

Effects of social and environmental determinants on overweight and obesity among Brazilian schoolchildren from a developing region

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ABSTRACT

Objective. To identify the social and environmental determinants most strongly associated with overweight and obesity in Brazilian schoolchildren from a developing region.

Methods. Data were collected from a community-based survey of schoolchildren from the Valley of Jequitinhonha, Minas Gerais, Brazil. The sample was composed of 5 100 schoolchildren aged 6–18 years. Overweight and obesity were defined by body mass index based on the current method recommended by the World Health Organization in 2007. Social and environmental determinants were collected by using a structured questionnaire.

Results. The prevalence of overweight and obesity was 11.1% and 2.7% in girls and 8.2% and 1.5% in boys, respectively. The chance of overweight was higher in schoolchildren who engaged in remunerated work (odds ratio [OR] = 2.19, 95% confidence interval [CI] 1.30–3.26), whose parents had higher education levels (OR = 1.52, 95% CI 1.12–2.07), who had two or fewer siblings (OR = 1.74, 95% CI 1.21–2.49), and who were in a high economic class (OR = 1.93, 95% CI 1.32–2.85). Schoolchildren who traveled by car to school (OR = 1.50, 95% CI 1.14–1.91), lived ≤ 5 km from school (OR = 1.64, 95% CI 1.06–2.39), and consumed foods sold in the school cafeteria (OR = 1.56, 95% CI 1.19–2.16) presented high odds of being overweight.

Conclusions. The background from a particular region of a country should be considered when implementing preventive measures regarding overweight and obesity, especially for very poor, developing regions like the Valley of Jequitinhonha. Measures taken should consider a multilevel intervention that includes the family, school, and physical environment.

Key words

Obesity; overweight; body mass index; nutrition assessment; socioeconomic factors; child; adolescence; Brazil.

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Obesity is considered to be a major public health problem and its prevalence is increasing not only in developed countries (1, 2) but also in countries that are undergoing economic and social transition (3–5). The World Health Organiza-

tion estimates that the prevalence of obesity is 4.8% in developing countries, 17.1% in transitional countries, and 20.4% in developed countries (6). In 1970 in Brazil, the prevalence of overweight was estimated to be 4% among young

people (6–18 years old), and it grew to 14% by the end of 1990 (7).

Overweight and obesity cause or exacerbate a large number of health problems, both independently and in association with other diseases (8, 9). Although the health consequences associated with excess weight are not identical in adults and children, risk factors associated with overweight and obesity installed in childhood and adolescence may be higher for cardiovascular diseases than when installed at more advanced ages (10). Overweight and obesity in children and adolescents can also lead to a higher incidence of problems related to self-esteem and self-concept, which may affect interpersonal relationships (11).

The main causes of overweight and obesity are multifactorial and include genetic, biological, social, and environmental determinants, which affect weight gain by acting through the mediators of energy intake, especially energy-dense food, and energy expenditure, especially daily physical activity (12). Despite the effect that genetic and biological determinants can have, the rising prevalence among genetically stable population groups indicates that social and environmental determinants must underlie the overweight and obesity epidemic (13).

Current evidence suggests that the development and execution of intervention programs related to preventing and managing overweight and obesity require the identification of obesogenic social and environmental determinants (14). Studies available in the literature have shown the complex association between social and environmental determinants and obesity (15, 16), but these studies were conducted in highly industrialized regions and whether the findings apply to less developed societies remains to be determined. Therefore, the aim of this study was to identify the social and environmental determinants most strongly associated with the prevalence of overweight and obesity in Brazilian schoolchildren from a developing region.

METHODS

This study is part of a cross-sectional survey, which used anthropometric indicators and social and environmental determinants for a population of schoolchildren from the Valley of Jequitinhonha, Minas Gerais, Brazil. The data

were collected between August and November 2007. The study design was approved by the Committee of Ethics in Research of the State University of Montes Claros–UNIMONTES (protocol no. 529/2006).

The Valley of Jequitinhonha is known as one of the poorest regions in Brazil. It is located in the northeast of Minas Gerais state, where some cities have the worst socioeconomic indexes in the country, with an infant mortality rate equivalent to 40 deaths per 1 000 live births. With regard to the human development index, 58.8% of the state's cities show values between 0.57 and 0.65, which represents a variation of 74% to 85% from the national average (17).

Study population and sampling

The study population included schoolchildren of both genders between the ages of 6 and 18 years who were enrolled in the 2007 school year. According to the information provided by the Sector of Statistics of the State of Minas Gerais Secretariat of Education, at the beginning of the 2007 school year, 175 826 schoolchildren were enrolled in the 5 022 primary classes and 32 245 schoolchildren were enrolled in the secondary classes, which made up a total of 208 071 schoolchildren.

The study used multistage sampling to obtain representative estimates of the population of schoolchildren from the Valley of Jequitinhonha, Minas Gerais, Brazil. The procedure consisted of three stages: 5 geographic regions were selected, 16 schools from each geographic region were randomly selected with probability proportionate to size, and schoolchildren from these schools were sampled. Sample weights were assigned to each student to take into account variations in selection probabilities that occurred during various stages of sampling. The sample size was established assuming a 95% confidence interval (CI), a 3.0% sampling error, and an increment of 10.0% in order to cover possible losses when the data were collected. Since a cluster sampling selection was used, a 1.5 design effect was obtained. The required sample size was 4 800 subjects. However, the sample used for analysis included 5 100 subjects (2 730 girls and 2 370 boys).

A letter about the nature and purpose of the study informed parents and

guardians of the schoolchildren; after their written consent was received, their children were considered for inclusion in the study. Oral consent was also obtained from the schoolchildren. The criteria for excluding subjects included not going to class on the day scheduled for data collection and any physical incapacity.

Data sources

The height and weight of each schoolchild was measured by three trained individuals using standardized procedures (18). Weight was measured in light clothing with no shoes. Height was measured with the schoolchildren shoeless and facing away from the scale. Height was measured to the nearest 1 mm, and weight was measured to the nearest 10 g. Independent duplicate measurements were obtained for height and weight, and the average of the readings was used in the data analyses. Technical errors varied from between 2 and 5 mm for height and from between 20 and 50 g for body weight. Body mass index (BMI) was calculated as weight divided by height squared (kg/m^2).

Overweight and obesity were defined by the BMI, based on the current method recommended by the World Health Organization 2007 (19). Social and environmental determinants were collected by using a structured questionnaire. The following information was collected: age, ethnicity, number of siblings, socioeconomic class, parent education level, paid work, food consumption at school, distance from home to school, transport to school, and city population size. The guidelines proposed by the Brazilian Association for Research Companies were used for the socioeconomic classification of the schoolchildren's families (20). This classification is based on the education level of the family's breadwinner, housing conditions, possession of household items and cars, and number of domestic employees. On the basis of the scores computed for each item, the socioeconomic position of the family was classified from the highest (class A) to the lowest (class E) level.

Statistical analyses

The results were analyzed statistically using the Statistical Package for the Social Sciences (SPSS, version 17.0). The prevalence of overweight and obesity

were estimated for each stratum of schoolchildren classified according to social and environmental determinants. The χ^2 test was used to determine eventual differences between prevalence in each stratum. The impact of social and environmental determinants on the prevalence of overweight and obesity were analyzed by using odds ratios (ORs), established by binary logistic regression adjusted for the remaining independent variables included in the regression models. Only social and environmental determinants that presented a level of significance ≤ 0.20 for association with the prevalence of overweight and obesity in the χ^2 test were included in the logistic regression model. All analyses were performed for the whole sample considering the clustering effect.

RESULTS

The prevalence of schoolchildren classified as overweight and obese, stratified according to the social and environmental determinants, is shown in Table 1. χ^2 analysis revealed that among the social and environmental determinants analyzed in this study, considering a level of significance ≤ 0.20 , only age group and ethnicity showed no significant association with the prevalence of overweight and obesity. Notably, gender, number of siblings, socioeconomic class, parents' education level, paid work, food consumption at school, transport to school, and city population size were significantly associated with the prevalence of overweight and obesity among the schoolchildren.

Table 2 shows the impact of the social and environmental determinants that were significantly associated with overweight and obesity in schoolchildren. The prevalence of overweight and obesity was significantly lower in boys (8.2% and 1.5%, respectively) than in girls (11.1% and 2.7%, respectively). Logistic regression analysis estimated that, compared with boys, girls presented 39% and 71% increased odds of being overweight and obese, respectively (OR = 1.39, 95% CI 1.15–1.68 and OR = 1.71, 95% CI 1.37–2.08, respectively).

The prevalence of overweight and obesity decreased in schoolchildren with more siblings. Those who reported being a single child showed an approximately 90% greater chance of being overweight

(OR = 1.89, 95% CI 1.17–2.61) and obese (OR = 1.87, 95% CI 1.30–2.46) relative to schoolchildren who reported having seven or more siblings. Despite the inverse relationship between the number of siblings and the high prevalence of overweight and obesity, the ORs suggested that the observed prevalence of overweight and obesity showed no significant differences in schoolchildren who reported having three or more siblings.

With regard to socioeconomic class, the results showed that the prevalence of overweight and obesity gradually increased in accordance with higher socioeconomic status. Schoolchildren belonging to families of a higher economic class (class A) demonstrated twofold higher odds of being overweight (OR = 1.93, 95% CI 1.32–2.85) and threefold higher risk of being obese (OR = 2.97, 95% CI 2.27–3.77) when using schoolchildren belonging to families of lower socioeconomic class (class E) as the reference.

Parents' education was another factor that appeared to have some impact on the occurrence of overweight and obesity. Schoolchildren whose parents had 12 or more years of schooling had 1.5-fold higher odds of being overweight (OR = 1.52, 95% CI 1.12–2.07) and 2-fold higher odds of being obese (OR = 2.12, 95% CI 1.41–2.91) compared with their peers whose parents had not completed more than 4 years of schooling. The size of the OR showed that the chance of schoolchildren being overweight and obese was significant beginning at the ninth year of schooling of the parents, when those with lower schooling were used as the reference.

Schoolchildren who engaged in remunerated work were at increased odds of being overweight and obese. The students who reported working more than 20 hours per week had odds of being overweight (OR = 2.19, 95% CI 1.30–3.26) and obese (OR = 2.29, 95% CI 1.40–3.35) 2-fold higher than schoolchildren who reported not working.

Students who reported consuming food in the school cafeteria demonstrated a 56% higher chance of being overweight than those who brought food from home or those who did not consume food during school hours (OR = 1.56, 95% CI 1.19–2.16). With regard to obesity, students who reported consuming food in the school cafeteria had 82% increased odds compared with those who brought food from home or

those who did not consume food during school hours (OR = 1.82, 95% CI 1.34–2.34). The students who preferred bringing their own food from home or who did not consume food during school hours showed similar levels of overweight (6.2% versus 9.5%) and obesity (1.5% versus 2%) compared with students who usually have the meals provided by schools.

Another significant factor contributing to the occurrence of overweight was the distance from home to school. The results of this study confirmed that overweight and obesity declined gradually as the distance from home to school increased. Schoolchildren who lived less than 1 km from school had the highest odds of being overweight (OR = 1.79, 95% CI 1.11–2.64) and obese (OR = 1.89, 95% CI 1.34–2.50) compared with those who usually traveled more than 20 km. Schoolchildren who used motor vehicles showed 50% higher odds of being overweight (OR = 1.50, 95% CI 1.14–1.91) and approximately twice the risk of being obese (OR = 1.93, 95% CI 1.40–2.52) compared with those who walked or cycled to school. Although the schoolchildren who used public transportation to go to school had a higher prevalence of overweight (7.4% versus 9.0%) and obesity (1.2% versus 2.2%), in both cases the ORs were reduced and were not statistically significant.

The results of this study also suggested that schoolchildren living in cities with larger populations are exposed to higher odds of being overweight and obese. Schoolchildren living in cities with more than 20 000 inhabitants had 53.0% higher odds of being overweight (OR = 1.53, 95% CI 1.10–2.04) and 41.0% higher odds of being obese (OR = 1.41; 95% CI 1.11–1.80) relative to schoolchildren living in cities with fewer than 5 000 inhabitants.

DISCUSSION

BMI scores were used to estimate the prevalence of overweight and obesity and the odds associated with social and environmental determinants among schoolchildren in Jequitinhonha Valley, Minas Gerais, Brazil. The results of this study reveal that, using the current method recommended by the World Health Organization 2007 for age and gender, the prevalence of overweight in the school population (9.7%) is lower

TABLE 1. Bivariable analysis examining prevalence and 95% confidence intervals (CIs) of overweight and obesity in schoolchildren according to selected social and environmental determinants, Valley of Jequitinhonha, Minas Gerais, Brazil, 2007

	No.	Overweight			Obesity		
		Prevalence (%)	95% CI ^a	P-value	Prevalence (%)	95% CI ^a	P-value
Gender				0.073			0.128
Boys	2 370	8.2	6.6–10.0		1.5	1.1–2.0	
Girls	2 730	11.1	9.3–13.2		2.7	2.1–3.4	
Age group (years)				0.373			0.428
6–9	1 839	8.9	7.5–10.5		1.9	1.3–2.6	
10–14	1 736	9.9	8.4–11.5		2.2	1.5–3.0	
15–18	1 525	10.7	9.1–12.5		2.5	1.8–3.3	
Ethnicity				0.963			0.974
White	3 927	9.6	8.1–11.3		2.1	1.5–2.8	
Nonwhite	1 173	9.7	8.2–11.5		2.0	1.5–2.6	
Number of siblings				0.037			0.186
≥ 7	631	7.5	6.5–8.6		1.5	1.1–2.0	
5 or 6	994	8.5	7.2–9.9		2.0	1.5–2.6	
3 or 4	1 591	9.3	7.9–10.9		2.2	1.6–2.8	
1 or 2	1 056	11.1	9.6–12.8		2.6	1.9–3.3	
Single child	828	12.1	10.6–13.8		2.8	2.1–3.6	
Socioeconomic class				< 0.001			0.039
Class E (lowest)	1 070	6.2	5.1–7.3		1.1	0.8–1.5	
Class D	1 245	8.9	7.5–10.5		1.8	1.3–2.4	
Class C	1 587	9.3	8.0–10.7		2.2	1.7–2.8	
Class B	762	11.6	9.9–13.4		3.4	2.8–4.2	
Class A (highest)	436	13.4	12.8–15.2		3.8	3.2–4.7	
Parents' education (years)				< 0.001			0.053
≤ 4	1 769	4.6	3.5–5.6		1.0	0.5–1.6	
5–8	1 327	9.2	7.9–10.6		2.0	1.4–2.7	
9–11	1 110	10.7	9.2–12.4		2.3	1.6–3.1	
≥ 12	894	14.4	12.9–16.1		3.1	2.3–4.1	
Paid work				0.002			0.084
No	2 471	6.5	5.3–7.9		1.4	1.0–1.8	
Occasional	856	8.7	7.3–10.3		1.8	1.3–2.4	
Half time	928	10.9	9.5–12.5		2.3	1.7–3.0	
Full time	845	14.3	12.8–15.9		3.0	2.4–3.7	
Food consumption at school				0.001			0.092
No	1 482	6.2	5.0–7.5		1.5	1.0–2.1	
Bring from home	847	9.5	8.1–11.1		2.0	1.3–2.7	
Refectory	2 771	13.8	12.2–15.6		3.1	2.3–4.0	
Distance from school (km)				< 0.001			0.041
> 20	571	5.3	4.3–6.4		0.8	0.4–1.2	
10–20	1 214	8.5	7.3–10.8		1.8	1.3–2.4	
5–10	1 468	9.6	8.3–11.1		2.1	1.6–2.6	
1–5	1 346	12.4	11.4–14.6		2.9	2.2–3.7	
< 1	501	13.7	12.1–15.5		3.1	2.4–3.9	
Transport to school				0.027			0.097
Walking/bicycling	2 494	7.4	6.2–8.6		1.2	0.7–1.8	
Public transport	1 917	9.0	7.5–10.6		2.2	1.6–2.9	
Car	689	13.4	11.9–15.0		2.9	2.1–4.0	
City population				0.029			0.105
< 5 000	674	7.3	6.0–8.7		1.8	1.3–2.3	
5 000–10 000	1 198	8.9	7.5–10.5		2.1	1.5–2.8	
10 000–20,000	1 864	10.2	8.7–11.9		2.4	1.8–3.2	
> 20 000	1 364	12.3	10.8–14.0		2.8	2.1–3.7	

Note: P-values are derived from χ^2 tests.

^a Confidence interval: 95%.

than reported in studies conducted from 1996 to 1997 in the southeast and northeast of Brazil (13.9%) (21). When the results of this study were compared with the results of international studies, the prevalence of overweight and obesity was lower than reported for young populations in North America (1) and in Eu-

ropean countries (2), but the results of this study were similar to those reported in other Latin American countries (5) and in Asia (3, 4). Comparing overweight and obesity prevalence rates between studies must be done with caution because of potential differences in methodology, cutoff points for weight

status classification, and study populations (sample size, maturation, and gender). Even assuming these weaknesses, cross-national comparisons suggest that overweight and obesity rates vary according to the level of development of a region and are less prevalent in the developing world.

TABLE 2. Multivariate analysis examining odds ratios and 95% confidence intervals (CIs) for prevalence of overweight and obesity in schoolchildren according to selected social and environmental determinants,^a Valley of Jequitinhonha, Minas Gerais, Brazil, 2007

	Overweight			Obesity		
	Prevalence (%)	95% CI ^b	P-value	Prevalence (%)	95% CI ^b	P-value
Gender			0.022			0.007
Boys	Reference			Reference		
Girls	1.39	1.15–1.68		1.71	1.37–2.08	
Number of siblings			< 0.001			< 0.001
≥ 7	Reference			Reference		
5 or 6	1.37	0.92–1.93		1.39	0.96–1.85	
3 or 4	1.47	0.91–2.18		1.42	0.99–1.88	
1 or 2	1.74	1.21–2.49		1.69	1.22–2.20	
Single child	1.89	1.17–2.61		1.87	1.30–2.46	
Socioeconomic class			< 0.001			< 0.001
Class E (lowest)	Reference			Reference		
Class D	1.41	1.02–1.94		1.38	0.99–1.79	
Class C	1.49	1.10–2.01		1.54	1.10–2.05	
Class B	1.84	1.22–2.79		2.18	1.57–2.86	
Class A (highest)	1.93	1.32–2.85		2.97	2.27–3.77	
Parents' education (years)			0.003			< 0.001
≤ 4	Reference			Reference		
5–8	1.19	0.89–1.57		1.34	0.95–1.79	
9–11	1.44	1.06–1.91		1.89	1.48–2.36	
≥ 12	1.52	1.12–2.07		2.12	1.41–2.91	
Paid work			< 0.001			< 0.001
No	Reference			Reference		
Occasional	1.13	0.85–1.44		1.18	0.90–1.50	
Half time	1.67	1.11–2.38		1.65	1.30–1.75	
Full time	2.19	1.30–3.26		2.29	1.40–3.35	
Food consumption at school			0.027			0.006
No	Reference			Reference		
Bring from home	1.13	0.84–1.47		1.29	0.95–1.68	
Refectory	1.56	1.19–2.16		1.82	1.34–2.34	
Distance from school (km)			0.004			0.002
> 20	Reference			Reference		
10–20	1.19	0.69–1.75		1.39	0.95–1.89	
5–10	1.40	0.88–2.15		1.50	0.99–2.07	
1–5	1.64	1.06–2.39		1.76	1.22–2.40	
< 1	1.79	1.11–2.64		1.89	1.34–2.50	
Transport to school			0.012			0.002
Walking/bicycle	Reference			Reference		
Public transport	1.15	0.92–1.43		1.31	0.98–1.68	
Car	1.50	1.14–1.91		1.93	1.40–2.52	
City population			0.019			0.009
< 5 000	Reference			Reference		
5 000–10 000	1.16	0.84–1.62		1.21	0.80–1.60	
10 000–20 000	1.29	0.99–1.65		1.39	0.97–1.90	
> 20 000	1.41	1.11–1.80		1.53	1.10–2.04	

^a Adjusted for all the other variables in the table.^b Confidence interval: 95%.

In this study, the prevalence and odds of being overweight and obese exhibited different distributions between and within individual and socioenvironmental determinants. With regard to gender, girls showed a higher prevalence of overweight and obesity than boys. In previous studies, important differences were also found in the prevalence of overweight and obesity between genders (1–5). The high prevalence among girls may be partially explained by the vulnerability of females associated with sex

hormones that increase body fat stores at ages near puberty (12). Differences in physical activity patterns may also contribute to these variations in the prevalence of overweight and obesity between genders. Boys are consistently more active than girls, and the differences are accentuated during adolescence (22).

The modernization of society and the changes observed more recently in the social behaviors of young people are associated with the adoption of a more sedentary lifestyle. Motor vehicles, work

mechanization, and decreased house-keeping duties contribute to the reduced levels of daily physical activity. Studies in the literature have examined the impact of traffic on levels of walking and bicycling. The real and perceived danger and discomfort imposed by traffic discourage walking and bicycling. Although it can be difficult to measure these effects, observed behavior provides good evidence for them, with the strongest association being an inverse correlation between volumes and speeds

of traffic and levels of walking and bicycling (23). The results of longitudinal investigations have shown a reduction of 50% in energy expenditure associated with the practice of habitual physical activity in adolescents from 12 to 18 years of age (22). It is possible that the girls in this study sample were more affected by these lifestyle changes.

The quantity of the city's inhabitants and paid work in this study were related to the occurrence of overweight and obesity among schoolchildren in the Jequitinhonha Valley, Minas Gerais, Brazil. Similar results were found in studies involving Brazilian adolescents with regard to the number of the city's inhabitants (24). International studies also found that overweight and obesity were more prevalent among young people who lived in cities with larger populations (25).

Variables associated with family environment indicated that a child or adolescent who is an only child or has one or two siblings had an increased chance of being overweight or obese. The impact of the number of siblings on the occurrence of overweight and obesity occurrence has also been examined by studies focused on young Europeans (26) and African Americans (27). Those studies found that the odds of overweight and obesity were inversely proportional to the number of siblings, regardless of birth order. In this case, it is possible that an increase in food consumption per capita due to a reduced number of family members may contribute to children having a greater chance of being overweight and obese.

Some reports described an inverse relationship between economic status and excessive body weight among young people in developed countries (1, 8, 9). Among young people, diet is influenced by the financial resources available to purchase food and by family education levels that influence the choice and preparation of food. Therefore, in developed countries, it is assumed that young people belonging to families of disadvantaged economic status, because of their lower earning power and decreased knowledge of healthy nutrition, are more exposed to high-calorie foods and simple carbohydrates, which are cheaper and easier to access. Likewise, changes in lifestyle among young people have led to a drastically reduced energy expenditure associated with more seden-

tary behaviors (e.g., watching television longer, replacing active play with inactive games, and playing in the street less because of a lack of security). However, the results of this study do not concur with those observations; on the contrary, the findings showed that overweight and obesity are more prevalent among young people in higher socioeconomic classes. This association appears to be a typical behavior for a region in an economic transition. Excessive body weight distribution varies significantly according to the level of economic development reached. In the early stages of the economic transition, the wealthier section of society shows an increase in the proportion of people who are overweight and obese. This tends to change in the later phases of the transition, with an increase in the prevalence of overweight and obesity among the poor (6).

Education level of schoolchildren's parents was another factor that showed a significant impact on the occurrence of overweight and obesity. These results diverge from those of other studies that showed an inverse relationship between education and the prevalence of overweight and obesity in children (28). However, studies of preschool children have revealed that the number of years their parents attended school had no significant effect on their body mass (29). This study shows that the level of parents' education provided information about the socioeconomic and education status of the family. However, socioeconomic status was one of the statistically controlled variables used in the design of this study, which highlights the effect of parents' education level on the occurrence of overweight and obesity in children, regardless of household income. The influence of education level regardless of income has also been reported in studies with regard to adult obesity (30).

With regard to transportation, it was found that young people who go to school in motor vehicles were more susceptible to being overweight than those who walked or biked to school. Similar results were found in a study of students from southern Brazil, which noted that students with lower BMI scores tended to travel actively to school (31). Intervention strategies to encourage students to go to school in a more active manner should be implemented to reduce the risk of increased body mass. Some ur-

banization requirements could encourage students to travel to school in a more active manner (e.g., paving access roads, organized traffic, increased safety, and, in particular, information to encourage the early adoption of an active lifestyle).

This study has several strengths, such as its large sample size and large number of variables that tap into several domains (e.g., family, school, and physical environment), but its limitations should be recognized. The cross-sectional design cannot establish a causal relationship between independent variables and overweight and obesity, and for this reason it constitutes the main limitation of this survey. An additional limitation of the study is the lack of pubertal indicators to adjust the prevalence of overweight and obesity in the timing of maturation, an approach that has been recommended by the World Health Organization (18). Adjustment for the timing of maturation may be important because overweight in girls is strongly associated with earlier maturation, while for boys early maturation is associated with a low BMI (32). Further, the BMI was used to approximate overweight and obesity. BMI is not a perfect measure of obesity, because it reflects not only body fat but also bone, muscle, and other lean tissues. Despite its limitations, a recent review found that BMI and measures of overfat and adiposity are highly correlated, indicating that BMI is an adequate and practical measure of overweight and obesity for large-scale population studies (33). A final limitation, common to all studies with these characteristics, is that the social and environmental variables were self-reported, which may affect their accuracy. However, these procedures, although imperfect, are the only ones available for this type of assessment in population studies.

In conclusion, the data revealed that, although overweight and obesity prevalence were similar to levels observed in other Brazilian regions and lower than those found in highly industrialized areas, the proportion of schoolchildren who were overweight and obese is particularly worrying (9.7% and 2.1%, respectively). The primary social and environmental determinants identified as potentially contributing to the incidence of overweight and obesity include family (high socioeconomic class, higher parental education level, and fewer sib-

lings), school (go to school in motor vehicles, shorter home-to-school distance, and food consumption at school), paid work (≥ 20 hours per week), and city population (living in cities with a larger population). The well-documented adverse psychological, social, and health consequences of overweight and obesity

in young people and later in life, combined with tracking childhood overweight into adulthood, suggest the need to implement preventive programs for the population studied. Preventive programs should consider a multilevel intervention that includes the family, school, and physical environment.

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RESUMEN**Efectos de los determinantes sociales y ambientales sobre la obesidad y el sobrepeso en escolares de una región en desarrollo del Brasil**

Objetivo. Identificar los determinantes sociales y ambientales más firmemente asociados con el sobrepeso y la obesidad en niños que asisten a la escuela en una región en desarrollo del Brasil.

Métodos. Se recopilaron los datos de una encuesta comunitaria llevada a cabo en niños inscritos en escuelas del valle de Jequitinhonha, Minas Gerais (Brasil). La muestra estuvo integrada por 5 100 escolares de 6 a 18 años de edad. El sobrepeso y la obesidad se definieron según el índice de masa corporal, con base en el método actualmente recomendado por la Organización Mundial de la Salud (2007). Los determinantes sociales y ambientales se recopilaron mediante un cuestionario estructurado.

Resultados. La prevalencia del sobrepeso y de la obesidad fue de 11,1% y 2,7% en niñas y de 8,2% y 1,5% en niños, respectivamente. Las probabilidades de tener sobrepeso fueron mayores en los escolares que desempeñaban un trabajo remunerado (razón de probabilidades [RP] = 2,19; intervalo de confianza [IC] de 95%, 1,30–3,26); en aquellos cuyos padres tenían niveles superiores de educación (RP = 1,52; IC de 95%, 1,12–2,07); en quienes tenían dos o menos hermanos (RP = 1,74; IC de 95%, 1,21–2,49); y en los de clase económica alta (RP = 1,93; IC de 95%, 1,32–2,85). Presentaron altas probabilidades de tener sobrepeso los niños que viajaban en automóvil a la escuela (RP = 1,50; IC de 95%, 1,14–1,91), los que vivían a ≤ 5 km de la escuela (RP = 1,64; IC de 95%, 1,06–2,39) y los que consumían los alimentos que se venden en la cafetería de la escuela (RP = 1,56; IC de 95%, 1,19–2,16).

Conclusiones. Deben tenerse en cuenta las características de cada región particular de un país cuando se ejecutan medidas preventivas del sobrepeso y la obesidad, especialmente en las regiones muy pobres y en desarrollo, como el valle de Jequitinhonha en Brasil. Las medidas que se adopten deben considerar una intervención en varios niveles que incluya a la familia, la escuela y el entorno físico.

Palabras clave

Obesidad; sobrepeso; índice de masa corporal; evaluación nutricional; factores socioeconómicos; niño; adolescente; Brasil.