Prevalence of overweight and obesity among Costa Rican elementary school children

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ABSTRACT

Objective. *Given that excessive body weight during childhood influences the development of several chronic diseases in adulthood, this study was conducted to determine the prevalence of overweight and obesity in urban and rural Costa Rican elementary school children.*

Methods. *The study was carried out from July 2000 to April 2001. A total of 1 718 students ages 7–12 were selected from 34 schools in the capital city of San José and in other nearby urban and rural areas. Both younger children (ones aged 7 through 9 years) and older children (ones aged 10 through 12 years) with a body mass index (BMI) at or above the sex-specific 85th percentile were considered overweight. The younger children were classified as being obese if their triceps skinfold was greater than or equal to the 85th percentile for age and sex using the percentiles by age for children in the United States of America as normative standards. The older children were considered obese if they had a BMI at or above the sex-specific 85th percentile and both the triceps and subscapular skinfold thickness at or above the 90th percentile.*

Results. *The prevalence of overweight was 34.5%. Children aged 7–9, boys, children from urban areas, and children of a higher socioeconomic status had a higher prevalence of overweight. The prevalence of obesity was 26.2%. A higher prevalence of obesity was found among children aged 7–9, boys, children from urban areas, and children of middle socioeconomic status.*

Conclusions. *Given the high prevalence of obesity that we found in the Costa Rican children, primary and secondary prevention measures are needed in order to reduce the proportion of deaths due to chronic nontransmissible diseases among Costa Rican adults in the coming decades.*

Key words Child, body mass index, obesity, risk factors, Costa Rica.

The prevalence of obesity is increasing worldwide at an alarming rate in both developed and developing countries (1). The current lack of consistency and agreement among different studies in the classification of overweight and obesity in children and adolescents makes it difficult to give an overview of the global prevalence of overweight and obesity in younger age groups. Nevertheless, irrespective of the classification system used, most studies of overweight and obesity during childhood and adolescence have reported that the prevalence of both has increased.

Generally, excessive body weight during childhood influences the development of coronary heart disease, hypertension and stroke, type 2 diabetes mellitus, certain types of cancer, and other diseases in adulthood (2–5). This is of particular concern in developing countries such as Costa Rica, which has a "delayed" model of epidemio-

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logic transition, where chronic and infectious diseases coexist (6).

Life expectancy in developing countries has increased; however, the possibility of improving it will depend not only on a decrease in infant mortality, but also on a decrease in chronic nontransmissible diseases associated with premature mortality (6). A decrease in the prevalence of overweight and obesity early in life could contribute towards achieving this goal. As has been widely demonstrated (1), it is possible to reduce the proportion of deaths due to chronic disease, and furthermore, prevent the occurrence of new cases by applying strategies directed to the modification of lifestyle risk factors.

Because of their public health importance, excessive body weight and obesity in childhood should be closely monitored. This offers the best hope for preventing progression of the disease and its associated morbidities into adulthood. This report is the first to describe the prevalence of overweight and obesity in urban and rural Costa Rican elementary school children.

METHODS

Sample

The sample was selected from the Greater Metropolitan Area (GMA) of Costa Rica and its bordering rural districts. The GMA itself includes the central cantons of four provinces: the province of San José (which includes the capital city of San José) plus the three nearby provinces of Alajuela, Heredia, and Cartago. The GMA and the neighboring rural areas have the country's greatest concentration of elementary school children.

A total of 1 780 children ages 7–12 were selected from 34 schools; 68% of the children were from urban areas, and 32% were from rural areas. The schools were selected with probability proportional to size from a list of schools in the study area. In each school, 50 students—half of them boys and half of them girls—were selected at random.

Schools were classified as either urban or rural according to the sociodemographic characterization of the geographic-population areas of Costa Rica, as has been defined by the National Department of Statistics (7).

Procedure

Permission for the study was obtained from the Ethics Committee of the Costa Rican Institute for Research and Education on Nutrition and Health. Consent to participate in the study was obtained from the head or principal of each school. Written parental consent was required for children to participate in the study.

Anthropometric measurements

Height, weight, and triceps and subscapular skinfold measurements were obtained according to the guidelines established by Lohman et al. (8). Weight was measured without shoes and heavy outer clothing. Height was measured with the student shoeless and facing away from the scale. Standing height was measured to the nearest 0.1 cm, and weight was measured to the nearest 0.1 kg. Independent duplicate measurements were obtained for height and weight, and the average of both readings—required to be within ± 0.5 cm or 0.5 kg, respectively—was used in the data analyses. Body mass index (BMI) was calculated as weight (kg) divided by height (m) squared.

Triceps skinfold (TRSK) (posterior upper arm, halfway between the elbow and acromion) and subscapular skinfold (SSK) (1 cm below the scapula's lower tip) were measured using a Lange skinfold caliper (Cambridge Scientific Industries, Cambridge, Maryland, United States of America) to the nearest 1.0 mm. Each skinfold was measured two times on the left side of the body, with it done a third time if the difference between the first two measures exceeded 4 mm.

Younger children (the students aged 7 through 9 years) and older children (the students aged 10 through 12 years) with BMI at or above the sex-specific 85th percentile were considered overweight.[3] In the absence of other data specifying optimum cutoff values for BMI in younger and older children, the BMI values by age for children in the United States were used, as recommended by the World Health Organization (WHO) Expert Committee on Physical Status (9).

Younger children were classified as obese if their triceps skinfold was greater than or equal to the 85th percentile for age and sex, using the percentiles by age for United States children as normative standards, as recommended by the WHO (9). This criterion was chosen because the triceps skinfold has generally been found to be the best predictor of fat in children (10, 11). An additional consideration was the need to compare our results with those from other studies. In most studies in Canada and in the United States, children are defined as obese based on the measurement of triceps skinfold (12, 13).

Older children with a BMI value at or above the sex-specific 85th percentile and both triceps skinfold and subscapular skinfold thickness at or above the 90th percentile were considered obese, as has been suggested by the WHO (9).

The subscapular / triceps index (STI), which measures the body fat distribution pattern, was calculated as SSK / TRSK (10). An STI value between 0.76 and 0.99 was considered indicative of high risk of central fat distribution, and a value ≥ 1 as an indicator of abdominal obesity (14).

Sociodemographic information

The survey included 12 sociodemographic items. Of the 12, the ones we used for our analysis were: age, gender, area (urban, rural), educational level (years of formal education) of parents, familial structure (nuclear,

[3] Some organizations, including the World Health Organization (9), term those who are in the age range of 10–12 years as being "adolescents"; in this article, we use the terms "younger children" and "older children" to distinguish between the two age groups in our study.

matriarchal, extended), homeownership, and having such services or household amenities as the Internet, cable TV, a hot water system, or a microwave oven. Possession of the particular services or amenities was used to determine an index of socioeconomic status according to the methodology described by Madrigal (15). That methodology uses weighting for each service or household amenity so as to obtain a score that has a high, positive correlation with family income. The resulting scores were categorized in order to classify the population by socioeconomic status (SES): a score < 5, low SES; 5–15, middle SES; and > 15, high SES.

Statistical analyses

Data were examined with SPSS 10.0 for Windows computer software (SPSS Inc., Chicago, Illinois, United States), using analyses of variance as appropriate for continuous variables and chi-square tests for categorical data. Logistic regression models were developed concurrently to test the effects of seven independent variables on overweight and obesity. Gender and area were included as dummy variables. Age, socioeconomic index, number of family members, and parents' educational level (years) were included as continuous variables. After examining bivariate relationships between variables, multivariate backward conditional models were initially used to identify which of the correlated variables provided the best model with a particular dependent variable. Collinearity was minimized by this approach, and correlation coefficients between independent variables included in the logistic regression models did not exceed 0.3. A level of $P < 0.05$ was considered statistically significant.

TABLE 1. Distribution (%) of the study population (*n* = 1 718) by demographic characteristics, study of prevalence of overweight and obesity among elementary school children, Costa Rica, 2000–2001

Demographic characteristic	Study population distribution (%)
Age group (yr)	
7–9	52.6
10–12	47.4
Gender	
Male	48.8
Female	51.2
Area	
Urban	67.8
Rural	32.2
Socioeconomic status[a]	
Low	38.6
Middle	45.1
High	16.3
Father's education (yr)	
≤ 6	25.7
7–11	28.2
≥ 12	46.1
Mother's education (yr)	
≤ 6	29.3
7–11	35.5
≥ 12	35.2
Familial structure	
Nuclear	67.7
Matriarchal	19.9
Extended	12.4

[a] Socioenomic status was determined according to the methodology described by Madrigal (15).

RESULTS

Of the 1 780 eligible children, the parents of 1 718 of them (96.5%) consented to their participation in the study. The sample consisted of 839 males and 879 females; 53% were aged 7 through 9 years, and 47% were aged 10 through 12 years. All the schoolchildren were from the same ethnic background, mestizo. Table 1 shows the demographic characteristics of the study population. Table 2 shows the percentiles for BMI of the study population by gender and age, and Table 3 shows similar data for triceps and subscapular skinfold thickness.

As defined by the 85th percentile of BMI, the prevalence of overweight was 34.5% (Table 4). Children aged 7–9, boys, children from urban areas, and children of high socioeconomic status had a higher prevalence of overweight. No statistically significant differences were found in the prevalence of overweight when parents' education and familial structure were analyzed.

The prevalence of obesity was 26.2% (Table 4). A higher prevalence of obesity was found among children aged 7–9, boys, children from urban areas, and children of middle socioeconomic status. Likewise, a greater prevalence of obesity was found among children whose fathers had ≥ 12 years of education and whose mothers had 7–11 years of education. There were no important differences in obesity prevalence among types of familial structure.

Around 22% of obese schoolchildren presented abdominal obesity (STI ≥ 1) (Table 5). On the other hand, 29% of children had an STI ranging from 0.76 to 0.99 (high risk of central fat dis-

TABLE 2. Percentiles of body mass index (BMI) for Costa Rican elementary school children in study of prevalence of overweight and obesity, 2000–2001

Gender/Age (yr)	*n*	BMI value for the respective subgroup: 5th	15th	50th	85th	95th
Males						
7	148	14.25	14.99	17.09	19.89	22.50
8	142	14.38	15.46	17.88	22.35	24.85
9	144	15.06	15.61	17.48	21.05	23.96
10	173	14.78	15.91	18.15	23.10	25.15
11	126	15.51	16.19	19.64	24.45	27.61
12	106	15.21	16.12	18.53	22.35	25.04
Females						
7	165	14.38	15.16	16.77	19.50	22.11
8	146	14.58	15.07	17.10	21.73	24.13
9	160	14.76	15.39	17.52	21.52	33.92
10	162	14.52	15.71	18.72	22.83	26.02
11	137	14.69	15.99	18.99	23.94	25.78
12	109	15.32	16.65	19.26	21.85	23.78

TABLE 3. Percentiles of triceps and subscapular skinfold thickness (mm) among Costa Rican elementary school children in study of prevalence of overweight and obesity, 2000–2001

Skinfold/Gender/Age (yr) group	*n*	Skinfold thickness (mm) for the respective subgroup							
		5th	10th	25th	50th	75th	85th	90th	95th
Triceps									
Males									
7	148	6.00	7.00	9.00	11.00	15.00	17.00	18.00	20.77
8	142	6.50	7.00	10.00	12.91	16.25	21.00	23.00	25.00
9	144	7.00	8.00	10.00	12.25	17.37	19.62	21.75	24.75
10	173	7.00	8.00	10.00	13.50	18.33	21.90	24.00	27.30
11	126	8.00	8.85	10.41	14.00	20.87	24.00	25.30	28.00
12	106	7.14	8.00	10.00	12.00	15.62	17.95	18.65	21.00
Females									
7	165	8.00	9.00	10.00	12.50	15.50	17.84	20.04	22.49
8	146	8.00	9.04	10.91	13.50	17.00	21.00	22.00	24.00
9	160	9.00	10.00	12.00	14.00	17.47	20.28	22.00	25.47
10	162	8.50	10.00	12.00	15.00	20.08	23.00	26.00	29.00
11	137	9.00	10.00	12.00	15.50	19.00	21.00	24.00	27.04
12	109	8.20	9.00	12.00	15.00	18.25	20.00	21.00	24.00
Subscapular									
Males									
7	148	4.00	4.00	5.00	6.00	8.00	11.00	13.10	18.55
8	142	4.00	4.00	5.00	6.50	12.00	15.84	20.00	30.00
9	144	4.00	5.00	5.00	6.96	11.00	14.12	16.00	22.37
10	173	4.50	5.00	5.50	8.00	15.00	18.95	22.60	26.60
11	126	4.00	5.00	6.00	9.00	17.16	20.97	24.30	31.65
12	106	4.87	5.00	6.00	7.08	10.25	13.93	16.00	19.12
Females									
7	165	4.50	4.60	5.26	6.50	10.00	12.00	17.00	23.70
8	146	4.50	5.00	5.95	7.91	12.00	15.00	18.30	21.65
9	160	4.50	5.00	6.00	8.00	14.00	17.21	19.00	22.00
10	162	4.50	5.00	7.00	10.66	16.00	22.00	25.00	28.00
11	137	5.00	6.00	7.00	10.50	16.00	21.00	23.00	28.00
12	109	5.00	6.00	7.00	10.00	14.08	17.00	19.00	20.00

tribution). The prevalence of abdominal obesity (STI ≥ 1) was higher in the older obese children (aged 10–12) than in the younger ones (aged 7–9) ($P < 0.001$). Table 5 shows the distribution of 450 obese school children by STI ranges.

The results of the logistic regression analyses are shown in Table 6. The odds of being overweight or obese were higher in boys than in girls. Older children had less risk of being either overweight (odds ratio (OR) = 0.88) or obese (OR = 0.75). In addition, higher socioeconomic status (OR = 1.03) was associated with being overweight. At a 95% confidence level, the area and the other variables (parental education and number of family members) in the models had ORs that were not significantly different from 1.0.

DISCUSSION

The prevalence of overweight and obesity that we found in Costa Rican schoolchildren is alarming. Overweight and obesity confer immediate psychosocial risk, such as social isolation, distorted body image, and social rejection in childhood. However, the most serious problems are heightened risk of persistent overweight and associated long-term health risks (1–5, 16, 17). According to the Child and Adolescent Trial for Cardiovascular Health (CATCH), both excess weight and fatness are associated with adverse lipoprotein profiles, including increased total and apolipoprotein-B cholesterol and decreased HDL cholesterol (18). (Sponsored by the National Heart, Lung and Blood Institute of the United States, CATCH was a field trial among elementary school children that was intended to test a program to reduce risk factors for heart disease). In addition, body fatness was significantly associated with increased blood pressure in the Bogalusa Heart Study. (That study is a long-term epidemiological study centered in a rural community in the state of Louisiana, which is in the southern part of the United States; the study has investigated critical questions concerning the early natural history of atherosclerosis (19).

In our study in Costa Rica, the prevalence of obesity was lower in the group over 9 years of age, which could reflect the maturing and developmental processes that are typical of this age (9). However, it is likely that many

TABLE 4. Prevalence (%) of obesity and overweight among elementary school children in Costa Rica according to various demographic characteristics, 2000–2001

Demographic characteristic	*n*	Overweight (%) BMI ≥ 85th	Overweight (%) *P* value	Obesity (%) Triceps ≥ 85th[a] or BMI ≥ 85th and triceps and subscapular ≥ 90th[b]	Obesity (%) *P* value
Gender			0.049		0.002
Female	879	32.3		22.5	
Male	839	36.8		30.0	
Age group (yr)			0.007		< 0.001
7–9	905	37.5		33.0	
10–12	813	31.2		18.5	
Area			0.006		< 0.001
Urban	1 164	36.7		28.4	
Rural	554	30.0		21.5	
Socioeconomic status[c]			< 0.001		< 0.001
Low	663	27.9		21.2	
Middle	776	37.2		29.4	
High	279	42.7		28.7	
Father's education (yr)			0.166		0.012
≤ 6	442	31.2		21.5	
7–11	485	34.1		26.9	
≥ 12	791	36.5		28.3	
Mother's education (yr)			0.118		0.002
≤ 6	505	31.3		21.6	
7–11	610	35.6		29.2	
≥ 12	603	36.2		27.0	
Familial structure			0.189		0.117
Nuclear	1 162	33.6		26.2	
Matriarchal	341	38.7		29.3	
Extended	215	33.0		21.4	
Overall	1 718	34.5	NA[d]	26.2	NA[d]

[a] Younger children (ages 7–9) were classified as obese if their triceps skinfold was greater than or equal to the 85th percentile for age and sex, using the percentiles by age for United States children as normative standards.
[b] Older children (ages 10–12) with a BMI value at or above the sex-specific 85th percentile and both triceps skinfold and subscapular skinfold thickness at or above the 90th percentile were considered obese.
[c] Socioeconomic status was determined according to the methodology described by Madrigal (15).
[d] NA = not applicable.

overweight or obese children will go on to become overweight or obese adults (17). The CATCH study suggests that the ability to predict future obesity can begin with children as young as 6–9 years old (18). It has been shown that the relative risk of an obese child becoming an obese adult is six to seven times greater than that of his/her nonobese peers (16, 20). Several studies suggest that approximately 42%–63% of obese schoolchildren become obese adults (16).

The prevalence of overweight and obesity that we found among the children in Costa Rica and the likelihood that those children will also be overweight or obese as adults suggest there will be an increased need for treatment of associated morbidities in the future. This is particularly important when we consider the high percentage (29.1%) of obese children with a high risk of central fat distribution (subscapular/triceps index between 0.76 and 0.99). Observations in the Bogalusa Heart Study (21, 22) show that adverse concentrations of triacylglycerol, LDL cholesterol, HDL cholesterol, and insulin are significantly associated with a central or abdominal distribution of body fat in children and adolescents.

Abundant evidence shows that abdominal obesity increases the risk of developing insulin resistance and the metabolic syndrome (hyperinsulinemia, dyslipidemia, glucose intolerance, and hypertension) that links obesity with cardiovascular disease (1). This appears to be quite important in Costa Rica, where coronary heart disease (CHD) is the leading cause of death among adults and where the prevalence of type 2 diabetes mellitus in adults is increasing (23).

Several studies note that the central distribution of fat is genetically determined and can be present from childhood, although it is more clearly manifested during puberty (1), as was evidenced in this study. In addition, the available evidence points out the relationship between central obesity and type 2 diabetes mellitus (24). Therefore, our data for Costa Rica suggest that over 35% of the obese children aged 10–12 years may be at risk of suffering type 2 diabetes mellitus. Traditionally, type 2 diabetes mellitus

TABLE 5. Distribution (%) of 450 obese Costa Rican elementary school children by subscapular/triceps index (STI) ranges, study of prevalence of overweight and obesity, 2000–2001

Group	*n*	STI range < 0.50	STI range 0.50–0.75	STI range 0.76–0.99	STI range ≥ 1
Gender					
Female	198	15.2	29.8	33.8	21.2
Male	252	17.5	34.1	25.4	23.0
Age (yr)					
7–9	299	24.7	35.7	24.7	15.0
10–12	151	0.0	25.3	38.0	36.7
Area					
Urban	331	16.0	32.6	28.4	23.0
Rural	119	17.6	31.1	31.1	20.2
Socioeconomic status[a]					
Low	140	21.4	26.4	32.1	20.0
Middle	230	11.9	34.8	29.1	24.2
High	80	21.3	33.8	25.0	20.0
Father's education (yr)					
≤ 6	95	17.9	23.2	34.7	24.2
7–11	131	16.2	32.3	24.6	26.0
≥ 12	224	16.1	36.2	29.5	18.3
Mother's education (yr)					
≤ 6	119	12.8	25.7	38.9	26.6
7–11	178	14.0	34.3	28.1	23.6
≥ 12	163	21.5	34.4	26.4	17.8
Overall	450	16.4	32.2	29.1	22.2

[a] Socioeconomic status was determined according to the methodology described by Madrigal (15).

TABLE 6. Logistic regression models using overweight and obesity as dependent variables, study of prevalence of overweight and obesity among Costa Rican elementary school children, 2000–2001

Variable[a]	Odds ratio	95% confidence interval
Overweight		
Gender (male)[b]	1.236	1.009–1.513
Age	0.878	0.825–0.933
Area (urban)[c]	1.119	0.868–1.442
Number of family members	0.963	0.909–1.021
Socioeconomic status index	1.027	1.013–1.042
Father's education (yr)	0.991	0.943–1.041
Mother's education (yr)	0.973	0.919–1.030
Obesity		
Gender (male)	1.530	1.224–1.913
Age	0.751	0.701–0.805
Area (urban)	1.285	0.969–1.703
Number of family members	0.947	0.777–1.783
Socioeconomic status index	1.012	0.888–1.010
Father's education (yr)	1.012	0.997–1.027
Mother's education (yr)	0.970	0.959–1.069

[a] Age, socioeconomic index, number of family members, and parents' educational levels were included as continuous variables.
[b] For gender, male=1 and female=0.
[c] For area, urban=1 and rural =0.

has been considered an adult disease and rare in pediatric populations. However, over the last decade, there has been a disturbing trend of increasing numbers of type 2 diabetes cases in children in North America, particularly adolescents (24–26), mirroring the increasing rates of obesity in this age group (26). Currently, type 2 diabetes among youth is an emerging public health problem in several countries, including Canada and the United States (24, 26, 27).

Different factors have been associated with the development of obesity (1). For example, some authors point to an inverse relationship between socioeconomic status and obesity among adults and adolescents in industrialized countries, with socioeconomic status (SES) acting as a powerful influence on the adoption of a healthy lifestyle (28). More-educated parents are better informed about proper health behaviors and adopt them, which is expected to lower the risk that their children will become obese. However, our findings in Costa Rica do not concur with those observations; on the contrary, our findings show a direct relationship between socioeconomic level and the prevalence of obesity. This association appears to be a typical behavior for a country in an economic transition (29). BMI distribution varies significantly according to the stage of economic development reached (1). In the early stages of the economic transition, the wealthier section of the society shows an increase in the proportion of people with a high BMI. This tends to change in the later phases of the transition, with an increase in the prevalence of high BMI among the poor (1).

The direct relationship between SES and obesity that we found is remarkably evident in the case of boys, with the obesity rate increasing from 21.9% in the low SES to 36.7% in the high SES (Table 7). This trend was also observed, although less strongly so, with both urban and rural children. However, the obesity rate tended to be similar—around 22%—among girls in the different social strata. This situation with girls is difficult to explain, but it could be argued that from an early age most girls tend be influenced by a social environment that strongly suggests that a thin body image is ideal or socially acceptable.

On the other hand, the obesity rate that we found was remarkably higher in urban males than in their rural

TABLE 7. Obesity rate (%) among Costa Rican elementary school children, by socioeconomic status and other variables, 2000–2001

Variable	Low socioeconomic status	Middle socioeconomic status	High socioeconomic status	*P* value
Male	21.9	34.1	36.7	0.004
Female	20.1	25.2	21.8	0.062
Urban	23.8	30.8	28.8	0.046
Rural	19.1	27.6	27.6	0.003
Overall	21.2	29.4	28.7	0.026

counterparts (35% and 20%, respectively; data not shown), as has also been reported for adults in Costa Rica (30). This finding is probably due to differences in lifestyle. While some rural children walk long distances to attend school and spend more time in activities demanding high energy such as agricultural work or walking in hilly areas, urban children take the bus to school and spend around three hours per day watching TV (31). In addition, it has been reported recently that the prevalence of sedentarism among Costa Rican urban boys aged 13–18 years is double the rate observed among their rural counterparts (43% and 20%, respectively) (32). The prevalence of cardiovascular diseases tends to be higher in men and in urban areas; therefore, reducing risk factors in these population groups from an early age could contribute to lower mortality rates.

It is difficult to compare our results to those reported in other countries because a variety of criteria are used for overweight. However, a few comparisons can be made from reports that have applied the same cutoff point as ours. Based on the 85th percentile, the 34.5% overweight prevalence that we found was more than 10 percentage points higher than the 22% figure reported by the Third National Health and Nutrition Examination Survey (NHANES III, 1988 to 1991) for United States children of the same ages as those included in this study (33). The 33% prevalence rate for obesity that we found in children under 10 years old was also some 10 percentage points higher than the 22% found in the CATCH population in the United States (18). However, in the CATCH study, obesity was defined as a triceps skinfold thickness above the 85th percentile, whereas we also included children with triceps skinfolds at the 85th percentile. The 26.2% prevalence of obesity that we found in Costa Rican schoolchildren was also approximately 10 percentage points higher than the 13% reported for Canadian children 7–12 years old (12), with the same criteria used in both countries.

Having used such a sensitive criterion to determine obesity in the older children (BMI at or above the sex-specific 85th percentile and both triceps and subscapular skinfold thickness at or above the 90th percentile) limits the possibility of comparing our data. That is because, so far, no other studies are available that have used the same criterion. In any case, the prevalence of overweight and obesity evidenced in Costa Rican schoolchildren is considerably higher than what has been found in other countries, in spite of our having used such strict criteria.

Using the United States population as the reference standard has been proposed as a benchmark to facilitate common definitions and communications (9). Upon comparison of the 50th percentile of triceps and subscapular skinfolds, it is evident that Costa Rican children exhibit values remarkably higher than those of the United States reference standard. For example, at the triceps, the 50th percentiles for 7-year-old and 9-year-old Costa Rican males were 11.00 mm and 12.25 mm, respectively. The mean triceps measurements for the United States reference population were 8.59 mm and 8.96 mm, respectively (9). At the subscapular, the 50th percentiles for 10-year-old and 12-year-old Costa Rican females were 10.66 mm and 10.00 mm, respectively. Measurements for the United States reference population were 6.4 mm and 7.7 mm, respectively (9). The BMI data for the Costa Rican children yielded the same pattern of higher values than those reported for the United States reference population. Our findings of a high adiposity level are consistent with a recent report on Costa Rica (34).

Various explanations are possible for the large differences between the mean values found for Costa Rican children and the ones for the United States reference population. The factors may include differences between the populations in terms of genetics or in the pace of sexual maturation. Or, the reason might be the increasing trend towards obesity among Costa Ricans in recent decades. For example, in 1996 the prevalence of obesity in adult Costa Rican women was 46%, approximately 10% higher than the prevalence observed in 1982 (35).

Our BMI and body composition data for the Costa Rican children clearly suggest the need to implement short-term strategies to decrease the prevalence of obesity in the country. Evidently, Costa Rica is facing a serious public health issue, which could have a marked effect on its economy. Although there are no data from Costa Rica, studies on the economic costs of obesity in other countries have shown that these costs account for between 2% and 7% of total health care expenses (1). The inclusion of costs associated with overweight would substantially increase the attributed cost because the number of overweight individuals in a community is generally three to four times greater than the number of those who are obese (1).

The health burden attributable to excess weight gain in Costa Rica and in other societies in transition is likely to be huge. This is because of the absolute numbers at risk, the large reduction in life expectancy, and the fact that the problem particularly affects young individuals, who have a key role in promoting economic development. In developing countries, a large proportion of deaths associated with chronic diseases linked to overweight and obesity occur in the productive middle years of life, at ages much younger than those seen in developed countries (1). The results of our study suggest that primary and secondary prevention measures, such as the ones suggested by the World Health Organization (1), are needed in other to reduce the proportion of deaths due to chronic nontransmissible diseases among Costa Rican adults in the coming decades.

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RESUMEN

Prevalencia del sobrepeso y la obesidad entre escolares de nivel primario en Costa Rica

Objetivo. Dado que el peso corporal excesivo durante la niñez influye en el desarrollo de varias enfermedades crónicas en la adultez, se llevó a cabo este estudio en escolares de nivel primario de áreas urbanas y rurales de Costa Rica, para determinar la prevalencia del sobrepeso y la obesidad.
Métodos. El estudio se llevó a cabo de julio de 2000 a abril de 2001. Se seleccionó un total de 1 718 estudiantes de 7 a 12 años de edad de 34 escuelas de la capital (San José) y de áreas rurales y urbanas cercanas. Se consideró que tenían sobrepeso tanto los niños menores (de 7 a 9 años) como los mayores (de 10 a 12 años) cuyo índice de masa corporal era igual o mayor al del 85% de los niños, según sexo. Se consideraron obesos a los niños menores si el pliegue cutáneo de sus tríceps era igual o mayor al del 85% de los niños estadounidenses de la misma edad y sexo, como estándares normativos. Se consideraron obesos a los niños mayores si su índice de masa corporal era igual o mayor al del 85% de los niños del mismo sexo y el espesor del pliegue cutáneo, tanto de tríceps como subescapular, era igual o mayor al del 90%.
Resultados. La prevalencia de sobrepeso fue del 34,5%. Niños de 7 a 9 años, los varones, niños de áreas urbanas y los niños de nivel socioeconómico más alto tenían mayor prevalencia de sobrepeso. La prevalencia de obesidad fue del 26,2%. Se encontró mayor prevalencia de obesidad entre niños de 7 a 9 años, varones, los niños de áreas urbanas, y aquéllos de nivel socioeconómico mediano.
Conclusiones. Dada la alta prevalencia de obesidad que se encontró en los niños costarricenses estudiados, es necesario aplicar medidas primarias y secundarias para reducir la proporción de muertes atribuibles a enfermedades crónicas no transmisibles entre adultos costarricenses en los próximos decenios.

La salud a través de la historia

En 2002 la Organización Panamericana de la Salud publicó una colección de citas que se tituló sencillamente *Salud*. El prefacio invita a los lectores a que contribuyan a próximas ediciones, sobre todo con aportes de escritores latinoamericanos. Nos han sugerido las siguientes citas del prócer cubano, José Martí (1853–1895)...

> *"En las selvas de nuestra América abundan remedios para todas las enfermedades que en nuestro suelo se producen".*
>
> *"En estos tiempos de ansiedad de espíritu, urge fortalecer el cuerpo que ha de mantenerlo".*
>
> *"La verdadera medicina no es la que cura, sino la que precave: la Higiene es la verdadera medicina".*

y de la trayectoria geohistórica del mosquito que hace el ilustre Dr. Carlos J. Finlay (1833–1915) en su famoso "El mosquito hipotéticamente considerado como agente de transmisión de la fiebre amarilla"…

> *"Históricamente el mosquito es uno de los insectos más antiguos observados. Aristóteles y Plinio hacen referencia a su trompa, que sirve a la vez para horadar la piel y chupar la sangre. El historiador griego Pausanias (citado por Tachenberg) menciona la ciudad de Myus, en Asia Menor, situada en una ensenada cuya comunicación con el mar vino a cerrarse luego; cuando el agua del lago que así se formara dejó de ser salada, resultó tal plaga de mosquitos que los habitantes abandonaron la ciudad y se trasladaron a Mileto. Así también leemos en las Décadas de Herrera que Juan de Grijalva, cuando por primera vez descubrió las costas de Nueva España, el año de 1518, hubo que ocupar con su gente la isleta que nombró Juan de Ulúa, teniendo que hacer sus chozas encima de los más altos medanos de arena de la isleta, por huir de la importunidad de los mosquitos", y Bernal Díaz de Castillo tuvo que irse a unos adoratorios de los indios "huyendo de la molestia de los mosquitos". En fin, en 1519, casi en el mismo sitio donde hoy se levanta la moderna Veracruz "los mosquitos zancudos, dice Herrera, y los chicos que son peores, fatigan la gente de Cortés"…*