiras do Estado do Paraná.

**Método:** Estudo descritivo. Foram avaliados 277 (148 meninos) escolares e divididos em três grupos: Rural (n=100), urbano (n=99) e indígena (n=78). Todos foram avaliados quanto à massa corporal (kg), estatura (m), índice de massa corporal. A análise dos dados foi efetuada por meio da Analysis of Covariance e do Qui-quadrado ( $P < 0,05$ ).

**Resultados:** Dentre os 277 escolares avaliados, a prevalência de excesso de peso foi de 14,6% da área rural, de 27,1% da área urbana e de 30,3% da área indígena nos meninos, e de 15,7% nas rurais, de 17,6% nas urbanas e 20% nas indígenas nas meninas. Não houve diferença nas frequências de excesso de peso entre os grupos em ambos os sexos. As crianças indígenas apresentam menor estatura em relação às crianças urbanas e rurais. Entre os indígenas, 42,4% dos meninos e 51,1% das meninas apresentaram baixa estatura. Apenas as crianças indígenas apresentaram excesso de peso e baixa estatura ao mesmo tempo, sendo prevalente em 15,1% dos meninos, e 11,1% das meninas.

**Conclusões:** A baixa estatura é frequente em populações indígenas. Pesquisas que identifiquem suas causas e consequências são necessárias. As crianças apresentaram elevados índices de excesso de peso em todas as regiões, demonstrando que maus hábitos alimentares e sedentarismo não são características apenas dos centros urbanos.

**Palavras-chave:** antropometria, composição corporal, índice de massa corporal, obesidade.