Research / Recherche

The worldwide magnitude of protein–energy malnutrition: an overview from the WHO Global Database on Child Growth

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Using the WHO Global Database on Child Growth, which covers 87% of the total population of under-5-year-olds in developing countries, we describe the worldwide distribution of protein–energy malnutrition, based on nationally representative cross-sectional data gathered between 1980 and 1992 in 79 developing countries in Africa, Asia, Latin America, and Oceania. The findings confirm that more than a third of the world's children are affected. For all the indicators (wasting, stunting, and underweight) the most favourable situation — low or moderate prevalences — occurs in Latin America; in Asia most countries have high or very high prevalences; and in Africa a combination of both these circumstances is found. A total 80% of the children affected live in Asia — mainly in southern Asia — 15% in Africa, and 5% in Latin America. Approximately, 43% of children (230 million) in developing countries are stunted. Efforts to accelerate significantly economic development will be unsuccessful until optimal child growth and development are ensured for the majority.

Introduction

Growth assessment is the single measurement that best defines the health and nutritional status of children, because disturbances in health and nutrition, regardless of their etiology, invariably affect child growth. Health and nutrition problems during childhood are the result of a wide range of factors, most of which — particularly in underprivileged populations — relate to unsatisfactory food intake or severe and repeated infections, or a combination of the two. These conditions, in turn, are closely linked to the general standard of living and whether a population is able to meet its basic needs such as food, housing, and health care. Growth assessment thus serves as a means for evaluating the health and nutritional status of children, just as it also provides an indirect measurement of the quality of life of an entire population.

Of the various anthropometric indices that can be used to assess child growth status, the following provide a comprehensive description: height-for-age portrays performance in terms of linear growth, and essentially measures long-term growth faltering; weight-for-height reflects body proportion, or the harmony of growth, and is particularly sensitive to acute growth disturbances; and weight-for-age represents a convenient synthesis of both linear growth and body proportion (*1*).

WHO's previous attempt to provide a global overview of the magnitude of protein–energy malnutrition appeared in 1983 (*2*). The present article expands and updates this analysis in the light of new data available from nutrition surveys in many more countries. Its immediate purpose is to contribute, as recently called for by the FAO/WHO International Conference on Nutrition,[a] to the availability of rel-

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evant and accurate information that can be helpful in monitoring trends, determining priorities, and evaluating the effectiveness of intervention programmes.

Nutrition is a basic human need that remains unmet for vast numbers of children, who are thus unable to achieve their full genetic developmental potential. The ultimate goal of this article is therefore to increase awareness of the magnitude of all forms of malnutrition as a critical first step to mobilizing the human and financial resources required to overcome the problem.

Methods

Cross-sectional data on the prevalences of wasting (low weight-for-height), stunting (low height-for-age), and underweight (low weight-for-age) were obtained from the WHO Global Database on Child Growth,[b] which was initiated in 1986 to compile, systematize, and disseminate widely the results of anthropometric surveys performed in both developing and developed countries. The specific objectives of the database are to describe the worldwide distribution of child growth failure, permit intercountry and interregional comparisons, and facilitate the monitoring of global, regional, and national trends. The existence of the database and its continual updating should stimulate new anthropometric surveys, particularly in those countries and regions thus far scarcely investigated.

The standardized presentation of results in the database is as follows:

— systematic use of the NCHS/WHO international reference population (*3*);

— display of growth retardation prevalences for under-5-year-olds, as measured by the proportion of weight-for-age, height-for-age and weight-for-height below –2 and –3 standard deviations (SDs) (*z*-scores);

— display of the prevalence of overweight, as measured by the proportion of children with weight-for-height above +2 *z*-scores;

— display of *z*-score means and SDs for the three indices; and

— stratification of the results according to age, sex, region, and rural/urban strata.

The criteria for entering surveys in the database are outlined below.

- A clearly defined population-base sampling frame, permitting inferences to be drawn about an entire population.
- A probabilistic sampling procedure involving at least 400 children (allowing for an estimation of prevalences with a random error of ≤5% at a confidence level of 95%).
- Use of appropriate equipment and standard measurement techniques (*3*).
- Presentation of results as *z*-scores in relation to the NCHS/WHO reference population or availability of raw data, permitting a standardized analysis to be made by WHO.

The present analysis is restricted to nationally representative surveys from developing countries in Africa, Asia, Latin America, and Oceania that were carried out between 1980 and 1992. Countries are grouped according to the United Nations classification (*4*), which divides the world into seven major areas and 22 regions; estimates of the under-5-year-old populations in 1990 for the countries concerned were obtained from the United Nations Population Division (*4*).

Regional prevalences for the indices were estimated for each geographical area by weighting the available national prevalences according to the population of under-5-year-olds in each country in 1990. The numbers of underweight, stunted, and wasted children in each area were obtained by applying prevalence estimates to the total population of under-5-year-olds in 1990. Global prevalences in developing countries were calculated by adding the estimates for the number of affected children in each area and then dividing the sum obtained by the 1990 under-5-year-old population of all developing countries. Estimates concerned with underweight, stunting, and wasting were obtained only for those regions where the proportion of children covered by national surveys was ≥70%, and in most cases >80%.

Results

Coverage attained by the database

Coverage in Africa. Anthropometric surveys carried out before 1980 are included in the database for 17 out of 52 African countries. The coverage for surveys carried since 1980 is substantially better (40 countries), most of which are national surveys. Regional or national surveys in Africa are lacking from Comoros, Mozambique and Somalia (in the east), Gambia and Guinea (in the west), Angola, Central African Republic and Chad (in the middle), and Libya (in the north).

[b] *WHO Global Database on Child Growth.* Updates are available on request from: Nutrition unit, World Health Organization, 1211 Geneva 27, Switzerland.

Coverage in Asia. Developing countries in Asia are also scarcely represented in the child-growth database before 1980 (8 out of 37 countries). Coverage improves for later surveys (24 countries), and mostly is based on national data, including surveys carried out in populous countries such as Bangladesh, China, India, Indonesia, and Pakistan. Countries still not represented in the database are mostly in western Asia (Bahrain, Cyprus, Lebanon, Qatar, Syria, Turkey, and United Arab Emirates), but also include Hong Kong and Republic of Korea (in east Asia), and Brunei and Cambodia (in south-eastern Asia).

Coverage in Latin America. Nearly half of the countries in Latin America (17 out of 36) are represented in the child-growth database before 1980. Coverage improves for more recent surveys (25 countries), most of which are based on the results of national surveys. Those countries still not included in the database are mostly in the Caribbean (Bahamas, British Virgin Islands, Grenada, Montserrat, Saint Kitts and Nevis, and Turks and Caicos Islands), but include also Argentina and Suriname in South America.

Coverage in Oceania. Coverage of developing countries in Oceania is restricted not only prior to 1980 (2 out of 13 countries) but also has failed to improve subsequently (only 3 countries based on national surveys). The following countries are still not included in the database: Fiji and New Caledonia (in Melanesia); Federal States of Micronesia, Marshall Islands, and Palau (in Micronesia); and Cook Islands, Samoa, Tonga and Tuvalu (in Polynesia).

Table 1 shows the population coverage attained by the child-growth database relative to national surveys performed since 1980. Taken as a whole, these surveys cover a population of 468 million children, or 87% of the estimated total number of under-5-year-olds in developing countries in 1990. The coverage is higher — almost 90% or more — in northern, eastern and western Africa, the whole of Asia, in eastern, southern and south-eastern Asia, and in Latin America. Coverage is around 70% throughout Africa and throughout Oceania, including Melanesia (the most populous region in Oceania). Middle and southern Africa, western Asia, and Micronesia are not adequately represented by national surveys, the coverage attained in these regions being, respectively, only 18.1%, 10.4%, 34.6%, and 20.0% of the total population of under-5-year-olds. Polynesia is not yet represented in the database.

Table 1: **Population coverage in the WHO Global Database on Child Growth, with respect to national surveys, 1980–92**[a]

	Total population ($\times 10^6$)	Population surveyed ($\times 10^6$)	Coverage (%)	No. of countries surveyed/total
Africa	115.52	89.44	77.4	(34/52)
Northern Africa	21.58	20.75	96.2	(5/6)
Eastern Africa	37.19	32.84	88.3	(13/16)
Western Africa	37.24	32.79	88.0	(10/16)
Middle Africa	13.28	2.41	18.1	(3/9)
Southern Africa	6.23	0.65	10.4	(3/5)
Asia	366.86	326.81	89.1	(19/37)
Eastern Asia	122.27	116.14	95.0	(2/5)
Western Asia	19.62	6.80	34.6	(5/13)
South-eastern Asia	57.66	53.45	92.7	(6/10)
Southern Asia	167.31	150.42	89.9	(6/9)
Latin America	54.63	51.20	93.7	(23/36)
Caribbean	3.39	3.31	97.6	(6/16)
Central America	16.07	16.07	100.0	(7/8)
South America	35.17	31.82	90.5	(10/12)
Oceania	0.86	0.57	66.3	(3/13)
Melanesia	0.73	0.56	76.7	(2/5)
Micronesia	0.05	0.01	20.0	(1/4)
Polynesia	0.08	0.00	0.0	(0/4)
All developing countries	537.87	468.02	87.0	(79/138)

[a] Under-5-year-old population estimates refer to 1990 according to United Nations Population Division. See ref. (*4*).

Overview of national surveys

The results of national surveys carried out between 1980 and 1992 in 79 developing countries in Africa, Asia and Latin America are summarized in Table 2 and in Fig. 1–3. Most surveys refer to a national random sample of children aged up to 59 months.

The worldwide distribution of underweight. Fig. 1 shows the distribution of developing countries according to the prevalence of underweight children (weight-for-age below –2 SD from the reference median value). Prevalences are grouped into four categories (<10%, 10–19%, 20–29%, and ≥30%), corresponding approximately to the quartile distribution observed in the 79 countries surveyed. These categories of underweight prevalences are referred to as (relatively) low, moderate, high, and very high.

Most developing countries in Latin America have low or moderate prevalences of underweight children, while most countries in Asia have high or very high prevalences. In Africa, however, both moderate and high prevalences are found.

In most of the 23 countries surveyed in Latin America the prevalence of underweight is low or moderate. The exceptions are Honduras (high prevalence) and Guatemala (very high) in Central America; Guyana (high), in South America; and Haiti (very high), in the Caribbean.

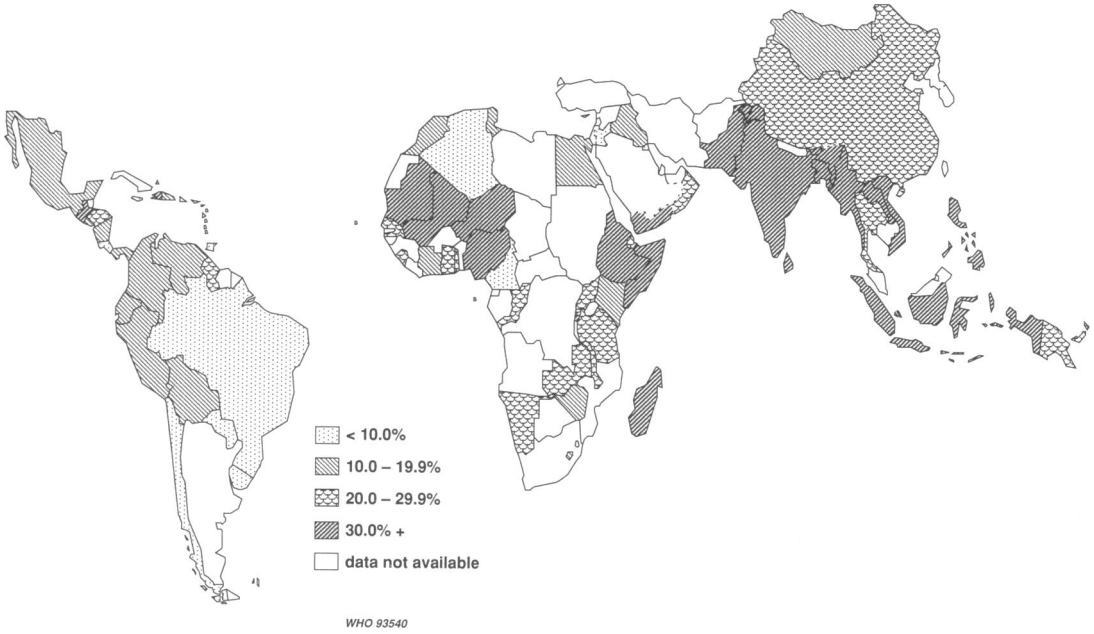
Table 2: **Prevalence[a] of underweight, stunting and wasting among under-5-year-olds in 79 developing countries, based on national surveys, 1980–92**

	Survey performed	Sample size	% underweight	% stunting	% wasting
Algeria	1992	—	9.2	18.1	5.5
Bangladesh	1989–90	1914	65.8	64.6	15.5
Barbados	1981	533	5.3	7.4	3.8
Bhutan[c]	1986–88	3273	37.9	56.1	4.1
Bolivia[b]	1989	2537	13.3	38.3	1.6
Brazil	1989	7314	7.0	15.4	2.0
Burundi[b]	1987	1930	38.3	48.1	5.6
Cameroon	1991	2357	13.6	24.4	3.0
Cape Verde	1983	14 767	19.0	14.9	4.8
Chile[c]	1986	—	2.5	9.6	0.5
China	1987	76 130	21.3	32.1	3.6
Colombia	1986–89	1973	10.1	16.6	2.9
Congo	1987	2429	23.5	27.1	5.4
Costa Rica	1982	1870	6.0	7.8	2.0
Côte d'Ivoire	1986	1947	12.4	17.2	8.6
Cuba[d, e]	1987	—	—	—	0.5
Djibouti	1989	3750	22.9	22.2	10.7
Dominican Republic	1991	2884	10.4	19.4	1.1
Ecuador	1986	7798	16.5	34.0	1.7
Egypt	1990	—	10.4	30.0	3.5
El Salvador	1988	2039	15.2	29.9	—
Ethiopia[f, g]	1992	20 230	47.7	64.2	8.0
Ghana	1987–88	2494	27.1	30.5	7.3
Guatemala[b]	1987	2230	33.5	57.9	1.4
Guyana	1981	532	22.1	20.7	8.5
Haiti[h]	1990	967	33.9	40.6	4.2
Honduras	1987	3338	20.6	33.9	1.9
India[i]	1988–90	13 548	63.9	62.1	19.2
Indonesia	1987	28 169	39.9	—	—
Iraq	1991	2565	11.9	21.8	3.4
Jamaica	1989	860	7.2	8.7	3.4
Jordan	1990	6601	6.4	19.3	2.8
Kenya[g]	1987	—	14.3	32.2	4.5
Kiribati	1985	2941	12.9	28.3	10.8
Kuwait	1983–84	2272	6.4	11.3	2.7
Laos	1984	6055	36.7	40.1	10.5
Lesotho[j]	1981	5467	15.6	26.1	4.5
Madagascar[k]	1983–84	1762	32.8	33.5	11.8
Malawi	1992	3236	27.2	48.6	5.4
Maldives	1983	1485	—	—	6.3
Mali[b]	1987	925	31.0	24.4	11.0
Mauritania	1990–91	4807	47.6	56.9	15.8
Mauritius	1985	2430	23.9	21.5	16.2
Mexico	1988	7426	16.3	27.0	5.5
Morocco[b]	1987	3292	15.7	25.5	3.7
Mongolia[l]	1992	1679	12.3	26.4	1.7
Myanmar[b]	1983–85	6255	38.0	49.7	11.0
Namibia	1992	2430	26.2	28.4	8.6
Nicaragua	1980–82	1611	10.5	21.8	0.6
Niger	1992	3848	36.2	32.3	15.8
Nigeria	1990	5565	35.7	43.1	9.1
Oman[d]	1991	764	24.3	20.7	7.3
Pakistan	1990–91	4037	40.4	50.0	9.2
Panama	1980	3314	15.7	22.0	6.4
Papua New Guinea[g]	1982–83	27 464	29.9	43.2	5.5
Paraguay	1990	3389	3.7	16.6	0.3
Peru	1991–92	7035	10.8	36.5	1.4
Philippines	1987	2250	32.9	38.6	4.5
Rwanda[g]	1991–92	1939	28.6	52.2	5.2
São Tome and Principe	1986	2155	17.0	26.0	5.0
Senegal[f]	1991–92	—	21.6	29.1	5.5
Seychelles	1987–88	836	5.7	5.1	2.0
Sierra Leone	1990	4595	28.7	34.7	8.5
Sri Lanka[b]	1987	1994	38.1	27.5	12.9
Sudan[m]	1987	15 534	—	—	12.5
Swaziland[g]	1983–84	4133	9.7	30.3	0.9
Tanzania	1991–92	6097	28.8	42.6	6.0
Thailand[b]	1987	1856	25.8	22.4	5.7
Togo[b]	1988	1396	24.4	29.6	5.3
Trinidad and Tobago[b]	1987	842	6.9	5.0	3.8
Tunisia[b]	1988	2023	10.4	18.2	3.1
Uganda	1988–89	3789	23.3	44.5	1.9
Uruguay[c, j]	1987	3471	7.4	15.9	—
Vanuatu	1983	1194	19.7	19.1	—
Venezuela	1981–82	6745	10.2	6.4	1.3
Viet Nam	1987–89	7044	45.0	56.5	9.4
Yemen	1991–92	—	30.0	44.1	12.7
Zambia	1992	4899	25.1	39.6	5.1
Zimbabwe	1988	2485	11.5	29.0	1.3

[a] % Below –2 SD of the WHO/NCHS reference population. Source : *WHO Global Child Growth Database* (see footnote *b*, p. 704).
[b] <3 years of age (Bolivia, Burundi, Guatemala, Mali, Morocco, Myanmar, Sri Lanka, Thailand, Togo, Trinidad and Tobago, and Tunisia).
[c] 0–72 months (Bhutan, Chile, and Uruguay).
[d] 12–59 months (Cuba and Oman).
[e] <3rd centile (Cuba).
[f] 6–59 months (Ethiopia and Senegal).
[g] National rural survey covering >80% of the total under-5-year-old population (Ethiopia, Kenya, Papua New Guinea, Rwanda, and Swaziland).
[h] Conducted in the five most populous of the nine departments (Haiti).
[i] Survey of rural population of eight states (India).
[j] National surveillance system (Lesotho and Uruguay).
[k] 0–23 months (Madagascar).
[l] 0–48 months (Mongolia).
[m] Northern Sudan (Sudan).

In Africa, a greater variation seems to occur among regions. The situation in northern Africa (represented in the database by Algeria, Egypt, Morocco, and Tunisia) is similar to that in Latin America, with a low or moderate prevalence of underweight. In western Africa, countries are mostly affected by high and very high prevalences, as is the case in eastern Africa. The only three surveys available for middle

Fig. 1. **Prevalence of underweight children in various developing countries, 1980–92.** (Dotted lines represent approximate border lines for which there may not be full agreement). Source: *WHO Global Database on Child Growth, 1993.*



Africa make it difficult to generalize about the frequency of underweight there (the prevalence is moderate in Cameroon and São Tome and Principe, and high in Congo). In southern Africa, the lack of national data for the two most populous countries, Botswana and South Africa, makes it difficult to define the pattern of underweight prevalences in the region (the prevalence is high in Namibia, moderate in Lesotho, and low in Swaziland).

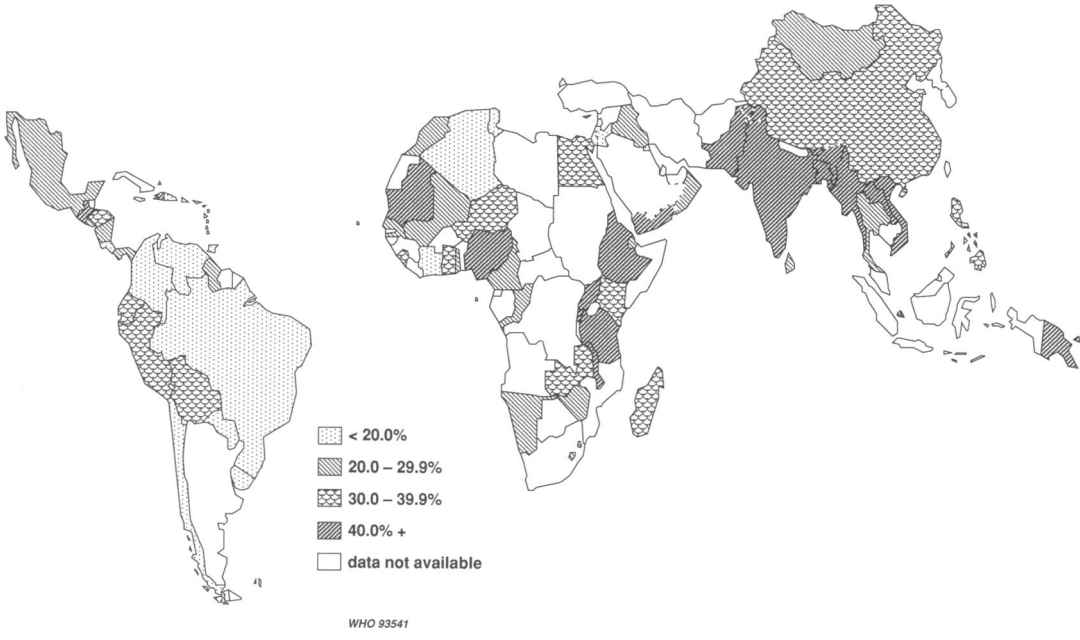
In all the countries surveyed in southern Asia (Bangladesh, Bhutan, India, Pakistan, and Sri Lanka) the prevalence of underweight is very high. With the exception of Thailand, this applies also to all the countries surveyed in south-eastern Asia (Indonesia, Laos, Myanmar, Philippines, and Vietnam). In Eastern Asia, China has a high prevalence of underweight and Mongolia a moderate prevalence. Paucity of surveys and contrasting results (low prevalence in Jordan and Kuwait, moderate in Iraq, high in Oman, and very high in Yemen) make it difficult to discern a prevalence pattern in western Asia.

The worldwide distribution of stunting and wasting. Fig. 2 and 3 show the distribution of developing countries according to their prevalence of stunted and wasted children (respectively, height-for-age and weight-for-height below –2 SD of the values for the reference median). As in the case of underweight, the prevalences of stunting are grouped into four categories corresponding to the quartiles of observed values in the 79 countries surveyed: <20%, 20–29%, 30–39%, and ≥40% (referred to here as low, moderate, high, and very high prevalences of stunting, resp.). The prevalences of wasting were originally grouped according to quartiles, producing four categories: <2%, 2–3%, 4–7%, and ≥8%; however, since both the two first categories are similar to expected values for the reference population (2.3%), they were pooled under one category (<4%), referred to as low prevalence of wasting. The two remaining categories (4–7% and ≥8%) are referred to as high and very high prevalences of wasting.

In broad terms, the differences between geographical areas as regards stunting and wasting resemble the situation for the distribution of underweight: high prevalences in Asia, low prevalences in Latin America, and a combination of both in Africa. On closer inspection, however, the situation in Latin America for stunting tends towards that in Africa, while for wasting the prevalences in Africa tend towards those in Asia.

The most favourable situation — a low/moderate prevalence of stunting and a low prevalence of wasting — is commonly found in countries in Latin America, while the opposite — high/very high prevalence of both stunting and wasting — is commonly

Fig. 2. **Prevalence of stunted children in various developing countries, 1980–92.** (Dotted lines represent approximate border lines for which there may not be full agreement). Source: *WHO Global Database on Child Growth, 1993.*



found in countries in Asia. A combination of high/very high prevalence of wasting and a low/moderate prevalence of stunting — indicating a predominance of acute over chronic malnutrition — though relatively rare in Latin America (Guyana, Mexico, and Panama) and Asia (Sri Lanka and Thailand), is quite common in Africa (10 countries, five of them in western Africa). The opposite pattern — high or very high prevalence of stunting combined with a low prevalence of wasting — which suggests a predominance of chronic over acute undernutrition, occurs in some countries in Latin America (Bolivia, Ecuador, Guatemala, Honduras, and Peru), in some countries in Africa (Egypt, Swaziland, and Uganda), and in the largest country in Asia (China).

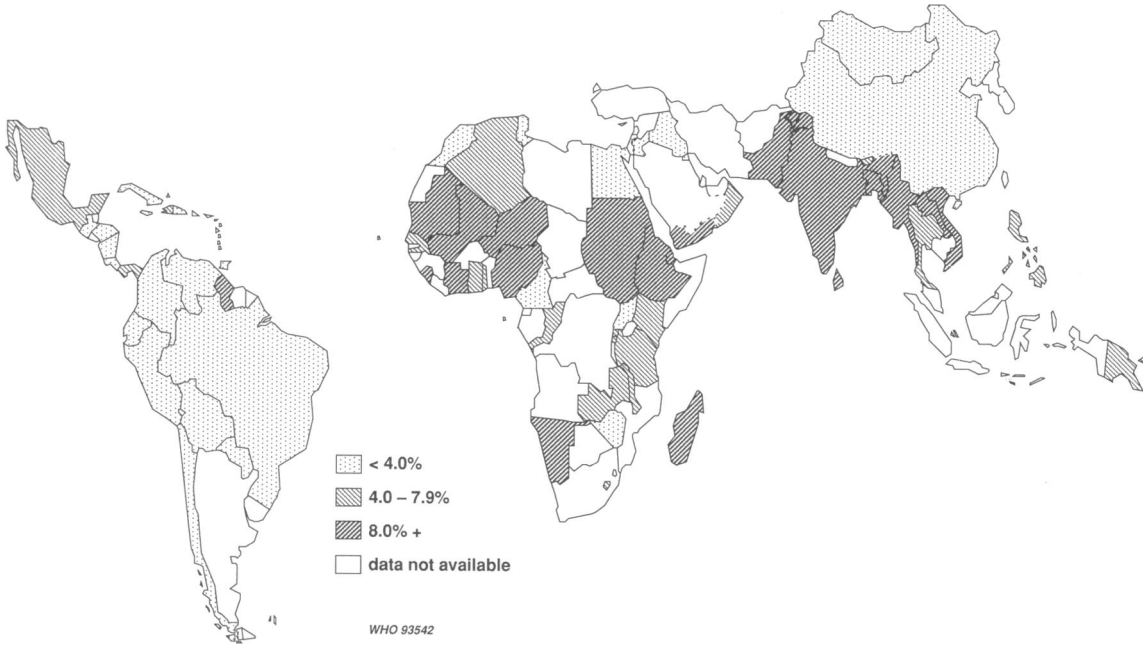
Global and regional estimates

Table 3 shows the global estimates for the prevalences of underweight, stunting, and wasting in developing countries, as well as the estimated absolute number of children affected by growth retardation. Available data for these prevalences are based on surveys covering 94% of the total population of under-5-year-olds in Latin America, 90% in Asia, 77% in Africa, and 66% in Oceania (see Table 1).

According to the estimates shown in Table 3, the risk of being underweight is 1.5 times higher in Asia than in Africa, and 2.3 times higher in Africa than in Latin America. Similar differences exist for stunting and wasting, although again it should be noted that the levels of stunting in Latin America tend towards those in Africa, while those for wasting in Africa tend towards the levels in Asia. The number of under-5-year-olds in each geographical area — 54 million in Latin America, 115 million in Africa, and 366 million in Asia — has the effect of making the regional distribution even more unequal. Irrespective of the indicator used, nearly 80% of affected children live in Asia, 15% in Africa, and only about 5% in Latin America. Oceania, despite its high prevalences of all three indicators, contributes very little to the absolute number of undernourished children, since there are fewer that 1 million under-5-year-olds in developing countries in this region.

Estimates of underweight, stunting, and wasting have also been obtained for the 10 regions that are reasonably well covered by national surveys. Except for estimates of stunting and wasting in south-eastern Asia, which are based on national surveys covering 53.3% of the total under-5-year-old population, all others are based on surveys covering at least 70% of

Fig. 3. **Prevalence of wasted children in various developing countries, 1980–92.** (Dotted lines represent approximate border lines for which there may not be full agreement). Source: *WHO Global Database on Child Growth, 1993.*



the total population of under-5-year-olds. Based on these estimates, regions have been ranked in descending order according to both the prevalence (Table 4) and the absolute number of affected children (Table 5).

The prevalences of underweight, stunted, and wasted children are far higher in southern Asia than in any other region. South-eastern Asia ranks second in the descending order of prevalences of underweight and third for wasting and stunting. Western Africa ranks second for wasting, third for underweight, and fifth for stunting. Eastern Africa ranks second for stunting and fourth for wasting and underweight. Melanesia ranks fourth for stunting, fifth for underweight, and sixth for wasting.

Eastern Asia (China and Mongolia) comes next in the descending order of prevalence of underweight and stunting, but ranks closer to the less-affected (Latin American) regions as far as wasting is concerned.

The lowest estimates for the prevalence of underweight, stunted, and wasted children are found in northern Africa and in the three regions of Latin America. The lowest prevalences of all three indicators occur in South America.

The ranking of regions according to the numbers of affected children reinforces the leading position of southern Asia — half of all underweight, stunted and wasted children in developing countries are located here. Eastern Asia ranks above African regions for these three indicators, and before south-eastern Asia where stunting and underweight are concerned. The Caribbean and Melanesia contribute the least in terms of absolute numbers of the world's undernourished children.

Table 3: **Global estimates for the prevalence[a] and number of underweight, stunted, and wasted children in developing countries**

	% underweight	% stunted	% wasted
Africa	27.4 (31.6)[b]	38.6 (44.6)	7.2 (8.3)
Asia	42.0 (154.1)	47.1 (172.8)	10.8 (39.6)
Latin America	11.9 (6.5)	22.2 (12.1)	2.7 (1.5)
Oceania	29.1 (0.3)	41.9 (0.4)	5.6 (0.1)
All developing countries	35.8 (192.5)	42.7 (229.9)	9.2 (49.5)

[a] % Below –2 SD of WHO/NCHS reference value.
[b] Figures in parentheses are millions of children.

Table 4: **Regional estimates for the prevalence[a] of underweight, stunted, and wasted children in developing countries, ranked in descending order**

% underweight		% stunted		% wasted	
Southern Asia	60.5	Southern Asia	60.3	Southern Asia	17.3
South-eastern Asia	37.8	Eastern Africa	47.0	Western Africa	9.5
Western Africa	32.8	South-eastern Asia	43.2	South-eastern Asia	7.6
Eastern Africa	31.0	Melanesia	42.2	Eastern Africa	6.0
Melanesia	29.5	Western Africa	37.9	Northern Africa	5.8
Eastern Asia	21.3	Eastern Asia	32.1	Melanesia	5.5
Caribbean	19.4	Central America	29.8	Central America	4.6
Central America	17.7	Caribbean	25.9	Eastern Asia	3.6
Northern Africa	11.3	Northern Africa	25.4	Caribbean	2.2
Southern America	8.4	Southern America	18.1	Southern America	1.9

[a] % Below –2 SD of the WHO/NCHS reference value.

Discussion

The data we have presented here document a disturbing picture of undernutrition among preschool-age children in underprivileged populations. Our findings confirm the great magnitude of undernutrition which, more than any other disability, continues to hamper the physical growth and mental development of more than a third of the world's children. Indeed, it is a major threat to their very survival.

The accumulated evidence in the WHO Global Database on Child Growth permits an accurate description of the magnitude and geographical distribution of protein–energy malnutrition. At present, the database covers 87% of the total population of under-5-year-olds (about 468 million children) living in developing countries in 1990, and thus allows calculation of reliable estimates on a regional basis. This global overview is a major improvement over WHO's previous attempt, made a decade ago, which was based on heterogeneous data sets using different reference populations and cut-off points (*2*); also far fewer countries and nationally representative surveys on which to base conclusions were included.

Our review of 79 national surveys carried out between 1980 and 1992 in developing countries demonstrates that undernutrition is still very common among preschool-age children, resulting in small (stunted) rather than thin (wasted) children. Most countries in Asia have high or very high prevalences of underweight children, while in Latin America, most countries have low or moderate prevalences of such children. In Africa, there appears to be a greater variation among regions than in either Asia or Latin America. Thus, the situation in northern Africa is similar to that in Latin America, while in western and eastern Africa countries are mostly affected by high and very high prevalences of underweight.

The differences between regions in terms of stunting and wasting duplicate those observed for the distribution of underweight. The most favourable situation — a low prevalence of both stunting and wasting — is commonly found in Latin America,

Table 5: **Regional estimates for the number of underweight, stunted and wasted children in developing countries, ranked by descending order**

No. underweight ($\times 10^6$)		No. stunted ($\times 10^6$)		No. wasted ($\times 10^6$)	
Southern Asia	101.2	Southern Asia	100.9	Southern Asia	28.9
Eastern Asia	26.0	Eastern Asia	39.2	South-eastern Asia	4.4
South-eastern Asia	21.8	South-eastern Asia	24.9	Eastern Asia	4.4
Western Africa	12.2	Eastern Africa	17.5	Western Africa	3.5
Eastern Africa	11.5	Western Africa	14.1	Eastern Africa	2.2
Southern America	2.9	Southern America	6.4	Northern Africa	1.2
Central America	2.8	Northern Africa	5.5	Central America	0.7
Northern Africa	2.4	Central America	4.8	Southern America	0.7
Caribbean	0.6	Caribbean	0.9	Caribbean	0.1
Melanesia	0.2	Melanesia	0.3	Melanesia	0

whereas the opposite is true in Asia. A combination of high wasting with low stunting, which indicates a predominance of acute over chronic malnutrition, is rare in Latin America and Asia but quite common in Africa, particularly western Africa. The opposite pattern, which suggests a predominance of chronic over acute malnutrition, occurs in China and in some countries in Latin America and Africa.

Our estimate for the global prevalence of underweight preschool-age children in developing countries (35.8%) is consistent with a recent value obtained using the same data but a different methodology (*5*). However, there have been no previous estimates of the prevalence and absolute numbers of stunted and wasted preschool-age children. Broadly speaking, the risk of being underweight is 1.5 times higher in Asia than in Africa, and 2.3 times higher in Africa than in Latin America. Similar differences exist for stunting and wasting. Differences in population size make the regional distribution even more unequal, with 80% of the affected children living in Asia — mainly in southern Asia — 15% in Africa, and only 5% in Latin America.

We estimate that 43% of under-5-year-olds in developing countries have low heights-for-age. Several studies have shown that stunting is associated with poor developmental attainment in young children (*6, 7*) and poor school achievement or intelligence levels in older children (*8, 9*). Furthermore, Martorell et al. recently provided the clearest demonstration that growth retardation in early childhood is associated with significant functional impairment in adult life (*10*). Children affected by marked growth retardation become adults with limited biological and intellectual abilities that diminish their working capacity. In women stunting is a matter of great concern in terms of increased obstetric risks. Finally, stunted children frequently experience social disadvantages, which themselves may detrimentally affect their development (*11*).

Social equity, as reflected in international human rights law (*12*),[c] affirms the right of every child to adequate nutrition to ensure proper physical growth and mental development. In a world where there is enough food for everyone, but where inequitable access to it is the main problem,[d, e] it is intolerable that more than 200 million preschool-age children continue to suffer the consequences of undernutrition.

The causes of growth retardation are deeply rooted in poverty and lack of education. To continue to allow underprivileged environments to affect children's development not only perpetuates the vicious cycle of poverty but also leads to an enormous waste of human potential. If the nutritional well-being of people is a precondition for the development of societies, it is all the more so where their most vulnerable members — children — are concerned. Governments will be unsuccessful in their efforts to accelerate economic development in any significant long-term sense until optimal child growth and development are ensured for the majority.

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Résumé

L'ampleur mondiale de la malnutrition protéino-énergétique d'après la base de données de l'OMS sur la croissance des enfants

La surveillance de la croissance des enfants est la meilleure façon d'évaluer leur santé et leur état nutritionnel. Nous avons utilisé la base de données mondiale de l'OMS sur la croissance des enfants, qui couvre 87% des enfants de moins de cinq ans vivant dans les pays en développement, pour évaluer la prévalence de la malnutrition protéino-énergétique dans les différentes régions du monde; cette étude se fonde sur les résultats d'enquêtes transversales représentatives menées entre 1980 et 1992 dans 79 pays en développement d'Afrique, d'Asie, d'Amérique latine et d'Océanie. Les résultats confirment l'ampleur du problème, qui touche plus d'un tiers des enfants du monde. Pour tous les indicateurs (émaciation, retard de croissance et insuffisance pondérale), la situation la plus favorable, c'est-à-dire des prévalences faibles ou modérées, se rencontre en Amérique latine; dans la plupart des pays d'Asie, les prévalences sont fortes ou très fortes, tandis qu'en Afrique, on observe les deux types de situation. Au total, 80% des enfants victimes de malnutrition vivent en Asie—principalement dans le sud du continent, 15% en Afrique et 5% en Amérique latine. Nous estimons que 43% des 230 millions d'enfants vivant dans les pays en développement

[c] *Convention on the Rights of the Child.* New York, United Nations General Assembly document A/RES/44/25, 5 December 1989.

[d] See footnote *a*, p. 703.

[e] *WHO Commission on Health and Environment: report of the Panel on Food and Agriculture.* Unpublished document WHO/EHE/92.2.

présentent un retard de croissance. Celui-ci s'accompagne d'un retard de développement pendant l'enfance et de déficiences fonctionnelles à l'âge adulte. Accepter qu'un environnement défavorable compromette le développement des enfants conduit à un énorme gaspillage du potentiel humain qui perpétue le cercle vicieux de la pauvreté. Les efforts visant à accélérer le développement économique ne pourront aboutir tant que la croissance et le développement des enfants ne seront pas assurés.

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