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Original Research Article

Physical Growth in Schoolchildren from Argentina: Comparison with Argentinean and CDC/NCHS Growth References

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ABSTRACT The aim of this study was to assess the physical growth of schoolchildren from Argentina by comparison with the CDC/NCHS and Argentinean growth references (AGR), to contribute to the discussion about the use of local or international references for the assessment of growth in developing countries. Weight and height were measured in 3,411 schoolchildren aged 5–14 years. Data were log-transformed and compared with both references by paired samples t-test (CI = 0.95; α = 0.005). The boys' weights were greater than CDC/NCHS (up to 10, and at 14 years old) and the national reference at all ages ($P < 0.005$). The girls also were heavier than CDC/NCHS (at 7 and 12 years old, $P < 0.005$) and AGR, except at age 11 and 14 years. In boys, height was lower than CDC/NCHS at 9 and 14 years of age, and higher than AGR at all ages ($P < 0.005$). The girls were also shorter than CDC/NCHS at 7, 13, and 14 years old ($P < 0.005$), and—except at age 14—taller than AGR. The weight was higher than both of the references. Height showed a clear dissociation from the national reference and minor differences from CDC/NCHS. Nevertheless, around puberty, the children's height fell short of CDC/NCHS, especially the girls, whose values approached those of their Argentinean peers. This divergence could be associated with cohort effects or population variations in adolescent growth spurt. The use of a single growth reference for preadolescent may be appropriate. The height decrease in adolescents suggests the usefulness of local standards at this period. Am. J. Hum. Biol. 21:312–318, 2009.

Anthropometric measurements are useful tools for evaluating growth and nutritional status of both individuals and populations. Many studies have been conducted on the anthropometric assessment of growth and nutritional status in preschool children (de Onis and Blossner, 1997), but much less information is available on older children and adolescents (de Onis et al., 2001). Among the most important reasons for this lack of information is the difficulty in interpreting anthropometric data in these age groups (de Onis and Habitcht, 1996). Additionally, there is a lack of agreement about whether the use of a single international reference is suitable to evaluate growth disregarding genetic factors, particularly on the reasoning that these norms may be too high for the children in developing countries (Edwards and Morse, 1989; Van Loon et al., 1986).

The 1977 NCHS growth charts had been used widely in assessing the nutritional and health status of children as well as in monitoring individual growth (Hamill et a1., 1979). A World Health Organization Expert Committee later recommended the provisional use of this NCHS reference (WHO, 1995), and also urged that the adequacy of these data for application to populations from different ethnic backgrounds be evaluated. In 2000, the Center for Disease Control and Prevention (CDC) proposed a revised version of the reference growth charts by improving the statistical procedures and incorporating new data from the second and the third National Health and Nutritional Examination Survey (NHANES) (Kuczmarski et al., 2000).

An understanding of ethnic differences in growth is essential to identifying the extent to which a single reference can be applied worldwide. The feasibility of developing a single reference growth standard has been recently discussed by several authors, particularly in schoolchildren and adolescents (Butte et al., 2007), because the evidence in developing countries seems to show that growth differences usually become manifest in school-aged children when they are compared with international standards (Al-Sharbati et al., 2001; Haas and Campirano, 2006; Hakeem et al., 2004). In such circumstance, the local standards would certainly be more appropriate than the international ones.

The Argentinean growth reference (AGR) (SAP, 2001) has been frequently used since its publication in 1987. It was constructed through the use of longitudinal and cross-sectional data, some of which samplings were garnered more than 35 years ago (Cusminsky et al., 1966, 1974; Funes Lastra et al., 1975). The most recent cross-sectional sample for children aged 12–19 years, carried out in 1985 (Lejarraga, 1986; Lejarraga and Orfila, 1987), constituted the only representative data for Argentinean children to date. Recent publications recommended its validity for nationwide use (del Pino et al., 2003, 2005). Moreover, as a result of ethnic, social, cultural, and eco-

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nomic differences, a positive secular trend may, in fact, be occurring in some regions of the country.

La Pampa is one of the provinces conforming the region of the Patagonia. Although the development of La Pampa's productive sector does not rank among the highest, the levels of general well-being and the various social indicators are relatively good within the national context. Such conditions should also be reflected in child and adolescent growth, but information on this question is not currently available. The aim of the study was to describe the weight and height of schoolchildren from Santa Rosa (La Pampa, Argentina) to assess the adequacy of using the Argentinean or the CDC/NCHS references for evaluating the growth of these age groups. The comparisons here are aimed at contributing information regarding more general question as to the usefulness of either national or international references for the assessment of growth in children from developing countries such as ours.

SUBJECTS AND METHODS

Socioenvironmental and demographic context

One of the characteristics that define Argentina as a developing, transitional, or peripheral country is the asymmetry in the degree of development of the different regions. Such developmental inequality began at the end of the 19th century when the agricultural-export model based on the Pampean Region became the key factor in the national economic dynamics, creating the breach with the rest of the regions at that time that is currently present (Cao and Vaca, 2006). In other regions, Native Americans were driven out or killed and their lands occupied. That circumstance also pertained to the region of the Patagonia; located in the south of Argentina and comprising the provinces of La Pampa, Río Negro, Neuquén, Chubut, Santa Cruz, and Tierra del Fuego. The Patagonia is characterized by a low population density resulting from its relatively late settlement along with the displacement of the indigenous population there. Subsequently, the economic and social development of the Patagonia was fundamentally influenced by settlement policies, such as the movement of army contingents into the region, the implementation of preferential production programs, and higher per capita public investments for social and economic infrastructure, when compared with other regions within the country (Cao and Vaca, 2006).

The Province of La Pampa has about 299,300 inhabitants, representing only 0.8% of Argentina's total population (CNPV, 2001). Its population is the result of two main waves of immigration: the first by the inhabitants of neighboring provinces at the end of the 19th century; the second by the Spanish, Italian, German, French, Jews, and Arabs from Europe and the Middle East at the beginning of the 20th century—the "golden era" of agricultural colonization. The rate of immigration from other Latin American countries has been low, and mostly from Chile. In recent years, immigrants from neighboring provinces have contributed to the region's population growth, as a result of a recession in their regional economies (Tourn, 1996). Santa Rosa is the capital city and the main urban center (with 94,340 inhabitants). The economy of the city is mainly based on the service sector, as evidenced by the net regional product, where the tertiary sector of the economy has the highest percentage (61.7%), as opposed to the primary (23.8%) and secondary (14.5%) sectors. Urban-population growth occurred with a concomitant increase in services and equipment (drinking water, sewage system, natural-gas supply, paving and public lighting, solid-waste collection), covering a large portion of the population's needs (MSR, Unpublished report). Census data from 1991 and 2001 show a relative increase of elderly citizens, as a result of the lower birth and fertility rates. The overall mortality rate has remained constant; whereas the infant mortality rate has decreased significantly (to a value of 12.7 per 1,000), the latter now being one of the lowest in the country (MSA/OPS, 2005). Data from the first semester of 2006 show that the population of Santa Rosa with unsatisfied basic needs amounts to some 9.2% (3.0% below the national mean), with an economically active population of 46,304 persons, 40% of whom are unemployed (1.7% below the national rate). The income gap in the city is 20 points below the national mean (EPH, 2006).

Data collection

The survey was conducted from April 2005 to December 2006 in public and private schools from Santa Rosa. The design was cross sectional and the sampling nonprobabilistic. To those ends, we mapped all the schools of the city and then selected one from each neighborhood. Where there was more than one school, we selected the one closest to the geographical center of the neighborhood. The children participated in the study after written consent was given by the parents or legal guardian. All the parents answered a structured questionnaire about household assets, physical amenities, and other characteristics of the family (Table 1).

At the school, the participation rate was >95% and only those who were absent on the day of data collection were excluded. From a total of 3,678 participants, 260 children were excluded because of their age (<5 or >14 years) and seven others because of chronic diseases. The subjects finally included in the analysis comprised 3,411 boys and girls aged 5–14 years, which group represented 19% of this age range within the overall population (17,959 students).

Anthropometric measurements of each child were taken by a single observer (ABO) following standardized procedures (Cameron, 2004). Height was measured with a portable stadiometer (accuracy, 1 mm) to the nearest centimeter. The students stood up straight, bare-footed with heels, buttocks, and back touching the stadiometer, with the head in the Frankfurt plane. A horizontal plate was then lowered until it was firmly touching the crown of the head. Body weight (kg) was measured on a digital scale (accuracy, 10 g) with subjects lightly clothed (the estimated weight of the clothes then being subtracted). The scale's calibration was frequently checked by an object of known weight. The precision of measurement was assessed by the technical error of measurement (TEM), calculated as the square root of the sum of squared differences between two repeated measurements on 15 subjects, divided by two times the number of subjects measured. The TEM values were below the maximum acceptable TEM values reported by Ulijaszek and Kerr (1999).

Birth dates were verified by checking the children's birth certificates or by retrieving this information from school admission records. Chronological age in years and decimals of the year were calculated by subtracting the

TABLE 1. Socioenvironmental characteristics of the sample study

Characteristic	Definition	Frequency (%)
Lodging status		
House owner	Home-tenure status	75.0
Lease holder		12.8
Free lodging		12.2
Members of the household	Number of persons living in the household	Mean = 4.7 ± 1.5
Crowding	Number of persons per room	Mean = 2.0 ± 0.4
Building materials		
Fired brick masonry	Type of materials used in the construction of the house	89.2
Low quality prefab		2.3
Makeshift materials		4.9
No answer		3.6
Piped water system	Drinking water (main source)	91.2
Piped gas	Fuel (for cooking and heating)	91.9
Sewage system	Wastewater disposal	86.6
Waste collection	Solid waste collection service	85.8
Health insurance	Medical insurance at the expense of the employer or paid by the person	70.0
Public assistance		
Nutritional support	National or local programs that benefit poor families by supplementing their food budget and/or by providing cash relief to the heads of households	13.8
Monetary support		16.0
Education of father		
University/Tertiary	Level of schooling achieved	39.5
Secondary		39.7
Primary		20.8
Education of mother		
University/Tertiary		34.2
Secondary		40.3
Primary		25.5
Occupation of father		
Employed	Formal worker	55.0
Autonomous worker	Freelance jobs	21.0
Unskilled worker	Unqualified worker or temporary jobs without work contract	12.6
Unemployed		3.6
No answer		7.8
Occupation of mother		
Employed	Formal worker	50.8
Autonomous worker	Freelance jobs	11.2
Unskilled worker	Unqualified worker or temporary jobs without work contract	3.3
Unemployed (housewife)		25.2
No answer		9.5

child's birth date from the measurement date. The grouping by age was defined as exemplified by children within their *n*th year: the ages within the *n*-year group extended from *n*.0 years to *n*.99 years (i.e., the 5-year group included 5.0–5.99 years and the 6-year group included 6.0–6.99 years, and so on). Mean values, standard deviations, and mean *z* scores were calculated according to sex and age. Logarithmic transformation (log10) was applied to reduce the skewness of the distributions. Data were compared with the AGR (SAP, 2001) and the CDC/NCHS growth data (Kuczmarski et al., 2000) by means of the paired-samples *t* test. Because of the number of statistical tests conducted simultaneously on our set of data, the significance level was adjusted by the Bonferroni test (CI = 0.95; $\alpha = 0.005$).

Research protocols followed the principles delineated in the Declaration of Helsinki and its amendments and the statements of the National Law 25326 on the privacy of personal data.

RESULTS

The social and environmental characteristics of the sample are presented in Table 1. Seventy-five percent of the families were homeowners. On an average, houses were inhabited by 4.7 persons, and the mean of crowding was two persons per room. Almost 90% of the houses were of solid-brick masonry and had running water, a sewage system, solid-waste collection, and a natural-gas supply. Seventy percent of the families had health insurance, while 13.8–16.0% received some kind of assistance from national or local programs (government agencies, nongovernmental organizations, or other entities) that benefit poor families. About 40% of the parents had secondary education, and 20–25% had tertiary or university preparation. The parents were mainly employed or worked in freelance jobs; the remaining were manual workers or had temporary jobs. Of the women, 25% were unemployed (i.e., did not work outside the home).

The sample composition, means, standard deviations, mean *z* scores, and comparisons between the sample and the growth references are showed in Tables 2 and 3. The mean weights and heights of the Santa Rosa schoolchildren and the 50th centiles of Argentinean (AGR) and CDC/NCHS growth references are plotted in the Figures 1 and 2, respectively.

In both sexes, body weight was above than of both references (sample > CDC/NCHS and AGR; Fig. 1), and the mean *z* scores were almost all positive ranging from −0.1 to 0.6 (Table 2). In the boys, body weight was significantly higher than that of CDC/NCHS up to 10 and at 14 years of age, and higher than that of the AGR at all ages ($P < 0.005$). On an average, the boys were 2.8 and 3.5 kg heavier than their CDC/NCHS and AGR age peers, respectively (Table 2). The girls also weighed significantly more than those of the CDC/NCHS at 7 ($P = 0.004$) and 12 years of age ($P = 0.000$). Their weights were also higher than those of their national peers, except at 11 and 14 years of age ($P > 0.005$). On an average, the girls were 1.6 and 2.2 kg heavier than their CDC/NCHS and AGR age peers, respectively (Table 2).

The overall height was intermediate between both growth reference standards (CDC/NCHS > sample > AGR; Fig. 2). In boys, it was significantly lower than the CDC/NCHS at 9 ($P = 0.002$) and 14 years old ($P = 0.004$), and significantly higher than AGR values at all ages ($P < 0.005$). The mean difference between the sample and the CDC/NCHS data was −0.2 cm, and between the sample and AGR 3 cm. Mean *z* scores fluctuated between −0.2 and 0.2 (CDC/NCHS) and between 0.3 and 0.5 (AGR; Table 3). The height of girls was below that of the CDC/NCHS at 7, 13, and 14 ($P < 0.005$) but above the AGR values, except at age 14 ($P > 0.005$). On an average, the girls were −1.1 cm shorter than CDC/NCHS peers and 2.3 cm taller than AGRs. The *z* scores ranged from −0.5 to 0.1 (CDC/NCHS) and from 0.3 to 0.4 (AGR) (Table 3).

TABLE 2. Means, standard deviations (SD), z scores, and paired-samples t test for weight between the sample and the growth references

				Sample-CDC/NCHS				Sample-AGR			
Age (years)	*N*	Mean (kg)	SD	Mean Dif. (kg)	*z*	*t*	Sig. (2-tailed)[a]	Mean Dif. (kg)	*z*	*t*	Sig. (two-tailed)[a]
Boys											
5.0–5.99	164	21.2	4.0	1.7	0.4	5.16	0.000	1.5	0.4	4.61	0.000
6.0–6.99	161	23.8	5.0	1.9	0.4	4.65	0.000	1.9	0.5	4.57	0.000
7.0–7.99	144	26.5	5.8	2.0	0.2	3.67	0.000	2.1	0.3	3.98	0.000
8.0–8.99	165	29.8	6.5	2.7	0.4	4.88	0.000	2.8	0.5	5.14	0.000
9.0–9.99	191	33.0	7.6	2.8	0.2	4.40	0.000	3.1	0.4	5.03	0.000
10.0–10.99	166	38.4	9.6	4.7	0.4	5.80	0.000	5.5	0.6	7.30	0.000
11.0–11.99	148	41.3	10.1	3.1	0.2	2.75	0.006	4.9	0.5	5.24	0.000
12.0–12.99	229	45.5	10.9	2.4	0.1	2.06	0.041	4.6	0.3	5.55	0.000
13.0–13.99	190	50.7	10.8	2.5	0.1	2.02	0.044	4.2	0.3	4.49	0.000
14.0–14.99	197	57.4	12.0	4.0	0.2	3.71	0.000	4.5	0.3	4.50	0.000
Girls											
5.0–5.99	134	20.1	3.6	0.1	0.2	2.68	0.008	1.1	0.3	2.95	0.004
6.0–6.99	146	22.6	4.1	1.2	0.2	2.63	0.010	1.3	0.3	2.99	0.003
7.0–7.99	153	25.7	4.8	1.4	0.1	2.90	0.004	1.6	0.2	3.51	0.000
8.0–8.99	133	29.3	6.5	2.0	0.1	2.60	0.010	2.4	0.3	3.31	0.001
9.0–9.99	142	32.6	7.1	1.8	0.1	2.04	0.043	2.5	0.4	3.49	0.000
10.0–10.99	168	36.9	9.2	1.9	0.1	1.51	0.134	3.0	0.3	3.41	0.000
11.0–11.99	170	40.1	8.3	0.7	−0.1	−0.11	0.915	1.5	0.1	1.21	0.228
12.0–12.99	229	47.5	10.8	3.7	0.2	3.94	0.000	3.9	0.3	4.27	0.000
13.0–13.99	198	49.8	8.5	2.1	0.1	2.60	0.010	2.5	0.2	3.25	0.001
14.0–14.99	183	52.3	9.8	1.5	0.0	1.13	0.258	2.3	0.1	2.33	0.021

[a] $\alpha = 0.005$.

TABLE 3. Means, standard deviations (SD), z scores, and paired-samples t test for height between the sample and the growth references

				Sample-CDC/NCHS				Sample-AGR			
Age (years)	*N*	Mean (cm)	SD	Mean Dif. (cm)	*z*	*t*	Sig. (two-tailed)[a]	Mean Dif. (cm)	*z*	*t*	Sig. (two-tailed)[a]
Boys											
5.0–5.99	164	113.2	4.9	1.0	0.2	2.34	0.021	2.3	0.5	6.06	0.000
6.0–6.99	161	119.1	5.6	0.5	0.1	1.00	0.317	2.1	0.4	4.77	0.000
7.0–7.99	144	124.9	5.3	−0.3	−0.2	−0.90	0.371	1.8	0.4	3.96	0.000
8.0–8.99	165	130.4	5.5	−0.4	−0.1	−1.34	0.181	2.0	0.4	4.45	0.000
9.0–9.99	191	134.9	6.2	−1.2	−0.2	−3.07	0.002	1.6	0.3	3.44	0.000
10.0–10.99	166	141.0	6.7	−0.1	0.0	−0.12	0.903	3.3	0.4	6.23	0.000
11.0–11.99	148	146.4	7.8	0.2	0.0	0.04	0.970	3.9	0.3	6.18	0.000
12.0–12.99	229	152.4	7.8	0.1	0.0	−0.75	0.455	4.2	0.3	8.27	0.000
13.0–13.99	190	159.2	8.1	−0.7	−0.1	−1.41	0.159	4.7	0.4	8.00	0.000
14.0–14.99	197	165.3	8.3	−1.5	−0.1	−2.86	0.004	4.2	0.5	6.91	0.000
Girls											
5.0–5.99	134	111.6	5.1	0.3	0.1	0.66	0.512	1.9	0.4	4.19	0.000
6.0–6.99	146	117.3	5.4	−0.7	−0.1	−1.91	0.058	1.6	0.4	3.68	0.000
7.0–7.99	153	123.1	5.3	−1.8	−0.3	−4.46	0.000	1.7	0.4	3.93	0.000
8.0–8.99	133	129.0	6.4	−1.3	−0.3	−2.73	0.007	2.4	0.4	4.22	0.000
9.0–9.99	142	135.4	6.2	−0.1	0.0	−0.21	0.835	3.8	0.3	7.30	0.000
10.0–10.99	168	140.4	7.4	−0.4	−0.1	−1.16	0.246	3.2	0.4	5.80	0.000
11.0–11.99	170	146.9	6.8	−0.6	−0.1	−1.54	0.125	3.4	0.4	6.60	0.000
12.0–12.99	229	153.9	7.0	−0.6	−0.1	−1.70	0.090	3.9	0.3	8.29	0.000
13.0–13.99	198	156.3	5.4	−2.7	−0.4	−7.32	0.000	1.2	0.4	2.87	0.000
14.0–14.99	183	158.4	6.2	−2.8	−0.5	−6.29	0.000	0.1	0.4	−0.13	0.893

[a] $\alpha = 0.005$.

DISCUSSION

The weights and heights in the schoolchildren from Santa Rosa exhibited differences when compared with the Argentinean and CDC/NCHS growth reference standards. Although the height tended toward the US reference values, the weight proved to be greater than both of the standard growth norms. The boys and girls from Santa Rosa weighed 3.5–2.2 kg more than their counterparts from 20 years before, and 2.8–1.6 kg more than their U. S. peers.

Two studies aimed to evaluate the validity of the Argentinean growth data reference were performed in children and adolescents, aged 0–5 (del Pino et al., 2003) and 10–19 years (del Pino et al., 2005). The first showed a trend toward a greater mean height in the sample from 4 years of age onward in both sexes. The second indicated that mean heights were greater within the group sampled at all ages, with a progressive decrease up to age 18. In addition, the boys' median weights were greater than the reference at all ages, whereas the girls' were greater between 10 and 13 years and afterward equivalent from age 14 onward. Because of these results, those authors concluded that the Argentinean reference is still valid for nationwide use. At the same time, a study in schoolchildren from La Plata (Buenos Aires) by Oyhenart and Orden (2005) compared prevalences of nutritional status based on the refer-

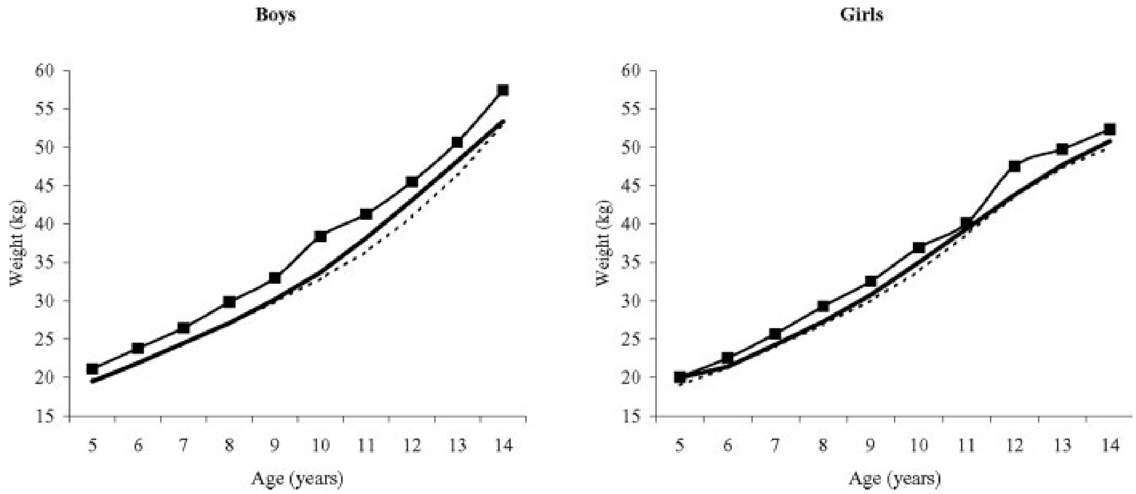

Fig. 1. Scatterplot of age group-specific means in weight (squares) in relation to 50th centiles of the CDC/NCHC (black line) and AGR (dashed line).

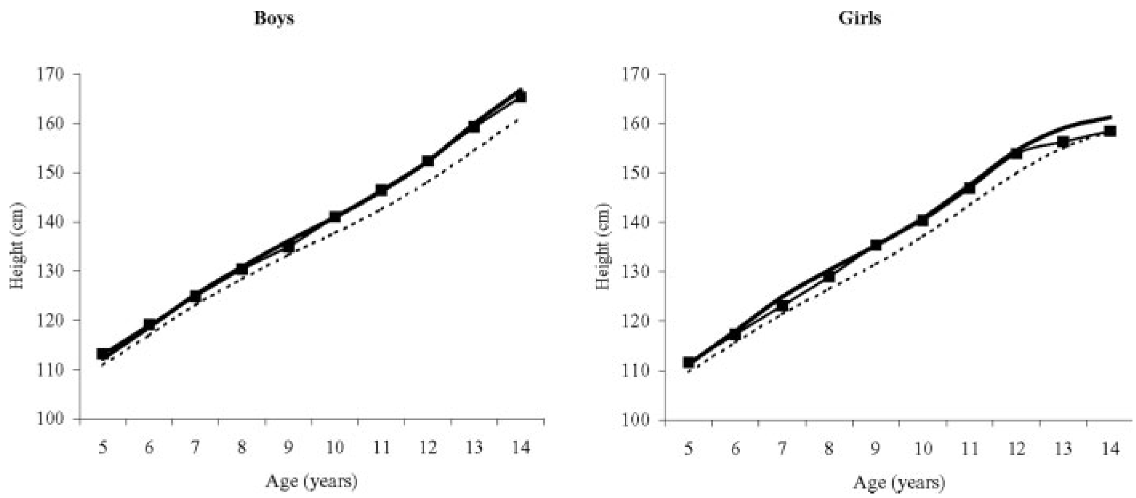

Fig. 2. Scatterplot of age group-specific means in height (squares) in relation to 50th centiles of the CDC/NCHC (black line) and AGR (dashed line).

ence values of NHANES I and II and those for Argentina. They found that comparisons to NHANES revealed a higher prevalence of stunting than that detected by the Argentinean reference. At variance, wasting had very low prevalence and was similar for both references. Thus, differences in stunting indicated a different nutritional status in these schoolchildren. Also, the increase in height with respect to the Argentine reference suggested the presence of a positive secular change.

In this study, the height of this population presented marked differences compared with the national values, especially in preadolescent children. During this period, boys were ~2 cm taller. At 13 years old, they measured 4.7 cm more than their Argentinean peers. The height also was greater in girls, who became 3.9 cm taller at 12 years of age. After that point, these differences became progressively smaller up to 14 years of age. On an average, the boys and the girls were 3 and 2.3 cm taller, respectively, than the 50th centile of their national age-matched peers. They were also heavier than the corresponding national reference data. These results raise the question as to the adequacy of using the Argentinean reference for the anthropometric assessment of growth and of height in particular.

With respect to the CDC/NCHS data, US schoolchildren are taller than their Santa Rosa age-matched peers, but the differences in height were less than those in weight. On an average, these magnitudes were −0.2 and −1.1 cm in the boys and the girls, respectively. The greatest discrepancy occurred around puberty and thereafter became more evident. In the 14-year-old boys the differences were about 1.5 cm. This divergence was greater in the girls, whose stature approached the national reference and remained 2.8 cm below the median CDC values. The causes for this deviation are unknown, but they could be related to a cohort effect or differences between populations with respect to the adolescent growth spurt.

There is an important evidence in support of the notion that linear growth is similar across populations up to the beginning of the adolescent growth spurt. For instance, data from Aminorroaya et al. (2002) reveal that the height curves of 6- to 17-year-old female students from Iran can almost be superimposed on those of the CDC/NCHS growth charts, but the American girls were significantly taller than Iranian girls after age 14. The growth patterns among Iranian students, however, had improved when compared with those of their fellow citizens from 22 years earlier. Similarly, Bener and Kamal (2005) reported that CDC girls were taller than Qatari girls after the age of 13 years. Height-for-age centile curves of the Qatari children showed a negative deviation from the CDC/NCHS reference curves for boys and girls from around ages 11 and 13, respectively. In Latin America, perhaps because of persistent problems with the economy of almost every country, the studies on schoolchildren have been primarily focused on nutritional status, rather than on physical growth per se. One of the few current studies that provide raw data on height and weight was published by dos Anjos et al. (2003), who assessed the growth of schoolchildren from Rio de Janeiro, Brazil. At around 12–14 years of age in girls and boys, respectively, the authors accordingly observed a "plateau," or leveling off, that placed these children below the CDC/NCHS curve in a manner similar to what has been reported for other populations from developing countries.

Haas and Campirano (2006) examined the variation in the achieved height of preadolescent and adolescent children across populations experiencing favorable conditions for the support of linear growth. The mean height of preadolescent children differed by 3–5 cm, whereas the mean values for the population began to diverge from the NCHS reference standard at puberty. The uncertainty of the causes of the divergence in achieved height during puberty requires further research to establish an appropriate adolescent growth reference. As these authors pointed out, in cross-sectional studies, a secular trend might be experienced differently by different age cohorts, so that younger children had perhaps been exposed to more favorable environments during the critical preschool years than had the older children. In Argentina, as many other developing countries, the evidence of a secular trend suggests that part of the differences among populations might become reduced in the future. For the time being, on the bases of these considerations, we believe that the CDC/NCHS growth data should be used cautiously for the assessment of adolescent growth.

CONCLUSIONS

This study confirms a positive secular trend in weight and height in the schoolchildren of Santa Rosa, when those they are compared to the AGR. This trend may be attributed to the relative welfare of this region, which circumstance would not necessarily reflect the conditions prevalent in the poorest regions of the country. International references such as the CDC/NCHS seem to be appropriate for the assessment of preadolescent growth but not for that of adolescents, which age group is apparently still growing below the values indicated by that reference. During this growth phase, the use of local reference standards would appear more adequate. Nevertheless, the differences in weight and height revealed in this study relative to the Argentinean national reference standard would indicate that this database as a sole information source needs to be updated to include the values pertaining specifically to all regions of the country.

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