

Prevalence and trends of overweight among preschool children in developing countries¹⁻³

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ABSTRACT

Background: Obesity during childhood is a matter of growing concern. Several reports show increasing rates of obesity in developed countries, whereas the extent of the problem in developing countries remains unknown.

Objective: The aim of this study was to fill this gap by quantifying the prevalence and trends of overweight among preschool children in developing countries.

Design: One hundred sixty nationally representative cross-sectional surveys from 94 countries were analyzed in a standardized way to allow comparisons across countries and over time. Overweight was defined as a weight-for-height >2 SDs from the National Center for Health Statistics/World Health Organization international reference median. Prevalences of wasted children (< -2 SDs) are also presented to enable comparisons between both ends of the distribution.

Results: The global prevalence of overweight was 3.3%. Some countries and regions, however, had considerably higher rates, and overweight was shown to increase in 16 of 38 countries with trend data. Countries with the highest prevalences of overweight are located mainly in the Middle East, North Africa, and Latin America. Rates of wasting were generally higher than those of overweight; Africa and Asia had wasting rates 2.5–3.5 times higher than overweight rates. Countries with high wasting rates tended to have low overweight rates and vice versa.

Conclusions: These estimates show that attention should be paid to monitoring levels and trends of overweight in children. This, however, should not be done at the expense of decreasing international commitments to alleviating undernutrition. The data presented confirm that undernutrition remains a major public health problem worldwide. *Am J Clin Nutr* 2000;72:1032–9.

KEY WORDS Overweight, obesity, anthropometry, infants, nutrition assessment, growth monitoring, preschool children, developing countries

INTRODUCTION

Overweight in children has become a matter of growing concern. In developed societies, several studies have shown increasing numbers of overweight children (1–3). In developing countries, the extent of the problem remains unknown. Although many nutritional surveys were conducted in developing countries

in the 1980s and 1990s (4), they generally were not analyzed to report prevalences of overweight.

Clinically significant obesity-related morbidities are rare in children and are generally restricted to the severely obese. Such morbidities include the pickwickian syndrome, orthopedic disorders such as genu valgum and genu varum, and respiratory disorders such as upper airway obstruction (5). The most prevalent immediate consequences for obese children are social isolation and peer problems (6). Of greater concern, though, is the risk that overweight during childhood will persist into adolescence and adulthood. The risk of adult morbidity and mortality that may follow childhood-onset obesity is potentially of great public health significance. Therefore, it is important that health policy planners have access to accurate information about the rates of and changes in overweight over time in children.

This article presents the prevalence, trends, and geographic distribution of overweight in preschool children based on national survey data collected from 1970 to date. These data constitute the largest compilation ever assembled to assess the extent of overweight in preschool children in developing countries.

SUBJECTS AND METHODS

Cross-sectional data on the prevalence of overweight were obtained from national nutritional surveys included in the World Health Organization (WHO) GLOBAL DATABASE ON CHILD GROWTH AND MALNUTRITION (Geneva). This database was developed in 1986 to compile, standardize, and disseminate the results of nutritional surveys conducted in both developing and developed countries. Its specific objectives are to describe the worldwide magnitude of child nutritional problems, to allow intercountry and interregional comparisons, and to facilitate the monitoring of global, regional, and national trends (7).

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For the present analysis, 160 national nutrition surveys from 94 countries were analyzed to estimate the prevalences of overweight in children. Multistage, random sampling methods were used for sample selection in all countries, except Argentina, Chile, Croatia, Uruguay, and Venezuela, where estimates are based on national nutritional surveillance systems. (Country-specific details on sampling procedures are available from the authors on request.) For the purpose of estimating regional and global prevalences of overweight, only nationally representative data derived from surveys conducted between 1985 and 1998 in developing countries in Africa, Asia, and Latin America were used. Countries were grouped according to the United Nations classification system (7). Overweight was defined as a weight-for-height >2 SD from the National Center for Health Statistics (NCHS)/WHO international reference median value, as recommended by the WHO (8). By definition, 2.3% of children in the reference population are estimated to be overweight. The analyses of the surveys did not produce CIs.

Surveys generally followed standard procedures of measuring length up to 24 mo of age and height from 24 mo onward. The anthropometric measurement techniques used in each survey are described in the comprehensive survey reports, which are available to readers on request. Some surveys included information on the reliability of the measurements and others did not. Survey results were checked for inconsistencies between estimates based on height-for-age, weight-for-age, and weight-for-height. The observed SDs of the z score distribution were used to assess the quality of the survey results, as recommended by an expert committee (8). With accurate age estimates and anthropometric measurements, the SDs of the observed height-for-age, weight-for-age, and weight-for-height z score distributions should be relatively constant and close to the expected value of 1.0 for the reference distribution (ranging within ≈ 0.2 units). This nearly constant SD in height- and weight-based z score distributions provides an opportunity to assess data quality (8). Surveys with an SD outside the expected ranges (0.85–1.10 for the weight-for-height distribution) required closer examination because of possible problems related to age assessment and anthropometric measurements. Surveys with inaccurate data resulting from measurement error or incorrect age reporting were excluded from the analysis.

For 38 countries, more than one data point was available, enabling the estimate of trends in overweight. On the basis of the information contained in the survey reports, the sampling frames were generally similar from one survey to the next within countries because surveys aimed to describe national changes over time. In some countries, however, the age ranges covered by the surveys varied slightly. The percentage-point change per year was calculated by dividing the difference between the earliest and latest data points by the number of years between the survey points. A trend was classified as rising if the change per year was $\geq 0.1\%$, falling if it was $\leq 0.1\%$, and static if it was between these 2 cutoffs.

Estimates of the population aged <5 y in 1995 for the countries concerned were obtained from the 1998 revision of World Population Prospects (9). Regional and global prevalences were estimated for each geographic area by weighting the available national prevalences on the basis of the population aged <5 y in each country in 1995. The numbers of overweight children in each region were obtained by applying prevalence estimates to the total population aged <5 y in 1995. The overall global preva-

lence in developing countries was calculated by adding the estimates of the number of affected children in each area and then dividing the sum obtained by the population aged <5 y in all developing countries. Estimates were obtained only for regions in which the proportion of children covered by the national surveys was $>70\%$, and in most cases $>80\%$. National, regional, and global prevalences of wasting (ie, weight-for-height < -2 SD of the NCHS/WHO reference median) are also provided to enable comparison with the lower end of the distribution. The term wasting was used in accordance with the terminology currently applied by the United Nations Children's Fund and the WHO to describe low weight-for-height in children (8, 10).

RESULTS

The regional and global estimates of the prevalence and number of overweight and wasted children aged <5 y by UN region in 1995, based on national survey data, are shown in **Table 1**. Except in Oceania, eastern and middle Africa, western Asia, and the Caribbean, all UN regions and subregions had data on overweight available for $>70\%$ of children aged <5 y, thus allowing the calculation of global and regional estimates. Differences in the amount of data available on overweight and wasting for children in a particular region reflect the fact that the initiation of the standardized analysis of surveys to report overweight prevalences came later than that for wasting. In total, national overweight data from 79 of a total of 147 developing countries were available for the present analysis. Of these, 12 surveys were conducted between 1985 and 1989, 27 were conducted between 1990 and 1994, and 40 were conducted between 1995 and 1998. On the basis of data from 88% of the total population aged <5 y, it was estimated that 3.3% (or 17.5 million) of preschool children were overweight in developing countries in 1995. The percentage of overweight children was highest in Latin America and the Caribbean (4.4%), followed by Africa (3.9%) and Asia (2.9%). However, in absolute numbers, Asia had the highest numbers of overweight children; 60% (or 10.6 million) of the overweight children from developing countries lived in this region. Within the UN subregions, the highest rate of overweight children was in North Africa (8.1%), driven mainly by Algeria (9.2%), Egypt (8.6%), and Morocco (6.8%). Southern Africa ranks second in the descending order of prevalence (6.5%), mainly because of rates in South Africa, where a national survey conducted in 1995 showed that 6.7% of preschool children were overweight. The lowest rates of overweight but the highest rates of wasting, respectively, were in south-central Asia (2.1% and 15.4%), followed by south-eastern Asia (2.4% and 10.4%) and western Africa (2.6% and 15.6%). Global and regional estimates of wasted children enable comparisons between both ends of the weight-for-height distribution. The overall prevalence of wasting in developing countries remains high (9.4%); this condition affects >50 million children. As expected, both Africa and Asia had rates of wasting that were 2.5–3.5 times higher than rates of overweight, highlighting the fact that undernutrition remains a major public health burden in these regions.

The extreme ends of the weight-for-height distribution for children aged <5 y in 94 countries are listed in descending order by wasting rates in **Figure 1**. There is considerable variation in the prevalence of overweight and wasting between countries. The percentage of overweight children ranged from 0.1% in Sri Lanka to 14.4% in Uzbekistan; rates of wasting ranged from



TABLE 1Regional and global prevalences and numbers of overweight and wasted preschool children (aged <5 y) in 1995¹

UN regions and subregions	Overweight			Wasted		
	Percentage of population covered	Percentage overweight	Number overweight	Percentage of population covered	Percentage wasted	Number wasted
	%	%	$n \times 10^3$	%	%	n
Africa	70.9	3.9	4471	94.5	9.6	11 060
Eastern	68.0	NA ²	NA	95.8	7.0	2741
Middle	20.7	NA	NA	84.6	8.6	1359
Northern	77.2	8.1	1645	99.8	7.2	1462
Southern	88.2	6.5	375	95.9	2.9	168
Western	90.7	2.6	888	94.2	15.6	5330
Asia	92.4	2.9	10 643	93.7	10.4	37 872
Eastern	94.4	4.3	4719	94.4	3.4	3731
South-central	98.9	2.1	3719	99.2	15.4	27 271
South-eastern	82.5	2.4	1327	84.0	10.4	5749
Western	54.8	NA	NA	70.7	5.1	1120
Latin America and Caribbean	94.1	4.4	2429	97.2	2.9	1591
Caribbean	64.8	NA	NA	64.8	NA	NA
Central America	97.9	3.5	564	99.8	4.9	789
South America	95.5	4.9	1729	99.6	1.8	635
Oceania ³	15.5	NA	NA	15.5	NA	NA
Developing countries	87.8	3.3	17 561	94.1	9.4	50 593

¹Overweight defined as a weight-for-height >2 SDs of the National Center for Health Statistics/World Health Organization (NCHS/WHO) international reference median; wasted defined as a weight-for-height <-2 SDs of the NCHS/WHO median.

²Not available.

³Excluding New Zealand and Australia.

0.0% in Australia to 23.3% in Mali. The countries with the highest prevalence of overweight were in the Middle East (Qatar), North Africa (Algeria, Egypt, and Morocco), and Latin America and the Caribbean (Argentina, Chile, Bolivia, Peru, Uruguay, Costa Rica, and Jamaica). Countries outside these regions with high rates of overweight were Armenia, Kiribati, Malawi, South Africa, and Uzbekistan. Of the 94 countries, 42 had higher prevalences of overweight than of wasting. However, rates of wasting were generally higher than those of overweight; 45 countries had wasting rates >5%, whereas 21 countries had overweight rates >5%. Similarly, only 2 countries had overweight prevalences >10%, whereas 18 countries had wasting rates >10%. Some of the least-developed countries had very high rates of wasting ($\geq 15\%$), eg, Afghanistan, Bangladesh, Maldives, Mali, and Niger. Except for Kiribati and Uzbekistan, all countries with wasting rates >10% had overweight rates <5%. Country-specific overweight prevalences, sample sizes, and the age groups represented are shown in **Table 2**. (Detailed information concerning data disaggregated by sex, area of residence, and administrative region within each country is available from the authors on request.)

Trends in overweight for countries with data from more than one survey are shown in **Table 3**. Trends in overweight were estimated for a total of 38 countries, of which 16 were in Africa, 7 were in Asia, and 13 were in Latin America and the Caribbean; the 2 additional countries with information on trends in overweight were Croatia and the United States. The trend is presented as rising, static, or falling and as the change (in percentage points) per year. The trend was mixed. Of the 38 countries with available trend data, 14 showed no obvious change in the prevalence of overweight between the earliest and latest data points, 16 showed a rising trend, and 8 showed a falling trend.

DISCUSSION

Childhood obesity is an increasing public health problem. Researchers showed an association between obesity in childhood and high prevalences of blood pressure (11), diabetes (12), respiratory disease (13), and orthopedic (14) and psychosocial (6) disorders. Of greater concern is the tracking of obesity from childhood to adulthood and its contribution to adult obesity-related morbidity and mortality (15, 16).

To date there is little information on the extent of overweight among children in developing countries. Although several nationally representative nutrition surveys have been conducted, their focus was on the lower end of the distribution and, thus, rates of overweight rarely were reported. In addition, results of different studies of overweight in children used distinct definitions of overweight, making comparisons between studies difficult. The aim of this study was to fill the gap by presenting the largest compilation of comparable data ever assembled to assess the extent of overweight in preschool children in developing countries.

The results showed that the overall prevalence of overweight in preschool children in developing countries was low (3.3%). This value was in line with an earlier estimate of 2.9% (7) that was based on fewer survey data and with a recent report on obesity in Latin American children (17). There was, however, large variability in rates of overweight across countries. Most developing countries had prevalences that are considered to be low to moderate; only 2 countries had rates >10%. Nonetheless, 21 countries had prevalences of overweight >5% and 16 of the 38 countries with more than one data point showed a rising trend. These data highlight the importance of closely monitoring future trends. For this purpose it is essential that survey data be analyzed systematically in a standard format to allow comparisons over time and across countries.

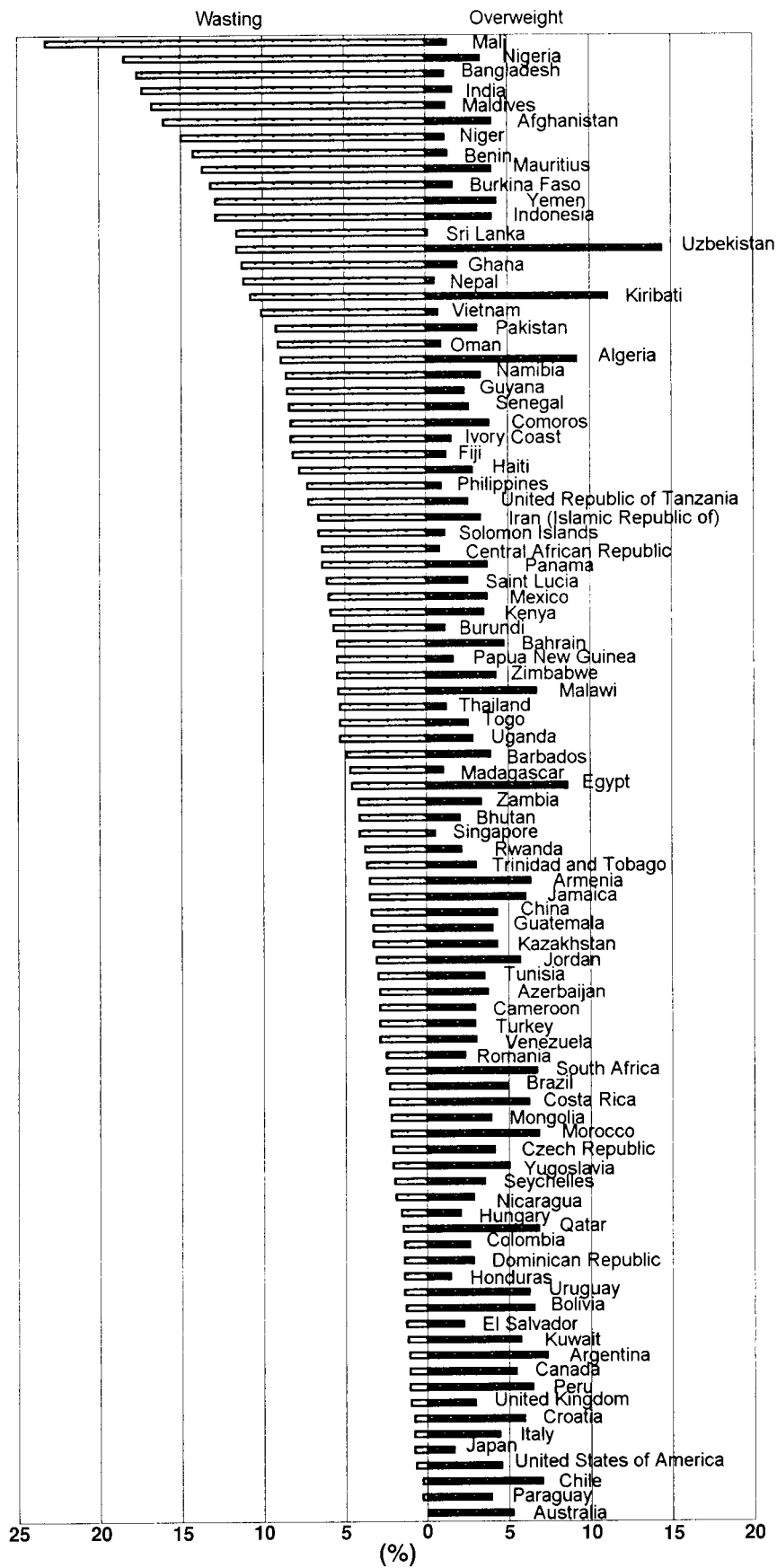


FIGURE 1. Weight-for-height distribution of preschool children in 94 countries.



TABLE 2
Latest national prevalence of overweight in preschool children by country

Country	Year	Sample size <i>n</i>	Age range <i>y</i>	Percentage overweight <i>%</i>
Afghanistan	1997	4846	0.50–2.99	4.0
Algeria	1995	3825	0–4.99	9.2
Argentina	1994	5296	0–4.99	7.3
Armenia	1998	3080	0–4.99	6.3
Australia	1995–1996	999999	2.0–7.99	5.2
Azerbaijan	1996	500	0.50–4.99	3.7
Bahrain	1989	2033	0–4.99	4.7
Bangladesh	1996–1997	4787	0–4.99	1.1
Barbados	1981	597	0–4.99	3.9
Benin	1996	2273	0–2.99	1.3
Bhutan	1986–1988	3273	0–5.99	2.0
Bolivia	1998	5773	0–4.99	6.5
Brazil	1996	3815	0–4.99	4.9
Burkina Faso	1992–1993	4278	0–4.99	1.6
Burundi	1987	1930	0.25–2.99	1.1
Cameroon	1991	2380	0–4.99	2.9
Canada	1970–1972	2050	0–5.99	5.4
Central African Republic	1995	2225	0–4.99	0.8
Chile	1996	999999	0–5.99	7.0
China	1992	6329	0–4.99	4.3
Colombia	1995	4408	0–4.99	2.6
Comoros	1995–1996	921	0–2.99	3.8
Costa Rica	1996	1008	1.0–6.99	6.2
Croatia	1995–1996	26036	1.0–5.99	5.9
Czech Republic	1991	32345	0–4.99	4.1
Dominican Republic	1996	3481	0–4.99	2.8
Egypt	1995–1996	9766	0–4.99	8.6
El Salvador	1993	3515	0.25–4.99	2.2
Fiji	1993	618	0–4.99	1.2
Ghana	1993–1994	1819	0–2.99	1.9
Guatemala	1995	7768	0–4.99	4.0
Guyana	1981	532	0–4.99	2.3
Haiti	1994–1995	2794	0–4.99	2.8
Honduras	1996	1307	1.0–4.99	1.4
Hungary	1980–1988	89980	0–4.99	2.0
India	1992–1993	25584	0–3.99	1.6
Indonesia	1995	9227	0–4.99	4.0
Iran (Islamic Republic of)	1995	11139	0–4.99	3.3
Italy	1975–1977	6778	1.0–5.99	4.4
Ivory Coast	1994	3341	0–2.99	1.5
Jamaica	1993	663	0–4.99	6.0
Japan	1978–1981	7308	0–4.99	1.6
Jordan	1990	6601	0–4.99	5.7
Kazakhstan	1995	717	0–2.99	4.3
Kenya	1993	4753	0–4.99	3.5
Kiribati	1985	2941	0–4.99	11.1
Kuwait	1996–1997	12376	0–4.99	5.7
Madagascar	1992	4240	0–4.99	1.0
Malawi	1992	3235	0–4.99	6.7
Maldives	1995	798	0–4.99	1.2
Mali	1995–1996	4678	0–2.99	1.3
Mauritius	1995	1537	0–4.99	4.0
Mexico	1988	7422	0–4.99	3.7
Mongolia	1997	442	0–4.99	3.9
Morocco	1992	4532	0–4.99	6.8
Namibia	1992	2430	0–4.99	3.3
Nepal	1996	3705	0–2.99	0.5

(Continued)

TABLE 2 (Continued)

Country	Year	Sample size <i>n</i>	Age range <i>y</i>	Percentage overweight <i>%</i>
Nicaragua	1993	3546	0–4.99	2.8
Niger	1992	4052	0–4.99	1.1
Nigeria	1993	2664	0.50–5.99	3.3
Oman	1994–1995	639	0–3.99	0.9
Pakistan	1990–1991	4056	0–4.99	3.1
Panama	1980	3314	0–4.99	3.7
Papua New Guinea	1982–1983	27464	0–4.99	1.6
Paraguay	1990	3389	0–4.99	3.9
Peru	1996	13431	0–4.99	6.4
Philippines	1993	4229	0–4.99	0.8
Qatar	1995	1180	0–5.99	6.8
Romania	1991	10957	0–4.99	2.3
Rwanda	1992	4386	0–4.99	2.1
Saint Lucia	1976	362	0–4.99	2.5
Senegal	1992–1993	3865	0–4.99	2.6
Seychelles	1987–1988	836	0–4.99	3.5
Singapore	1970–1977	9655	0–5.99	0.5
Solomon Islands	1989	3981	0–4.99	1.1
South Africa	1994–1995	9807	0.50–4.99	6.7
Sri Lanka	1987	1994	0.25–2.99	0.1
Thailand	1987	1856	0.25–2.99	1.2
Togo	1988	1396	0–2.99	2.5
Trinidad and Tobago	1987	840	0–2.99	3.0
Tunisia	1988	1996	0.25–2.99	3.5
Turkey	1993	3152	0–4.99	2.9
Uganda	1995	4775	0–3.99	2.8
United Kingdom	1973–1979	13380	0–4.99	2.9
United Republic of Tanzania	1996	5344	0–4.99	2.5
United States of America	1988–1994	6413	0.17–4.99	4.5
Uruguay	1992–1993	11512	0–4.99	6.2
Uzbekistan	1996	989	0–2.99	14.4
Venezuela	1997	291749	0–4.99	3.0
Vietnam	1998	12919	0–4.99	0.7
Yemen	1996	3833	0.50–4.99	4.3
Yugoslavia	1996	3226	0–4.99	5.0
Zambia	1996–1997	5443	0–4.99	3.3
Zimbabwe	1994	2014	0–2.99	4.2

Overall, wasting rates were considerably higher than rates of overweight: 18 countries had wasting rates >10% and some of the least-developed countries had very high rates (>15%). Most of the countries with wasting rates >10% had rates of overweight <5%. In turn, most of the 21 countries with overweight rates >5%—mainly the wealthier of the developing countries—had wasting rates <5%. This suggests a population-wide shift, with overweight replacing wasting as countries undergo the nutrition transition (18). This shift of the entire weight-for-height distribution—most likely as a result of improved socioeconomic conditions—was also observed in adult populations (8).

Three countries (Uzbekistan, Kiribati, and Algeria) had high occurrences of both overweight and wasting. In the case of Uzbekistan, one possible explanation may have been the changes this republic has been undergoing as a consequence of the collapse of the former Soviet Union in 1991. Uzbekistan has been experiencing rapid social and economic changes in the transition from a centrally planned economy to a market economy. This process

produced disruption in most sectors of the economy, causing economic decline and inflation, which might have had an effect in some segments of the population in terms of increased rates of child malnutrition (19). The coexisting high rates of both overweight and wasting in Kiribati and Algeria may be explained by the culturally positive connotation that being overweight carries in these societies. More in-depth research is necessary to unravel these nutritional enigmas.

The rates of overweight shown should be viewed as conservative estimates. The actual prevalences could have been considerably higher if a leaner reference population had been used. The NCHS growth curves—currently recommended for international use (20)—were formulated in 1975 by combining growth data from 4 sources to serve as a reference for the United States. The reference for the age group 0–23 mo is based on a group of children in the Fels Research Institute Longitudinal Study from 1929 to 1975. The reference for the age group 2–18 y is based on data from 3 representative surveys conducted in the United States from 1960 to 1975 (8). The NCHS reference is limited by biological and technical drawbacks. An important limitation is the fact that the distributions of weight-for-age and weight-for-height were markedly skewed toward the higher end, reflecting a substantial rate of childhood obesity (8, 21). The use of the NCHS reference is, therefore, likely to underestimate the rates of overweight. This limitation, however, should not have affected the assessment of trends because surveys that provided estimates over time were all analyzed with use of the same reference population. Because of these limitations of the NCHS reference, a new international growth reference based on breast-fed infants is being developed (22). When the new reference is available, in 2004, its use is expected to yield higher rates of child overweight (23).

The data presented in this study confirm that, in preschool children, undernutrition remains the nutrition problem of greatest concern in developing countries, even though some countries are starting to have worrisome rates of overweight. Therefore, during the early years of life, focus should remain on sustaining proper growth and development. However, the rapid changes in dietary patterns and lifestyles occurring in many developing countries (18) warrant close monitoring of overweight prevalences in children so that preventive measures can be taken in a timely manner. There is also a great need for information on nutritional status in school-age children, a group usually not included in nutritional surveys but for whom overweight would be of greater concern than for preschool children.

Methodologic constraints encountered in assessing trends in overweight included the likelihood that the equipment and measurement techniques used were not systematically standardized from one survey to the next within countries. In addition, although the sampling frames described in the survey reports are generally similar, the age range varied from one survey to the next for a few countries (Table 3). These constraints notwithstanding, we consider this to be a valid attempt to quantify the magnitude of the problem and describe the trends in childhood overweight, which can serve as a baseline for assessing future patterns. The present estimates can also help identify countries and regions in need of population-wide interventions to prevent childhood overweight.

Tackling the problem of the growing numbers of obese individuals is a major challenge for most countries affected by the problem. Achieving behavioral changes in adults that lead to lasting weight reduction has proven to be difficult. Because most individuals develop their eating and activity patterns during child-

TABLE 3

National survey data on trends in overweight in preschool children

Country	Year of survey	Age range	Percentage overweight ¹	Rate change ²	Trend ³
		y	%	pp/y	
Bangladesh	1982–1983	0.25–4.99	0.1	0.07	Static
	1985–1986	0.50–4.99	0.1		
	1989–1990	0.50–4.99	0.3		
	1992	0.50–5.99	0.2		
	1995–1996	0.50–5.99	0.4		
Bolivia	1996–1997	0–4.99	1.1	0.25	Rising
	1989	0.25–2.99	4.5		
	1993–1994	0.25–2.99	4.3		
Brazil	1996	0–4.99	7.5	–0.13	Falling
	1998	0–4.99	6.5		
	1975	0–4.99	7.6		
Chile	1989	0–4.99	5.4	–0.37	Falling
	1996	0–4.99	4.9		
	1986	0–5.99	10.7		
Colombia	1994	0–5.99	6.8	–0.22	Falling
	1995	0–5.99	7.2		
	1996	0–5.99	7.0		
Costa Rica	1986	0.25–2.99	4.6	0.28	Rising
	1995	0–4.99	2.6		
Croatia	1982	0–5.99	2.3	0.60	Rising
	1996	1–6.99	6.2		
Dominican Republic	1993–1994	1–5.99	4.1	0.21	Rising
	1994–1995	1–5.99	4.9		
	1995–1996	1–5.99	5.9		
Egypt	1986	0.50–2.99	2.8	0.35	Rising
	1991	0–4.99	2.8		
Ghana	1996	0–4.99	4.9	0.17	Rising
	1978	0.50–4.99	2.2		
	1988	0.25–2.99	3.1		
	1992–1993	0–4.99	10.0		
	1994–1995	0.50–5.99	4.8		
Guatemala	1995–1996	0–4.99	8.6	0.16	Rising
	1987–1988	0–4.99	0.7		
	1988	0.25–2.99	0.5		
Haiti	1993–1994	0–2.99	1.9	0.11	Rising
	1987	0.25–2.99	2.7		
Honduras	1995	0–4.99	4.0	0.01	Static
	1978	0.25–4.99	0.8		
Madagascar	1994–1995	0.25–4.99	2.8	–0.03	Static
	1987	0–4.99	1.5		
	1996	1–4.99	1.4		
Mali	1983–1984	0–1.99	2.4	0.07	Static
	1992	0–4.99	1.0		
Mauritius	1997	0–2.99	2.0	–0.16	Falling
	1987	0.25–2.99	0.7		
Morocco	1995–1996	0–2.99	1.3	0.82	Rising
	1985	0–4.99	5.6		
Nepal	1995	0–4.99	4.0	0.01	Static
	1987	0–4.99	2.7		
	1992	0–4.99	6.8		
Nicaragua	1975	0.50–4.99	0.1	0.05	Static
	1995	0.50–2.99	0.6		
	1996	0–2.99	0.5		
Niger	1996	0.50–2.99	0.3	0.05	Static
	1980–1982	0–5.99	2.2		
	1993	0–4.99	2.8	0.05	Static
	1992	0–4.99	1.1		
	1998	0–2.99	0.8		

(Continued)

TABLE 3 (Continued)


Country	Year of survey	Age range	Percentage overweight ¹	Rate change ²	Trend ³
		y	%	pp/y	
Nigeria	1990	0–4.99	1.5	0.60	Rising
	1993	0.50–5.99	3.3		
Pakistan	1977	0.50–4.99	3.8	0.05	Static
	1985–1987	0.50–4.99	4.9		
	1990–1991	0–4.99	3.1		
Peru	1991–1992	0–4.99	5.3	0.22	Rising
	1996	0–4.99	6.4		
Philippines	1971–1975	0–5.99	0.4	0.02	Static
	1992	0–4.99	0.9		
	1993	0–4.99	0.8		
Rwanda	1976	0–4.99	1.2	0.06	Static
	1992	0–4.99	2.1		
Senegal	1986	0.50–2.99	1.8	0.11	Rising
	1992–1993	0–4.99	2.6		
Solomon Islands	1970	0–4.99	3.1	–0.11	Falling
	1989	0–4.99	1.1		
Sri Lanka	1977–1978	0.50–4.99	0.1	0.00	Static
	1987	0.25–2.99	0.1		
Togo	1976–1977	0.50–4.99	0.4	0.18	Rising
	1988	0–2.99	2.5		
Trinidad and Tobago	1976	0–4.99	5.2	–0.20	Falling
	1987	0–2.99	3.0		
Tunisia	1973–1975	0–5.99	1.3	0.15	Rising
	1988	0.25–2.99	3.5		
Uganda	1988–1989	0–4.99	2.4	0.06	Static
	1995	0–3.99	2.8		
United Republic of Tanzania	1991–1992	0–4.99	3.4	–0.18	Falling
	1996	0–4.99	2.5		
United States of America	1963–1974	0–4.99	2.3	0.10	Rising
	1988–1994	0.17–4.99	4.5		
Venezuela	1981–1982	0–4.99	3.3	0.02	Static
	1987	0–4.99	5.8		
	1990	0–4.99	2.3		
	1991	0–4.99	2.5		
	1992	0–4.99	2.9		
	1993	0–4.99	2.9		
	1994	0–4.99	3.0		
	1995	0–4.99	2.8		
	1996	0–4.99	2.8		
	1997	0–4.99	3.0		
Vietnam	1992–1993	0–4.99	1.7	–0.17	Falling
	1998	0–4.99	0.7		
Zambia	1992	0–4.99	2.8	0.10	Rising
	1996–1997	0–4.99	3.3		
Zimbabwe	1988	0.25–4.99	4.4	0.03	Static
	1994	0–2.99	4.2		

¹Overweight defined as a weight-for-height >2 SD of the National Center for Health Statistics/World Health Organization international reference median.

²The difference between the earliest and latest data points divided by the number of years between the 2 survey points; pp, percentage points.

³Rising, ≥ 0.1 pp/y; static, < 0.1 and > -0.1 pp/y; and falling, ≤ -0.1 pp/y.

hood, preventive measures targeting children and adolescents might be one long-term approach to dealing with the problem of obesity. During infancy and early childhood, preventive measures should focus on the promotion and protection of breast-feeding. Several reports suggest that this may be a powerful strategy for fighting the increasing levels of childhood obesity (24–27) because breast-fed infants seem to self-regulate their energy intake at a lower level than do formula-fed infants (28, 29). Preventive measures should involve the parents, given that children tend to imitate their “model” of eating and physical activity habits (30), as well as the commercialization and presentation of foods. For children aged ≥ 6 y, schools also play an important role in teaching healthy eating and exercise behaviors.

It is important to recognize that the prevention of obesity requires a partnership. Governments, international agencies, consumers, industry, trade, and the media all play important roles in promoting healthy diets and appropriate levels of physical activity. 

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