3rd Report on the World Nutrition Situation

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A report compiled from information available to the ACC/SCN

December 1997

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Enquires should be addressed to:

ACC/SCN Secretariat,
c/o World Health Organization,
20 Avenue Appia,
CH 1211 Geneva 27,
Switzerland.
Email: accscn@who.ch
Fax: +41 22 798 8891
Tel: +41 22 791 0456

UNITED NATIONS – ADMINISTRATIVE COMMITTEE ON COORDINATION/SUB–COMMITTEE ON NUTRITION (ACC/SCN)

The ACC/SCN is the focal point for harmonizing the policies and activities in nutrition of the United Nations system. The Administrative Committee on Coordination (ACC), which is comprised of the heads of the UN Agencies, recommended the establishment of the Sub–Committee on Nutrition in 1977, following the World Food Conference (with particular reference to Resolution V on food and nutrition). This was approved by the Economic and Social Council of the UN (ECOSOC). The role of the SCN is to serve as a coordinating mechanism, for exchange of information and technical guidance, and to act dynamically to help the UN respond to nutritional problems.

The UN members of the SCN are FAO, IAEA, IFAD, ILO, UN, UNDP, UNEP, UNESCO, UNFPA, UNHCR, UNICEF, UNRISD, UNU, WFP, WHO and the World Bank. From the outset, representatives of bilateral donor agencies have participated actively in SCN activities. The SCN is assisted by the Advisory Group on Nutrition (AGN), with six to eight experienced individuals drawn from relevant disciplines and with wide geographical representation. The Secretariat is hosted by WHO in Geneva.

The SCN undertakes a range of activities to meet its mandate. Annual meetings have representation from the concerned UN Agencies, from 10 to 20 donor agencies, the AGN, as well as invitees on specific topics; these meetings begin with symposia on subjects of current importance for policy. The SCN brings certain such matters to the attention of the ACC. The SCN sponsors working groups on inter–sectoral and sector–specific topics.

The SCN compiles and disseminates information on nutrition, reflecting the shared views of the agencies concerned. Regular reports on the world nutrition situation are issued, and flows of external resources to address nutrition problems are assessed. Nutrition Policy papers are produced to summarize current knowledge on selected topics. *SCN NEWS* is normally published twice a year. As decided by the Sub−Committee, initiatives are taken to promote coordinated activities − inter−agency programmes, meetings, publications − aimed at reducing malnutrition, primarily in developing countries.

Further information can be obtained from the Sub−Committee on Nutrition, as follows:

Chairman: Dr Richard Jolly
Special Advisor to the Administrator
United Nations Development Programme
One United Nations Plaza, New York, NY 10017, USA
Telephone: [212] 906 5764, Fax: [212] 906 6661
EMail: Richard.Jolly@UNDP.ORG

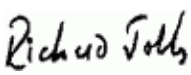
Technical Secretary: Dr Sonya Rabeneck
c/o World Health Organization
20, Avenue Appia
CH−1211 Geneva 27, Switzerland
Telephone: [41−22] 791 04 56, Fax: [41−22] 798 88 91
EMail: ACCSCN@WHO.CH

Chairman's Forward

This *Third Report on the World Nutrition Situation* is part of a series of SCN reports initiated in the mid 80s on nutritional status of populations in developing countries. These reports focus on information important for all the UN agencies concerned with nutrition, and for the many governments and non−governmental organizations and individuals active in nutrition. The centrepiece of earlier reports was estimates of regional trends in underweight of preschool children. This *Third Report* presents, for the first time, information on global and regional trends in stunting, i.e., low height−for−age. This analysis was made possible because of the significantly enriched database on child growth made available by countries to the international community in recent years. This work was also motivated by important research on childhood stunting and mental development. All regions in the world, except Sub−Saharan Africa, show steady reductions in stunting over the period 1980−95.

Much progress has been made against micronutrient malnutrition since the *Second Report* was published in 1992. Chapter 2 describes this dramatic progress and highlights some of the outstanding issues, emphasizing the need for program monitoring and sustainability. Chapter 2 presents, for the first time in this series, information on folic acid deficiency and zinc deficiency. Both of these nutrition problems have for many years been largely overlooked. A short section on calcium is also included. Chapter 3 presents a review of issues related to the nutritional status of refugees and displaced persons, and Chapter 4 draws policy implications.

This *Report* provides important material for identifying the new possibilities and challenges ahead. The SCN's Commission on Nutrition Challenges for the 21st Century will present its draft report at the forthcoming SCN Symposium in Oslo, March 30, to be chaired by Dr. Gro Harlem Brundtland. This will provide a major occasion for the global nutrition community to review priorities for nutrition action for the next century, based on many of the key findings described here.



Acknowledgements

Regression analysis, graphs and tables for Chapter 1 on Childhood Stunting and Young Child Development were prepared by Edward Frongillo and Francoise Vermeylen of Cornell University. Chapter 1 was written by Edward Frongillo, with contributions from the SCN's Advisory Group on Nutrition. Box 1 on stunting and mental development was extracted from a short policy paper prepared for the SCN by Sally

Grantham–McGregor and L.C. Fernald of the University of London. Box 2, prepared by Hooman Peimani, covers Central Asia and the Caucasus, a region not previously discussed in these reports. Simone Barquera–Cervera, Saul Morris and Marie Ruel of IFPRI prepared Box 3 (a simulation) and Annex 3 on the issue of age. Chapter 1 was reviewed by members of the SCN's Advisory Group on Nutrition and by Richard Jolly, Chair of the SCN. George Beaton reviewed the regression methods, as presented in Annex 2.

We are grateful to Mercedes de Onis and Monica Blössner of WHO'S Nutrition Program for sharing with us data available in the WHO Database on Child Growth and Malnutrition. All stunting estimates presented in Chapter 1 are based on these WHO data. Mercedes de Onis also reviewed the chapter.

Databases to estimate prevalences, trends, and status of control programs for sections on iodine deficiency disorders, vitamin A deficiency and iron deficiency anaemia in Chapter 2 were assembled by a collaborative team involving the following institutions and persons: UNICEF (Nita Dalmiya, Joane Csete and David Alnwick); Tulane University (John Mason, Nancy Mock, Amy Gilman and Karen Mason); and the Micronutrient Initiative (Kavita Sethuraman and Mahshid Lotfi). The SCN is most grateful for the enormous amount of work done by this team in taking up the challenge of bringing together a very large amount of material and seeing a complex task through to completion. This work was coordinated by Mahshid Lotfi at the Micronutrient Initiative. The SCN acknowledges all these contributions with thanks.

The text on iodine deficiency disorders and vitamin A deficiency was subsequently finalized by Francois Delange of the International Council for the Control of Iodine Deficiency Disorders and by Barbara Underwood of the National Academy of Sciences in Washington, respectively. Ken Bailey and Yun Ling provided data from the WHO database on anaemia in children, and Carla AbouZahr, also of WHO, on anaemia in pregnant women. Janice Johnston also provided information on the determinants of anaemia. Bill Clay of FAO wrote a background paper on food–based strategies to control vitamin A deficiency. These contributions are most appreciated.

The section on folic acid was written by Rafael Perez–Escamilla of the University of Connecticut. The section on zinc was based on material provided to the SCN by Rosalind Gibson of the University of Otago, New Zealand. The section on calcium was written by Ann Prentice of the Dunn Nutrition Centre in Cambridge and by Robert Parr of the International Atomic Energy Agency in Vienna. We are particularly indebted to Dr. Parr for furnishing an exhaustive compilation of dietary calcium intake data and for a very useful background paper.

Chapter 2 on micronutrients was reviewed by members of the Advisory Group on Nutrition, Bruno de Benoist of WHO, Guy Nantel of FAO (folic acid), Louis Pizzarello of Helen Keller International (vitamin A) and Ray Yip of UNICEF (iron).

Chapter 3 on Refugees and Displaced Persons was written by Jane Wallace, who coordinates and writes the SCN's *Reports on the Nutrition Situation of Refugees and Displaced People,* and Jeremy Shoham of the London School of Hygiene and Tropical Medicine. Data used for this chapter are from a database located in the SCN Secretariat. The chapter benefited from comments from Rita Bhatia of UNHCR, and Anne Callanan and Christine van Nieuwenhuyse of WFP. This chapter was reviewed by Lola Nathanial of Save the Children Fund(UK), Cutberto Garza of Cornell University and Arjan de Wagt in the Netherlands. Chapter 4, on policy implications, was written by Eileen Kennedy who is a member of the Advisory Group on Nutrition. All of these contributions are acknowledged with thanks.

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List of Acronyms

ACC/SCN	Administrative Committee on Coordination/Sub−Committee on Nutrition
ACF (AICF)	Action Contre la Faim
ADFL	Alliance of Democratic Forces for the Liberation of Congo
ARRA	Administration for Refugeen and Returneen Affairs
CDC	Centers for Disease Control
CMR	Crude Mortality Rate
CSB	Com Soya Blend
DHS	Demographic Health Survey
DNA	Deoxyribonucleic Acid
DRC	Democratic Republic of the Congo
DTP	Diphtheria, Tetanus and Polio
ECOMOG	ECOWAS (Economic Community of West African States) Ceasefire Monitoring Group
FAO	Food and Agricultural Organization
FDA	Food and Drug Administration
ICCIDD	International Council for the Control of Iodine Deficiency Disorders
ICRC	International Committee of the Red Cross
IDA	Iron Deficiency Anaemia
IDD	Iodine Deficiency Disorders
IDP	Internally Displaced Persons
IFPRI	International Food Policy Research Institute
IIH	Iodine−Induced Hyperthyroidism
IMR	Infant Mortality Rate
INACG	International Nutritional Anemia Consultative Group
IOM	Institute of Medicine
IUGR	Intra−Uterine Growth Retardation
IVACG	International Vitamin A Consultative Group
JCHP	Joint Committee on Health Policy
MCH	Maternal and Child Health
MI	Micronutrient Initiative
MRC	Medical Research Council
MSF−B	Médecins Sans Frontières − Belgium
MSF−CIS	Médecins Sans Frontières − Célula Inter Secçoes
MSF−F	Médecins Sans Frontières − France
MSF−H	Médecins Sans Frontières − Holland
MUAC	Mid Upper Arm Circumference

NCHS	National Center for Health Statistics
NGO	Non Governmental Organization
NID	National Immunization Day
NTD	Neural Tube Defect
OLS	Operation Lifeline Sudan
ORT	Oral Rehydration Therapy
PAMM	Programme Against Micronutrient Malnutrition
PCD	Partnership for Child Development
RDA	Recommended Daily Allowance
RNIS	Refugee Nutrition Information System
SCF	Save the Children Fund
SPLA	Sudanese Peoples Liberation Army
TSH	Thyroid Stimulating Hormone
U5MR	Under Fives Mortality Rate
UNDP	United Nations Development Programme
UNHCR	United Nations High Commission on Refugees
UNICEF	United Nations Children's Fund
UNU	United Nations University
USI	Universal Salt Iodization
WFP	World Food Programme
WHO	World Health Organization
WV	World Vision

Highlights

STUNTING

? In 1995 stunting affected 53.5% of preschool children in South Asia, 39.4% in Sub−Saharan Africa, 38.3% in South East Asia, 27.8% in Middle America and the Caribbean, 22.2% in Near East/North Africa, and 12.9% in South America. About 34.1% of preschool children in China were stunted in 1992.

? These prevalences translate into very large numbers of stunted children: by far the worst affected region is South Asia, where 89.9 million children were stunted in 1995, followed by 42.6 million in Sub−Saharan Africa. About 30.2 million children were stunted in South East Asia in 1995. In comparison, numbers are much lower in the three remaining regions: 10.9 million in Near East/North Africa, 5.6 million in Middle America/Caribbean and 4.6 million in South America.

? The prevalence of stunting has declined globally from 48.8% in 1980 to 39.9% in 1995. However, numbers (excluding China) have increased over this period from about 175.8 to 183.9 million.

? The average rate of decline in the 61 countries for which trend data are available is about 0.54 percentage points per year. Rates of progress differed across regions. South East Asia experienced the most rapid rate of progress, at −0.90 percentage points per year, followed by South Asia at −0.84 percentage points per year, and South America at −0.81 percentage points per year. Rates of progress in reducing stunting were −0.64

percentage points per year in Near East/North Africa and −0.26 in Middle America/Caribbean.

? Sub−Saharan Africa as a whole saw no progress in reducing stunting during the period 1980 to 1995, in fact the trend was positive, at +0.13 percentage points per year. The numbers of children in Sub−Saharan Africa affected by stunting increased by an alarming 62% during this period.

? There are important differences amongst Sub−Saharan African countries. Of the 25 countries in this region with more than one survey, 13 countries made important progress at an average rate of − 0.44 percentage points per year. Stunting increased in the remaining 12 countries at an average rate of +0.84 percentage points per year.

? Except for the Near East/North Africa region, there is no evidence for a slowdown in the rate of progress over the two successive five−year periods examined, 1985−90 and 1990−95. There is no information on trends in Central Asia and the Caucasus. However, recent surveys show high rates of stunting in several countries of this region, as well as wide disparities within countries.

? The prevalence of low−birth−weight is very high in countries with prevalent stunting. Low−birth−weight is especially high in South Asia, which also has both the highest rates and numbers of stunted children.

MICRONUTRIENT MALNUTRITION

? Rates of salt iodization in all regions have increased significantly, especially over the past five years. This has resulted in a dramatic reduction in the percentage of populations at risk of iodine deficiency disorders. This figure has declined from 28.9% to 13.7% globally during the period 1994 to 1997.

? Progress has been most dramatic in Central and South America, which have historically had very high prevalence rates of iodine deficiency disorders. In about 20 countries in this region more than 90% of salt is iodized and in an additional 14 countries the rate is between 75 and 90%. There are some countries in other regions, in particular in the former Soviet Union where special efforts need to be made to get programmes back on track.

? Progress has been impressive in Sub−Saharan Africa where all but four countries have implemented salt iodization programmes. While iodization rates tend to be lower in Sub−Saharan Africa, with only 11 of the 40 countries in this region reporting more than 75% of salt adequately iodized, progress continues to be made and momentum is high.

? Impacts on goitre prevalence have been documented for those countries with data on both iodization and goitre prevalence. Elimination of iodine deficiency disorders could, in due course, be recognised as the most spectacular public health success of this century. However, it bears repeating that the management systems put in place so far are fragile. Monitoring is all important and community−based monitoring of salt iodization will play an essential role.

? Prevalence rates of clinical vitamin A deficiency decreased in all regions during the period 1985 to 1995. Rates of progress were highest in South Asia, at about −0.84 percentage points per ten years, followed by Eastern and Southern Africa at about −0.74 percentage points per ten years. This translates into a reduction in numbers affected globally from about 5 million 1985 to 3.3 million in 1995. Although these trends are encouraging, progress will have to accelerate if elimination targets are to be met in all regions by the year 2000. Presumably global progress in reducing clinical vitamin A deficiency is reflected by progress in reducing subclinical deficiency, but it is not possible to substantiate this until sufficient data from repeat surveys are available.

? Iron deficiency anaemia affects about 43% of women and 34% of men in developing countries. Countries of South and South East Asia have the highest prevalence of anaemia, about 80% of pregnant women are affected. In all regions, the prevalence of anaemia is higher in pregnant women than in non−pregnant women. Preschool children in all regions are affected by anaemia; average prevalence rates range up to about 64% in South and South East Asia.

? The past few years have seen increased interest and policy attention on programmes to address iron deficiency anaemia, especially through preventive supplementation and fortification of staple cereals. Concerted and sustained efforts are needed to increase this momentum, and to keep iron on the policy agenda.

? The extent of folic acid deficiency in developing countries is generally unknown. Folic acid deficiency may be a contributing cause to much of the anaemia of pregnancy seen amongst African women. The prevalence of zinc deficiency is also unknown. Mild and moderate forms are likely to be widespread and until recently largely overlooked. Zinc deficiency may contribute significantly to growth stunting in young children. Zinc deficiency may be particularly widespread among African women. A high proportion of pregnant women in developing countries are also likely to be at risk because of chronically low zinc intakes.

REFUGEES AND DISPLACED PERSONS

? When continual access to populations of refugees and internally displaced persons is possible, levels of wasting are generally low. Two exceptions to this are for the Somali refugees in Kenya and Ethiopia where levels of wasting over 20% are seen.

? Cases of micronutrient malnutrition, specifically beri–beri, pellagra, scurvy and vitamin A deficiency, continue to be reported. Efforts to prevent this include the provision of a micronutrient–fortified blended food to populations wholly dependent on food aid. At the same time, questions on the reliability of methods used to diagnose micronutrient malnutrition are being raised.

Chapter 1: Stunting and Young Child Development

INTRODUCTION

Beginning in 1987, the ACC/SCN has periodically examined the trends in the prevalence of child underweight. In this chapter, for the first time, we report on trends in stunting, i.e., poor growth in the length of infants and the height of children. This has been made possible by the increased availability of national data on height for countries in all regions, especially over the past five years.

As in previous reports in this series, this chapter provides information on trends occurring in six regions: Sub–Saharan Africa, Near East/North Africa, South Asia, South East Asia, Middle America/Caribbean and South America The primary purpose is to estimate the trends in the prevalence of stunting by region, determine if any of the regional trends are speeding up or slowing down and determine if the regions are progressing differently. Information is also presented on rates of low–birth–weight, the relationship of stunting to other national factors and the ages at which children are susceptible to faltering in height.

In the Second *Report on the World Nutrition Situation* (ACC/SCN, 1992, p.10),underweight was found to affect about one–third of all children in developing countries in 1990. The percentage of children who were underweight fell in the 1980s from around 37.8% in 1980 to 34.3% in 1990. In contrast to other regions, the underweight prevalence in Sub–Saharan Africa generally deteriorated or remained static in the 1980s. South Asia was found to be improving slowly, but the underweight prevalence in this region was the highest in the world, and more than half of the underweight children in the world lived there. Two subsequent reports (*Update on the Nutrition Situation, 1994* and *Update on the Nutrition Situation, 1996*) reinforced these findings.

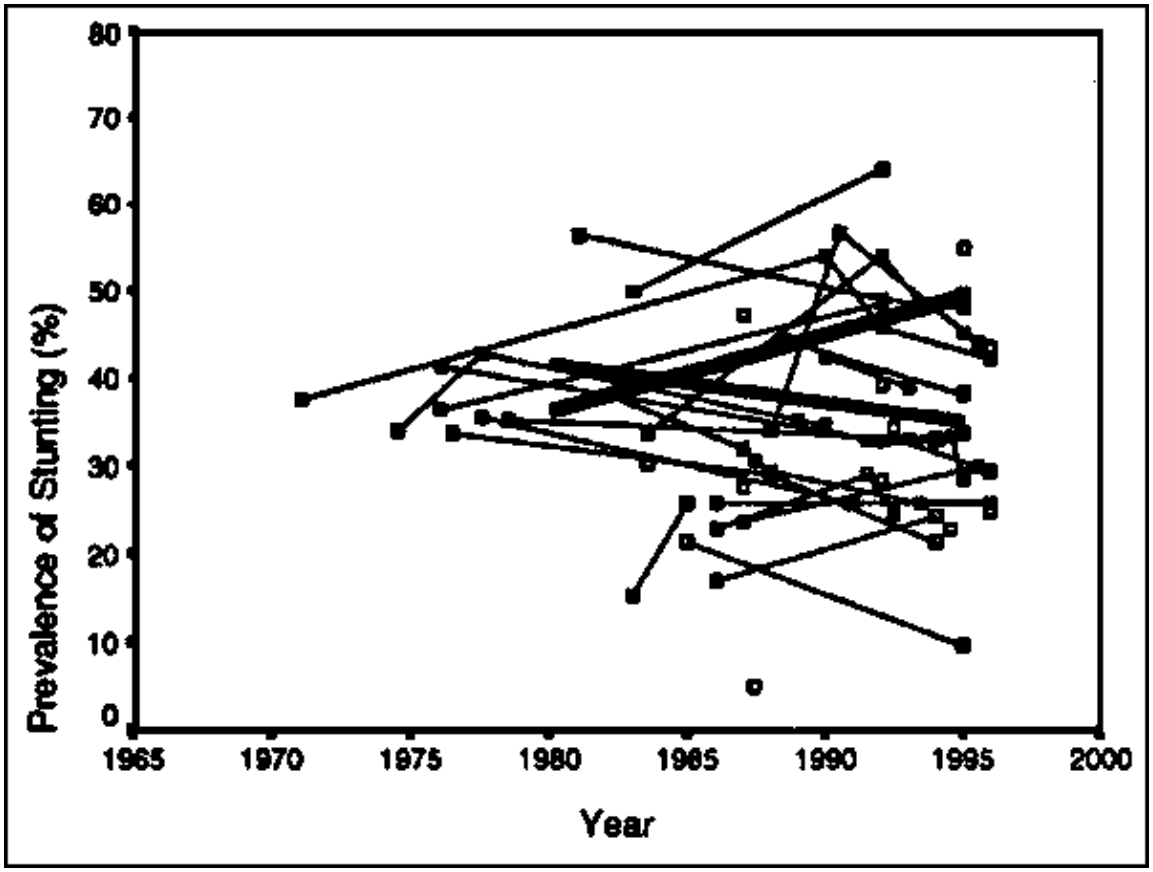
The *Update 1996* suggested a slowdown in the rate of progress in reducing underweight. These three reports also examined country trends and relationships of rates of underweight to other country–level social and economic factors.

This chapter focuses on stunting for several reasons. First, as stated earlier, trends in the prevalence of stunting have not previously been reported. Second, child health goals for the early part of the next century have specifically targeted improvements in the rates of stunting. One of the five health outcome targets (out of eleven total targets for health) given by the World Health Organization in its recently revised *Health for All in the 21st Century* is 'the percentage of children under five years who are stunted should be less than 20% in all countries and in all specific subgroups within countries by the year 2020' (WHO, 1998, p.22). Third, stunting may be a better cumulative indicator of well–being for populations of children in countries than is underweight, because underweight is affected by weight recovery for some children between two and five years of age and by some children being overweight.

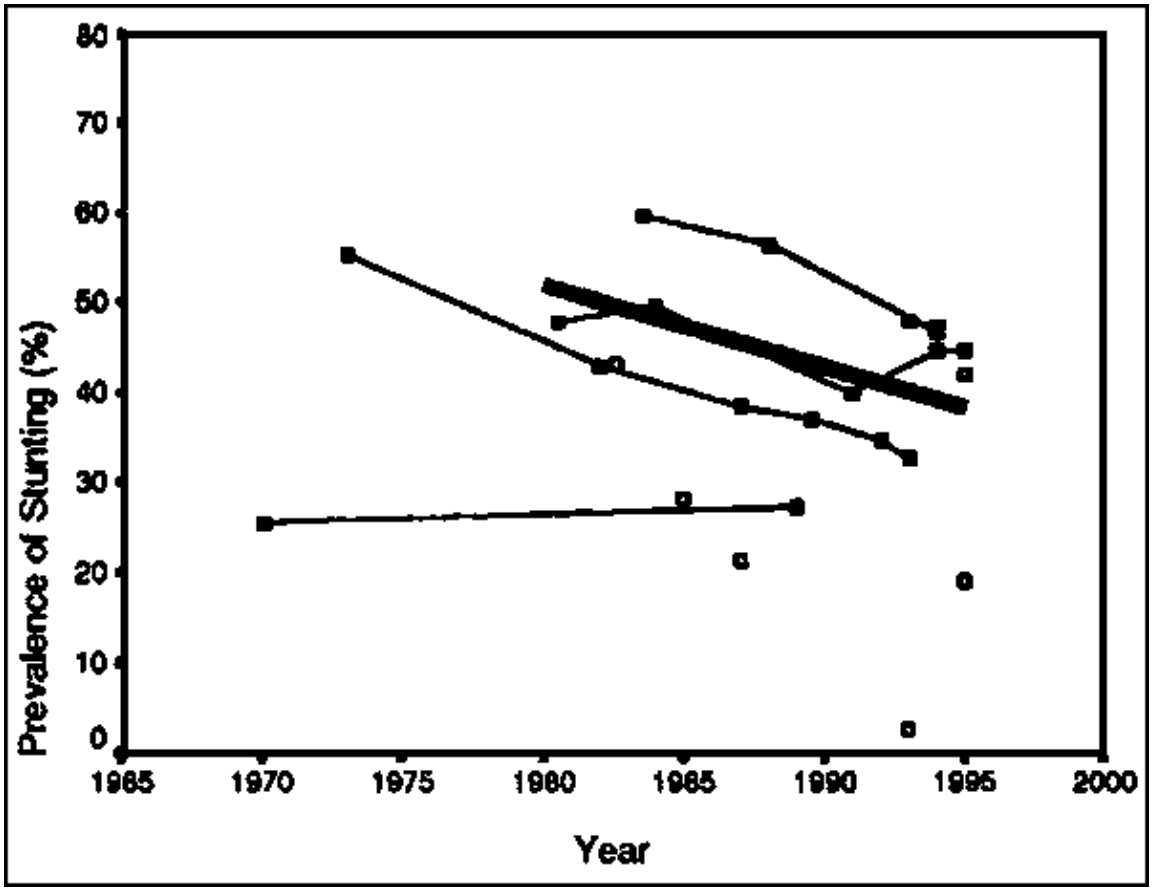
Has there been progress in reducing stunting?

To assess progress in child stunting, data compiled by the WHO Nutrition Programme in its Global Database on Child Growth and Malnutrition were used. Data were available from 61 countries for the estimation of trends in stunting, and from 95 countries for the estimation of prevalence of stunting (Table 1). Countries contributed to the estimation of trends in stunting if they had two or more surveys. Countries contributed to the estimation of prevalence in stunting if they had at least one survey.

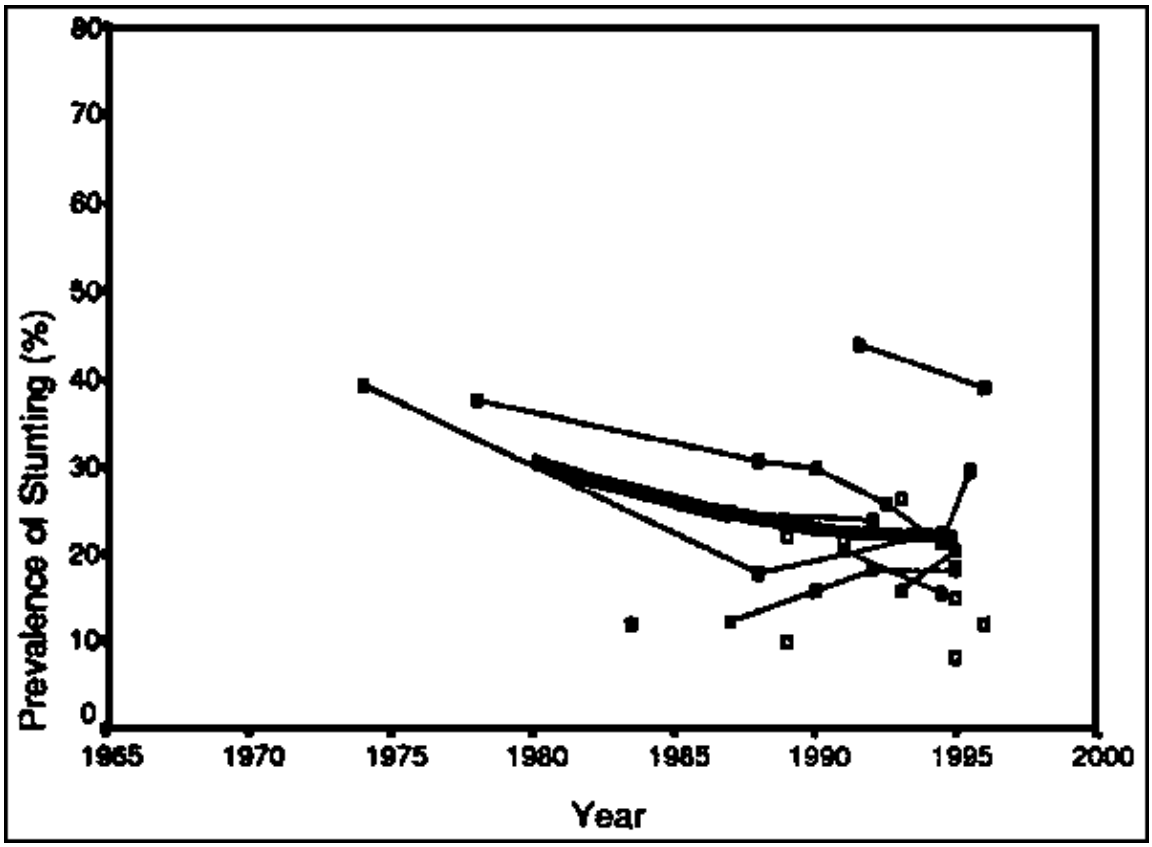
Figure 1: Trends in Stunting (height–for–age <–2 SD below the reference median) over Time in Six Regions



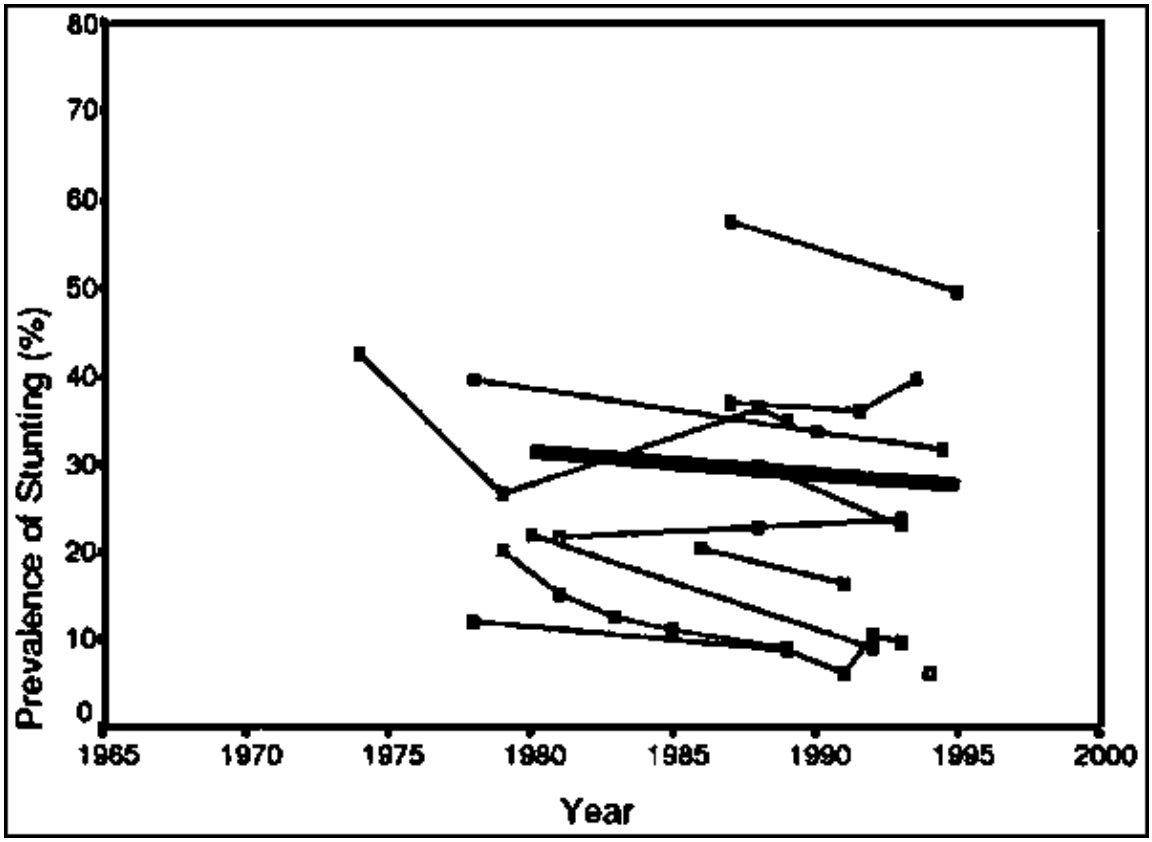
Sub–Saharan Africa



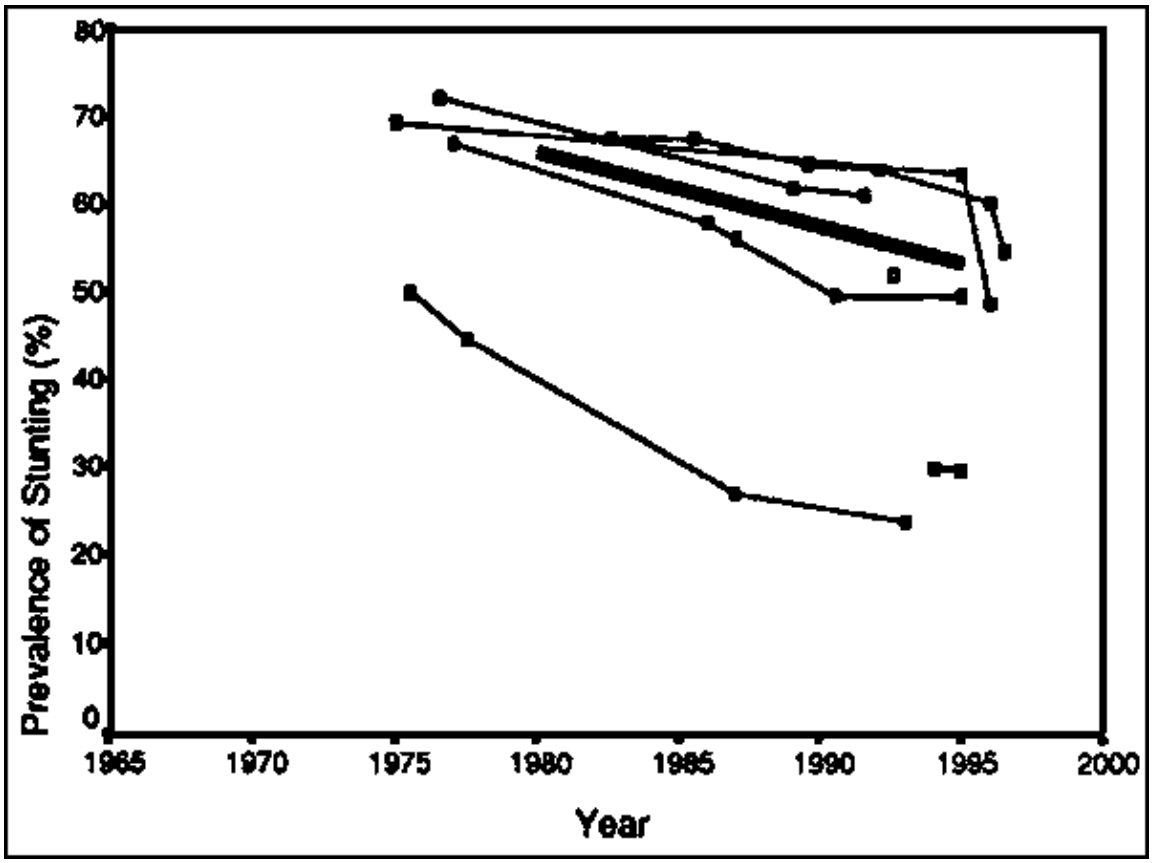
South East Asia



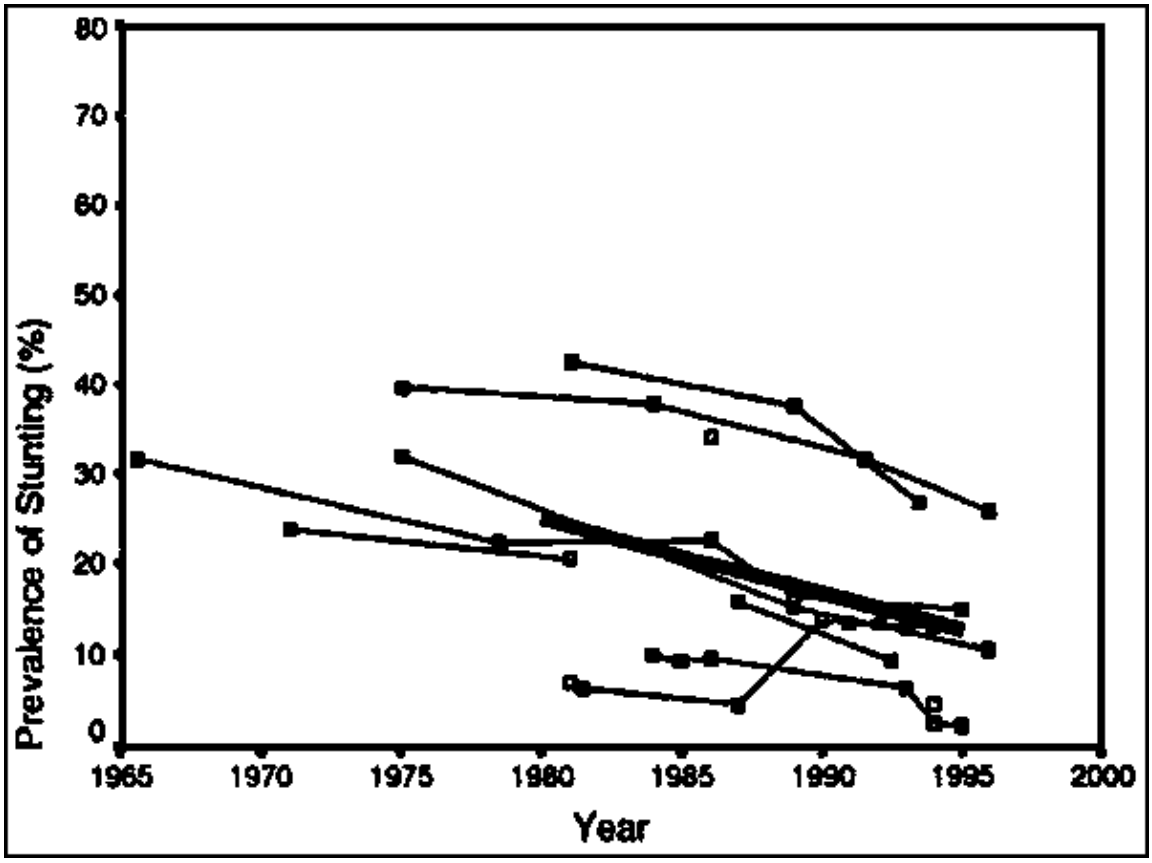
Near East/North Africa



Middle America/Caribbean



South Asia



South America

Note: Heavy lines indicate regional trends, weighted by population. In the case of Sub–Saharan Africa, two trend lines are included: one for the countries where stunting is improving, and one for the countries where stunting is deteriorating.

Table 1: Percentage of Countries and Total Population Covered by Region for Estimation of Trends and Prevalence in Stunting (calculated for 1995)

Region	*Trends in Stunting*			*Prevalence of Stunting*		
	Countries Covered		**Population Covered**	**Countries Covered**		**Population Covered**
	%	**Number**	**%**	**%**	**Number**	**%**
Sub–Saharan Africa	50	25	67	74	36	85
Near East/North Africa	35	7	55	85	17	94
South Asia	75	6	98	88	7	98
South East Asia	23	5	33	55	11	78
Middle America/Caribbean	83	10	95	85	11	95
South America	47	8	84	75	12	99
Across all regions	44	61	77	74	95	91

Figure 1 presents graphs of the available data for each country in each of the six regions. In the graphs, data from each country are tied together by lines so that specific countries can be distinguished. It can readily be seen that the variability in the trends across countries is much greater in the Sub–Saharan African region than in other regions. Further information can be found in *Annex 1,* where prevalence rates are presented for each country.

Trends in stunting over time for children under five years old were estimated for the period 1980 to 1995 for each of the six regions and for the regions combined. A few surveys that were available before 1980 were

also included in the analysis. The analytical method used was a generalization of linear regression that combined information on the trends for each country, assuming a straight–line relationship between stunting overtime. All the results presented in this chapter are from models that included the population of each country as weights, so that larger countries contributed more to the estimates for each region than did smaller countries. The methodology and data sources are described in *Annex 2.* Trends in the prevalence of stunting are reported as the absolute prevalence change in percentage points per year (i.e., not as the percentage change from initial value). Overall, stunting during the 1980 to 1995 period declined globally at the rate of 0.54 percentage points per year.

Table 2: Estimated Trends in Stunting for the Period 1980 to 1995 for Children Under Five Years Old by Region

Region	*Trend % Points per Year*	*S.E. for Trend*	*P–Value for Trend*
Sub–Saharan Africa	0.130	0.145	0.374
Near East/North Africa	–0.635	0.166	0.002
South Asia	–0.837	0.068	0.000
South East Asia	–0.903	0.118	0.000
Middle America/Caribbean	–0.259	0.190	0.188
South America	–0.807	0.089	0.000
Across all regions	–0.539	0.065	0.000

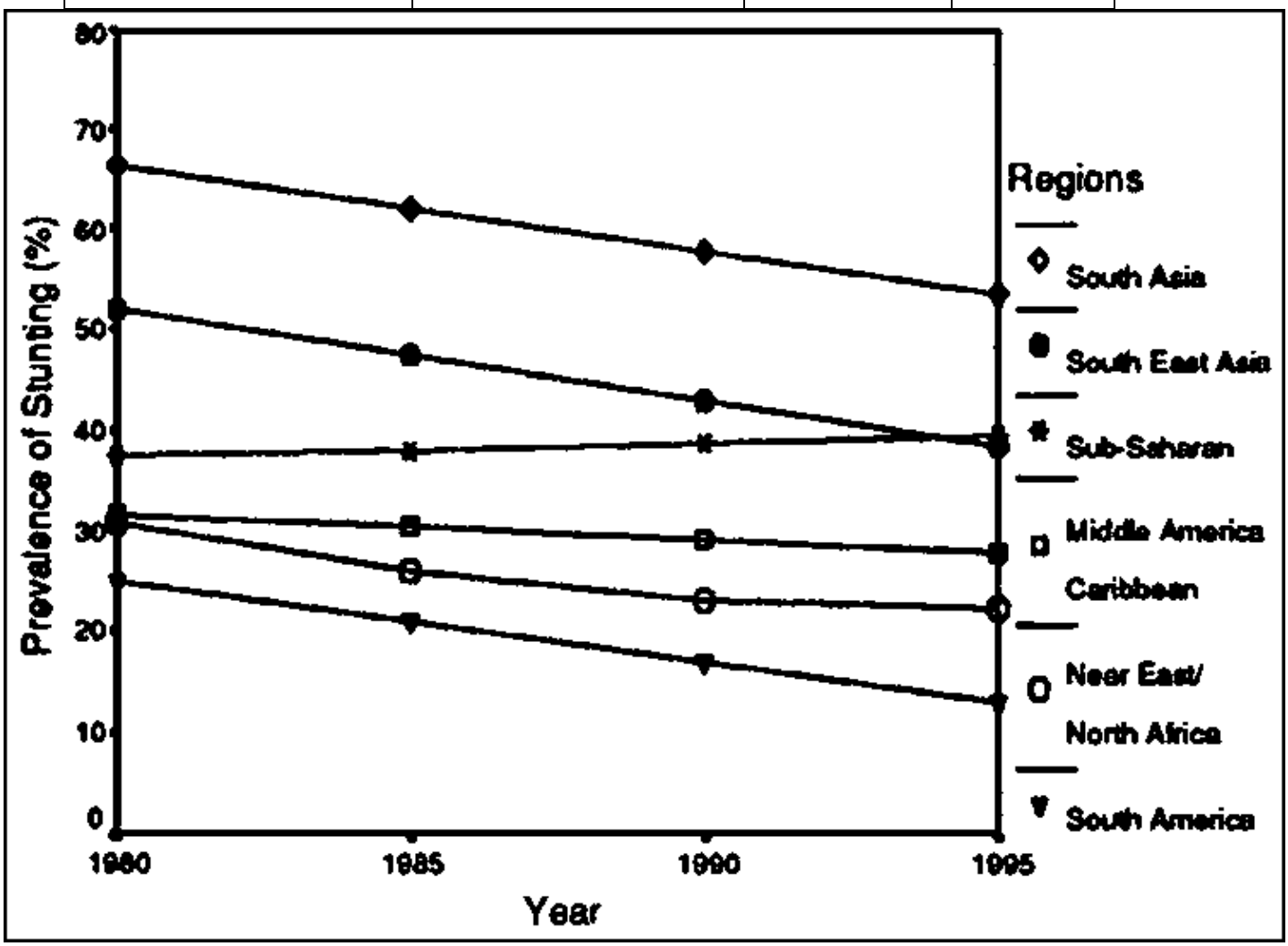


Figure 2: Trends in Prevalence of Stunting by Region

As shown in Table 2 and Figure 2, the trends in the prevalence of stunting differed by region. Sub–Saharan Africa had an increase in the average prevalence of stunting of 0.130 percentage points per year, whereas each of the other regions showed a statistically significant decrease in stunting, with trends ranging from –0.259 to –0.903 percentage points per year. South Asia, South East Asia and South America showed the greatest progress. Near East/North Africa showed substantial progress and Middle America/Caribbean showed modest progress. The trends for each of the regions were estimated with sufficient precision to be able to contrast these different trends with statistical confidence.

Table 3: Estimated Prevalence of Stunting (%) and Numbers of Children Affected for 1980, 1985, 1990 and 1995 by Region

Region	*Prevalence Stunting*				*Numbers Stunted (in millions)*				*% Increase (+) or Decrease (–) In Numbers from 1980 to 1995*
	1980	**1985**	**1990**	**1995**	**1980**	**1985**	**1990**	**1995**	
Sub–Saharan Africa	37.4	38.1	38.7	39.4	26.255	30.832	36.248	42.590	+62
Near East/North Africa	30.8	25.9	23.0	22.2	11.397	10.991	10.865	10.913	–4
South Asia	66.1	61.9	57.7	53.5	88.873	93.237	91.520	89.877	+1
South East Asia	51.9	47.3	42.8	38.3	35.581	32.862	30.119	30.206	–15
Middle America/Caribbean	31.6	30.4	29.1	27.8	5.398	5.467	5.631	5.626	+4
South America	25.0	21.0	16.9	12.9	8.285	7.309	5.965	4.644	–44
China (1992)			31.4				36.068		
Across all regions (excluding China)	48.8	45.6	42.5	39.9	175.789	180.698	180.348	183.856	+5

Note: These estimates were derived assuming a linear relationship between stunting and year. The only region for which there was evidence of a non–linear relationship was Near East/North Africa. For this region, a quadratic model was used to approximate the non–linear relationship. The estimated prevalence values for this region were from this model.

To determine if any of the regional trends were speeding up or slowing down, generalized regression models that allowed for curvature (i.e., changes in trends) were used. The only region for which there was evidence of a nonlinear relationship was Near East/North Africa. In this region, a quadratic model was used to approximate the non–linear relationship. From this model, the estimated trends (percentage points per year) for 1980, 1985, 1990 and 1995 were –1.206, –0.786, –0.366 and 0.054, respectively. This indicates more rapid progress early in this period and no progress at the end of this period in Near East/North Africa.

From the statistical models, the estimated prevalence of stunting was determined for each region and for the regions combined for each of four years: 1980, 1985, 1990 and 1995 (Table 3). In 1995, the overall prevalence of stunting across the six regions (excluding China) was 39.9%. South Asia had the highest prevalence (53.5%), followed by Sub–Saharan Africa (39.4%), South East Asia (38.3%), Middle America/Caribbean (27.8%), Near East/North Africa (22.2%) and South America (12.9%). No relationship was found between prevalence rate and rate of progress across regions.

The prevalence of stunting in China was 31.4% in 1992, the only national survey estimate for that country.

The numbers of children under five years old who were stunted during 1980 to 1995 were also estimated for the six regions and for the regions combined (Table 3). These estimates were derived using the prevalence

values of stunting and the total population under five of each region from the United Nations' estimates of 1996. Thus, the estimate of the numbers of children under five who were stunted for each region covered all countries in each region, including those countries that did not have a survey to contribute to the estimation of prevalence values. The combined number of children who were stunted in the six regions increased from 175.8 million in 1980 to 183.9 million in 1995. China's prevalence rate of 31.4% means that some 36 million children in China are stunted. The number of children affected in Sub−Saharan Africa increased from 26.3 to 42.6 million, an increase of 62%.

In this region, both the prevalence of stunting and the population of children under five years old increased. In the other regions, population size increased while the prevalence of stunting decreased. This resulted in either a decrease or no change in the number of stunted children.

Trends in stunting and underweight move in parallel

Weight−for−age is commonly used as an indicator for malnutrition because weight is easier to measure than height. Weight−for−age reflects linear growth and weight accumulation achieved pre− and post−natally over a long term as well as weight accumulation in the short term. Low weight−for−age may reflect either normal variation in growth or a deficit in growth. Underweight is usually defined as weight <−2 SD below that expected on the basis of the international growth reference. The prevalence of underweight in developing countries is 31%, ranging from 6.5% in South America to around 50% in South Asia (WHO, 1997, p.38). Thus, both stunting and underweight are most prevalent among South Asian children.

Trends in the prevalence of underweight, as reported in the *Update 1996,* are similar to those for stunting. Sub−Saharan Africa had an increase in the prevalence of underweight from 1985 to 1995, just as it did for stunting (Table 3). Other regions had decreasing trends in the prevalence of both underweight and stunting. Stunting is more prevalent than underweight in all regions. The prevalence of stunting is, on average, 11.5 percentage points[1] higher than the prevalence of underweight. This can be explained by the fact that children who are stunted in early life may attain normal weight later on but remain short.

[1] *The regression line for the relationship between stunting and underweight is: stunting prevalence = 11.5 + (0.889) × (underweight prev)*

Concepts and indicators

Malnutrition 'results from the interaction between poor diet and disease and leads to most of the anthropometric deficits observed among children in the world's less developed countries' (WHO, 1995a). The conceptual frame work developed by UNICEF and reproduced here on page 79 summarizes current thinking that the immediate causes of malnutrition are poor diet and disease. Poor diet and disease result from the underlying causes of food insecurity, inadequate maternal and child care, and poor health services and environment. The basic causes are social structures and institutions, political systems and ideology, economic distribution, and potential resources.

Height−for−age is one of three anthropometric indices commonly used as an indicator for malnutrition. A deficit in height−for−age does not establish the specific processes that lead a particular child or a group of children to be malnourished. Height−for−age reflects linear growth achieved pre− and post−natally, and its deficits indicate long−term, cumulative effects of inadequacies of health, diet, or care. For children up to about two years of age, height is measured by recumbent length. For older children, height is measured by stature while standing.

Shortness in height refers to a child having low height−forage. Shortness may reflect either normal variation in growth or a deficit in growth. Stunting refers to shortness that is a deficit, i.e., linear growth that failed to reach genetic potential as a result of suboptimal health or nutrition conditions. Beaton et al, (1990) have argued that stunting is a population proxy for multifaceted deprivations. Recent research has found that linear bone growth occurs in an episodic or saltatory process such that a stasis period of one or more days of no growth is punctuated by a daily saltation of growth (Lampl et al., 1992). This research suggests that stunting must result from a decreased frequency of growth events, a decreased amplitude of growth when an event occurs, or both.

Stunting is defined as height <−2 SD below that expected on the basis of the international growth reference. National prevalences of stunting in developing countries range up to 64.2% (WHO, 1997, p.18). There are often large disparities within countries. For example, in Mozambique, 34.0% of children in Maputo province and 74.0% in Zambezia province were stunted according to a national survey done in 1995. Where the prevalence of stunting is high, it can be assumed that most short children are stunted because of environmental reasons. It also follows that where stunting rates are high, the majority of children (and not only those below the traditional cut−off point) are not reaching their growth potential. The process that leads to stunting is thought to occur pre−natally and post−natally, primarily during the first two to three years of life. The cause of stunting probably varies in different settings depending on which nutrient (or nutrients) may be limited and the frequency of infection. Protein as well as energy, zinc and iron have been implicated, as has prolonged infection (Allen, 1994).

The prevalence of stunting has several uses in populations of children under five years of age:

? to identify the most vulnerable areas to target nutrition, health, social and economic interventions;

? to determine priorities for allocation of resources;

? to assess response to interventions in order to make decisions about effectiveness, improvement, discontinuation and modification;

? to promote the survival of children at nutrition risk through appropriate interventions (WHO, 1995).

Consequences of stunting

Malnutrition is an important problem on its own firstly because good nutrition is an essential determinant for well−being, secondly, because good nutrition is a fundamental right (Jonsson, 1996), and thirdly because of the consequences associated with malnutrition. The consequences of malnutrition as indicated by anthropometry include childhood morbidity and mortality, poor physical and mental development and school performance, and reduced adult size and capacity for physical work (WHO, 1995a).

Malnutrition potentiates the effects of infection (Pelletier et al., 1993). Malnourished children have more severe diarrhoeal episodes as measured by duration, risk of dehydration or hospital admission, and associated growth faltering. They also have a higher risk of pneumonia. Exposure to pathogens in the environment can affect the growth of children through several mechanisms. One is the reduction of food intake and poor use of ingested nutrients. In addition, the body has an inflammatory response to many infections. Inflammation may reduce the length of bones because of systemic and local disturbances of normal growth (Sherry, 1994). An unsanitary environment may have broader effects on children than just those associated with particular bouts of overt illness. Children living in poor conditions are constantly exposed to pathogens that cause persistent tow−level challenge to their immune systems. Children who are not apparently infected, that is, who show no clinical illness, may nonetheless have an immunological response that diverts specific nutrients from normal growth and thus restricts length gain (UNICEF, 1997, p. 26).

Malnourished children have a high mortality rate in early life. Those with severe malnutrition are most likely to die. However, because only a small percentage are severely malnourished, most deaths from malnutrition occur among children with mild−to−moderate malnutrition (Pelletier et al., 1993). Malnutrition acts synergistically with disease by increasing case−fatality rates. Stunting is associated with impaired mental development and poor school performance. This association is not a simple causal one because complex environmental, social and economic factors affect both physical growth and mental development (see Box 1).

Stunting in childhood leads to reduced adult size and reduced work capacity. This in turn has an impact on economic productivity at the national level (WHO, 1995a, p. 180). Women of short stature are at greater risk of obstetric complications because of smaller pelvic size. Small women have a greater risk of delivering an infant with low birth weight. This leads to an intergenerational effect since tow−birth−weight infants tend to attain smaller size as adults. As presented later in this chapter, those countries with high rates of stunting also have high rates of low birth weight.

Born malnourished

Stunting is a cumulative process that can begin *in utero* and continue to about three years after birth. Low−birth−weight (LBW, defined as <2500 g at birth) is an important indicator of foetal/intrauterine nutrition and a strong predictor of subsequent growth and well−being. A recent analysis using data from the WHO Database on Low Birth Weight has quantified the magnitude and described the geographical distribution of this problem for the first time (de Onis et al., 1997). Whereas rates of LBW in industrialized countries are in the range of 6% to 8%, in developing countries LBW is much more common: in South Asia 33%, in Sub−Saharan Africa 16%. In least developed countries, 23% of babies are born with LBW. These average national figures mask enormous variation within countries. In India, for example, rates range from about 10% amongst privileged high−income families to 56% in poor urban slums (UNICEF, 1997a, p. 25). LBW is common in countries with prevalent stunting (Figure 3).

Box 1: Stunting and Mental Development

(extracted from a short paper prepared by SM Grantham−McGregor and LC Fernald for the ACC/SCN's Commission on the Nutrition Challenges of the 21st Century. December, 1997)

Stunting in poor populations is usually associated with poor mental development. However, the many socio−cultural and economic disadvantages that coexist with stunting (Martorell et al., 1988) may also detrimentally affect mental development. This makes it difficult to determine whether the poor development of stunted children is due to nutrition deficiency or whether stunting is just an indicator of poverty. Thus, it is important to control for social background as much as possible in study design and statistical analysis.

Most cross−sectional studies have found significant associations between height−forage and children's cognitive development in preschool and school−age children. Even after controlling for socio−economic conditions, investigators have found significant associations between height−for−age and IQ, cognitive function and school achievement levels in school−age children in many countries. Significant associations have also been found between stunting and poor psychomotor development, fine motor skills and neuro−sensory integration. In populations with high levels of stunting, height in early childhood also predicts IQ at school age. Stunted children's cognitive function is more likely to be detrimentally affected by short−term hunger than non−stunted children (Simeon and Grantham−McGregor, 1989).

The only supplementation study aimed specifically at stunted children was conducted with stunted and non−stunted Jamaican children aged nine to 24 months (Grantham−McGregor et al., 1991). The stunted children received nutritional supplementation for two years with or without psychosocial stimulation. Supplementation and stimulation produced independent benefits to the children's mental and motor development. The benefits from a combination of supplementation and stimulation were additive, and only the children receiving both treatments caught up to the non−stunted control group in development levels. The implications of these findings are that at least part of the deficit in the development of stunted children is due to poor nutrition. However, both stimulation and supplementation are necessary to improve the development of stunted children to culturally appropriate levels.

The precise mechanism linking stunting to poor mental development is unknown. It is possible that the mechanism varies according to which nutrients are deficient, or that several mechanisms could act together. One possibility is that undernutrition causes poor motor development and apathy which in turn reduce a child's ability for environmental exploration and skill acquisition (Levitsky, 1979). Reduced activity has been described in iron, zinc and energy deficiencies. Another possible mechanism is that the children's small size could lead adults to treat them like younger children and not provide age−appropriate stimulation. Undernutrition could have a direct effect on children's central nervous system. Stunted children have smaller heads than non−stunted children, and in one study, head size in early childhood was a stronger predictor of IQ at seven years of age than other previous or current anthropometric measures (Grantham−McGregor et al., 1997). A more speculative explanation is that raised anxiety levels, as evidenced by heightened cortisol, could contribute to poor cognition and behaviour.

Total low−birth−weight figures combine term and pre−term births. In most developing countries, most low−birth−weight infants are full−term, but have intrauterine growth retardation (IUGR). IUGR is a major clinical and public health problem in developing counties. It is defined as a deficit in weight of the foetus relative to that expected for gestational age. IUGR is an important cause of stunting, because small foetal size leads to LBW, which in turn is highly related to small postnatal size.

'IUGR contributes to closing the intergenerational cycle of poverty, disease and malnutrition'

(de Onis et al., 1997)

Figure 3 shows that LBW is very common in countries with prevalent stunting. The relationship between these two indicators has been analyzed empirically by Osmani (1997). He concluded that the very high prevalence of LBW lies behind the high rate of undernutrition in South Asia.

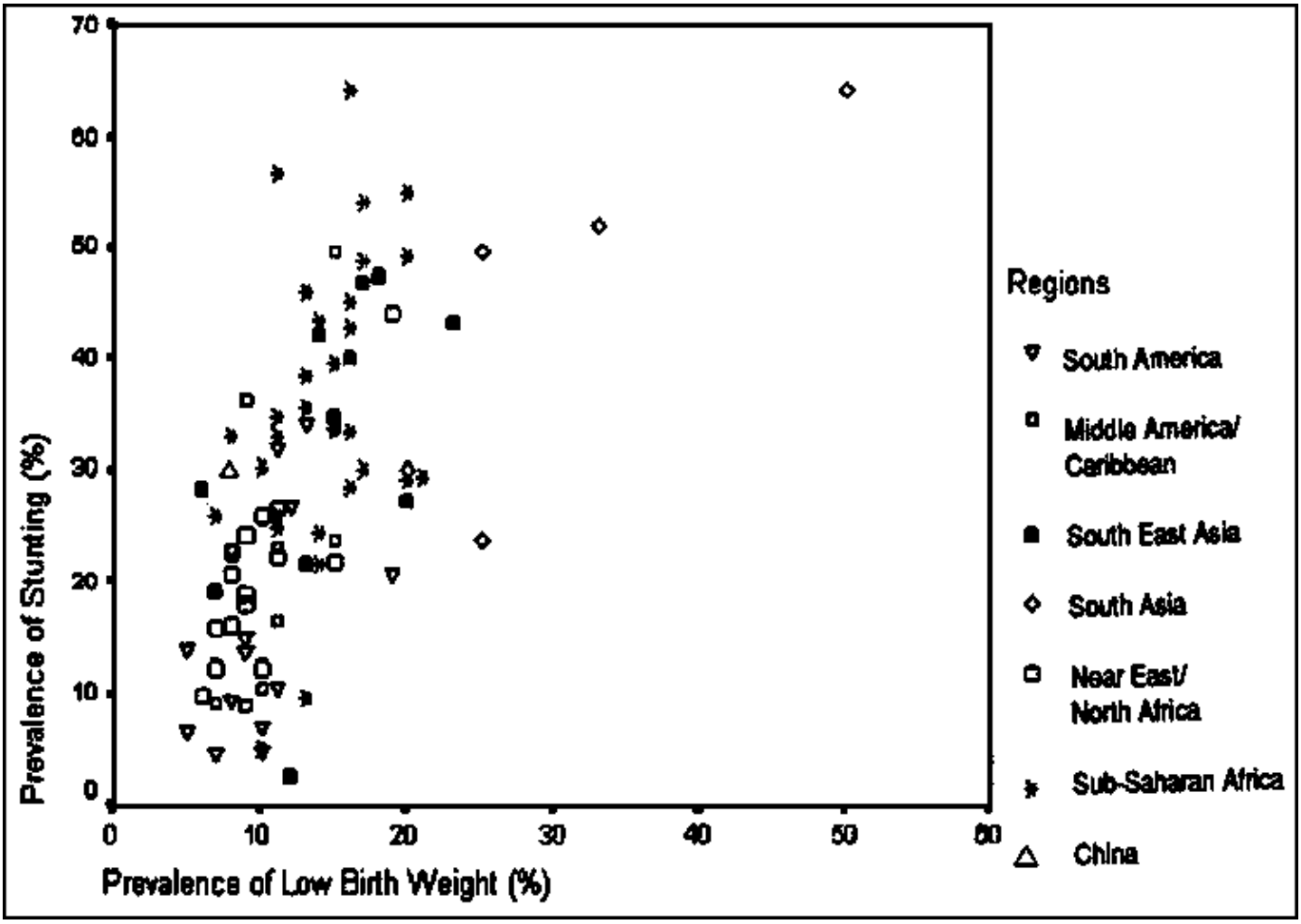


Figure 3: Prevalence of Low Birth Weight (LBW) and Stunting

In many countries, these high rates of impaired foetal growth exceed the recommended levels for triggering public health action. IUGR in excess of 20% has been recommended by WHO as the cut–off; in the absence of information on gestational age, a prevalence of >15% LBW may be used. Population–wide interventions are needed in these countries. A recent review of randomized controlled studies evaluated the effectiveness of interventions to prevent or treat impaired foetal growth (Gülmezoglu et al., 1997). Interventions likely to be beneficial include balanced protein/energy supplementation where diets are deficient, smoking cessation and anti–malarial chemoprophylaxis in primigravidae. Zinc, folate and magnesium supplementation during gestation were flagged as meriting further research. The same authors emphasize that appropriate combinations of interventions should also be evaluated (de Onis et al., 1997a). Research in the Gambia showed that low birth weight can be reduced by about 40% and infant mortality by 50% through improved food intake during pregnancy (Ceesay et al., 1997).

The issue of age

Susceptibility to poor linear growth changes as the young child ages. The velocity of linear growth is highest during the first months of life, hence this is a period of particularly increased susceptibility. Exclusively breastfed infants are protected against early post–natal stunting (WHO, 1995). Consequently, for most infants

in the developing world, the post–natal period that is most susceptible to poor linear growth is after 3–6 months and up to 24–36 months. After this time, it is thought that poor conditions have less of an effect on linear growth because growth velocity is much lower.

This age differential in the susceptibility to poor linear growth after birth has important implications for assessment and monitoring. Children aged from birth to 59 months do not form a homogenous group. Prevalence estimates are affected by the distribution of ages included in the survey. Prevalence estimates may be higher if older children are included than if they are not, and may be tower if infants from birth to three months are included than if they are not. This implies that separate estimates of the prevalence of stunting should be made for younger (i.e., birth to 24 months) and older children for the purposes of describing trends over time. This issue is discussed further in *Annex 3.* For this Report there were insufficient data to estimate trends in stunting or regional prevalences by age group.

There is now convincing evidence (as reviewed by Scrimshaw, 1997) that foetal malnutrition lays the foundation for adult chronic disease. This has enormous consequences for policy–setting in countries where LBW is a public health problem.

The pre–pregnancy determinants of LBW, as well as adequate nutrition throughout pregnancy, require priority attention.

Understanding regional differences in stunting

Table 4 summarizes the numbers of countries by region showing increasing or decreasing trends in stunting over the period 1980–1995. There were 61 countries with more than one survey; stunting decreased in 43 of these over the period 1980–1995. Stunting increased in 18 countries. This section discusses factors associated with the prevalence and trends in stunting for the six regions. Further information about the regions can be found in *Update on the Nutrition Situation, 1996* (ACC/SCN 1996), the *Human Development Report 1997* (UNDP, 1997) and *Malnutrition in South Asia: A Regional Profile* (UNICEF, 1997a).

Table 4: Numbers of Countries with more than one Survey in each Region Showing Increasing or Decreasing Trends

Region	*Number of Countries Decreasing*	*Number of Countries Increasing*
Sub–Saharan Africa	13	12
Near East/North Africa	5	2
South Asia	6	0
South East Asia	4	1
Middle America/Caribbean	8	2
South America	7	1
Total	43	18

Sub–Saharan Africa

The trend in Sub–Saharan Africa for stunting is very disturbing. For the region as a whole, no progress has been made in reducing the prevalence of child malnutrition over the past 15 years, and there is some indication that the prevalence has increased. Because of population growth, the number of children who are stunted has been increasing substantially. Two countries, Nigeria and Ethiopia, accounted for about half (52%) of the stunted children in this region in 1995.

There are important differences amongst African countries. Trends defined two broad groups of countries: those that improved over time and those that worsened over time. Of the 25 countries with more than one survey in this region (noted in *Annex 1*), rates of stunting are on the decline in about half. These 13 countries had an estimated prevalence of stunting in 1995 of 35.2% (equivalent to over 15 million children), with the trend in stunting prevalence decreasing on average by 0.442 percentage points per year ($p<0.0001$). Countries achieving the highest rates of decline included Nigeria and Zimbabwe. For those Sub–Saharan

African countries where stunting is increasing, the estimated prevalence in 1995 was 48.3% (equivalent to over 11 million children). The rate of increase for this group was on average 0.837 percentage points per year ($p<0.0004$). Countries in this group included Ethiopia and Madagascar.

Sub−Saharan Africa has been characterized by falling gross national product per capita. Contributors to this fall in economic resources have been drought, civil wars and political instability, world−wide recession, falling commodity prices and weaknesses in structural adjustment programmes. Although stunting is not restricted to drought−prone areas in Sub−Saharan Africa (Pelletier et al., 1995), seasonality is an issue in this region. LBW is less prevalent in Sub−Saharan Africa than in South Asia. However, LBW increases when food is short and the demands for agricultural labour are high. Debt service requirements reduce available external resources, limiting national expenditures for social services. Furthermore, the poverty rate is about 40% in this region, and poverty is increasing. Only about one−third of rural Africans have access to safe water and adequate sanitation. Immunization rates are still far below target levels in many countries; the proportion of fully immunized children is just over half (56%) in Sub−Saharan Africa as a whole. Illiteracy is still high amongst African women, especially in rural areas. The fertility rate is the highest of any region, but is declining and is now just below 6.0 births per woman.

Near East/North Africa

The trend in Near East/North Africa shows a decrease early in the period, but no progress at the end of the period. The number of children who are stunted had been decreasing, but then did not change between 1990 and 1995. Nevertheless, this region now has the second lowest prevalence of stunting (22.2%) among the six regions. Three countries, Egypt, Iran and Turkey, accounted for about half (51%) of the stunted children in this region in 1995.

As in Sub−Saharan Africa, country trends in the prevalence of stunting in this region were highly variable. Of the seven countries with more than one survey in this region, two had increased (Algeria and Turkey) and five had decreased prevalence of stunting over the period.

Near East/North Africa had a GNP per capita of US$ 1710 (1995) with a negative rate of growth during 1980−91. Economies vary greatly in this region, and oil prices have great influence on the economies. Other factors influencing economic growth are civil wars and political instability, worldwide recession, economic sanctions and, at least in the short term, structural adjustment programmes. The poverty rate in this region is low. Access to safe water is over 80% and immunization coverage is over 85%. Dietary energy supply is very high in this region. Although overall literacy rates continue to improve, there are still significant gender differences (in 1995, 70% for males and 47% for females). The fertility rate stands now at 4.5 births per woman.

Box 2 presents a perspective on stunting in Central Asia and the Caucasus.

South Asia

South Asia showed the second highest improvement in the prevalence of stunting among the six regions, with a decline of 0.84 percentage point per year. However, this region has by far the highest prevalence of stunting among the six regions at 53.5% in 1995. Two countries, India with 68.2 million and Pakistan with 11.4 million, together accounted for 88% of the stunted children in this region in 1995. All of the six countries with more than one survey in this region had decreased prevalence of stunting over the period.

South Asia has been characterized by a slowly rising gross national product per capita. However the poverty rate is high; some 47% of the population live on <$1 per day. South Asia has about two−fifths of the income−poor of the developing world. Access to safe water is, on average, quite high at around 80%. However, poor hygiene and sanitation, linked with overcrowding, are important determinants of stunting in South Asia. Immunization coverage is 77% for the region as a whole, but significantly lower for Nepal at 45%. Dietary energy supply (now over 2200 kcals/person/day) and access to health services have improved at the national level, but, there are very high rates of underweight among women, poor weight gain during pregnancy, and associated LBW. Bangladesh, India and Pakistan have the highest rates of LBW in the world (50%, 33% and 25% respectively). Poor child feeding practices or poor child care also require priority attention.

The primary school enrolment ratio for girls is still under two−thirds (63%). The fertility rate has decreased slowly from 4.3 to 3.5 in the last five years. The low status of women and the quality of care offered to women and children in this region are matters of serious concern to nutrition (ul Haq, 1997; Ramalingaswami et al.,

1996 and Osmani, 1997).

Box 2: Stunting in Central Asia and the Caucasus

Prepared for the ACC/SCN by H. Peimani

In its 1998 State of the World's Children Report, UNICEF called attention to the rising rate of stunting amongst Russian children. In fact, stunting is widespread in many countries of the former Soviet Union, and gives cause for concern.

Central Asia comprises five new states with a combined preschool child population of about 7 million. Kazakhstan and Uzbekistan are the two most populous and industrialized Central Asian states, with GNP per capita of US$ 1330 and US$ 970, respectively. A national survey in Kazakhstan in 1995 reported that 15.8% of preschool children were stunted. Disparities within the country were significant. Rates range from 7% in the northern districts along the Russia border – where the population is mainly of Russian origin – to 22.7% in the south where incomes are lower and the population is mainly ethnic Kazakh. Uzbekistan reported in 1996 a national prevalence rate of 31.3% in children up to three years of age. One severely affected district reported 20.3% <–3 SD and 39.8% <–2 SD. In the capital city, Tashkent, more than one in five children is stunted.

Tajikistan is Persian–speaking, mainly agrarian and very poor with a per capita GNP of US$ 340 in 1995. A 1996 survey showed that stunting affects the majority of young children in some districts: 51.3% in Aini and 53.9% in Varzob. There is no national prevalence rate for the country. Tajikistan has experienced a civil war (now over), which has damaged the existing infrastructure and agricultural resources. Only 60% of the population have access to safe water, and only 49% in the rural area. Its neighbour to the south, Afghanistan has even higher stunting rates in some provinces: 66% in three provinces surveyed in 1995.

Prevalence rates of stunting in preschool children in the Caucasus are: 11.9% in Armenia (1993) and 22.2% in Azerbaijan (1996). Internally displaced children in Azerbaijan are markedly worse off, with a prevalence rate of 30.5%. The civil war in Azerbaijan and the ten–year conflict between Armenia and Azerbaijan have damaged ailing infrastructures. Destruction of farms and other food–producing centres during military engagements have reduced the production and availability of food and sharply increased food prices. Unemployment is very high in these two countries.

The break–up of the Soviet Union into 15 independent states did not remove the problems of the centrally–controlled economy. Transition from the old system to a type of free–enterprise economy has resulted in a severe short–term fall in living standards. These countries have seen significant reductions in industrial and agricultural production, rising unemployment and underemployment, low wages, shortages of food, poor distribution networks, high prices and partial or total removal of government subsidies. Access to health care has declined due to reduced funding, closures and cutbacks.

South East Asia

South East Asia showed the sharpest improvement in the prevalence of stunting among the six regions, with a decline of 0.90 percentage points per year. Given the dramatic decline in poverty in this region, one might expect a lower overall prevalence of stunting (38.3% in 1995). Two countries, Indonesia with 9.2 million and Viet Nam with 4.7 million, together accounted for slightly less than half (46%) of the stunted children in this region in 1995. Four of the five countries with more than one survey in this region had decreased prevalence of stunting over the period. The region will be influenced significantly by future trends in Indonesia, which has the largest child population in this region and for which there is only one survey now. The prevalence rate in Indonesia was 42.2% in 1995.

South East Asia has had rapid economic expansion, as seen in quickly rising gross national product per capita, especially until 1992. The poverty rate is about 14%, substantially less than in South Asia and Sub–Saharan Africa. This region's current financial crisis resulting in widespread unemployment will have a negative impact on child nutrition unless social safety nets are in place. Access to safe water is around two–thirds, but access to sanitation is low (35%), especially in the rural areas (18%). Total fertility rates are nearly down to two births per woman. Immunization coverage exceeds 90%.

Middle America/Caribbean

Of the five regions that had improvements in the prevalence of stunting, Middle America/Caribbean had the least improvement, with a reduction of only 0.26 percentage points per year. There was no change in the number of stunted children over the period. Mexico with 3.9 million accounted for two–thirds of the stunted children in this region in 1995. Eight of the ten countries with more than one survey in this region had decreased prevalence of stunting over the period. In Guatemala, the national rate of stunting is very high at about 48%. This rate stands in stark contrast to that of Costa Rica (1.6%) and Panama (5.7%).

Middle America/Caribbean has had rapid economic expansion, as seen in quickly rising gross national product per capita, especially since 1988. However, poverty is rising in spite of overall economic growth. Immunization coverage improved substantially and reached 75% in Mexico, 78% in the Dominican Republic and Nicaragua.

Dietary energy supply was relatively high and remained constant. Female education increased slowly, while the fertility rate (about three births per woman) has been decreasing slowly.

South America

South America showed a reduction of 0.81 percentage points per year. By the end of the period this region had the smallest number of stunted children among the six regions. Brazil with 1.9 million accounted for 41% of the stunted children in this region in 1995. Seven of the eight countries with more than one survey in this region had decreased prevalence of stunting over the period, while Venezuela had an increase. Several countries in this region have significantly high rates of obesity among children.

South America has had rapid economic expansion, as seen in quickly rising gross national products per capita. The poverty rate in Latin America as a whole is 24%, but income maldistribution persists in spite of overall economic growth. Access to safe water and access to health care services remain high. Immunization coverage has improved and is relatively high. Dietary energy supply was relatively high and has remained constant. Female education has increased substantially, while the fertility rate (about three births per woman) has been decreasing slowly.

China

The prevalence of stunting in China in 1992 was 31.4%. This rate translates into some 36 million Chinese children who are stunted. The national trend in China could not be examined because there is only one national survey available. Beaton (1993, p. 39) documented a strong decreasing secular trend in stunting in China between 1975 and 1985. The trend in the prevalence of underweight was about –0.8 percentage points per year from 1985 to 1995 (ACC/SCN, 1996). China has achieved huge reductions in human poverty and rapid economic growth, although some of these faltered in the late 1980s. Dietary energy supply is relatively high and increasing. Access to safe water in rural areas is still low (56%) and access to adequate sanitation is very low (7%). On the other hand, immunization coverage is nearly universal (97%). About half of girls are enrolled in secondary education, and the proportion is increasing. The total fertility rate has fallen to below two children born per woman.

Further considerations

This chapter has examined both the prevalence of stunting from a cross–sectional perspective and the trends in the prevalence of stunting from a longitudinal perspective. A recent cross–sectional study found that about three–quarters of the variability in national prevalence of stunting could be explained by national and regional factors (Frongillo et al, 1997). The study shows that higher food availability, female literacy and gross product were the most important national factors associated with lower prevalence of stunting. Regional differences persisted, even after accounting for national factors. Social and human development factors were important even after accounting for economic factors.

There is substantial variability among countries in the prevalence of stunting; there is also substantial variation within countries. Most stunting is found in the poorest regions of a country, so those with reasonably good economic and social statistics on average can have high rates of stunting if there is substantial inequity across the country. Mexico is just one example of a country that has undertaken substantial economic changes, resulting in important benefits for some and costs for many others (UNDP, 1997). As a result, Mexico has a higher prevalence of stunting than would be expected on the basis of its average national statistics (Frongillo et al., 1997).

A recent synthesis of eleven detailed country studies in *How Nutrition Improves* (1996) suggested some explanations for how improvements in child malnutrition occur. Economic development is positively related to nutritional improvement, and equitable growth strategies seem to be better for reducing poverty and improving nutrition than compensatory poverty alleviation programmes. Economic growth is important, but nutritional improvements can move in advance of that growth. Investments in health and education (particularly of women) can help to improve nutrition if the investments reach the malnourished, are of good quality and are well–distributed. Policies encouraging community–based programmes accelerate improvement. Box 3 illustrates that significant reductions in child stunting rates will take at least two to four years. The impact of this improvement on educational achievement and economic growth may take decades before it becomes evident.

Conclusions

This examination of stunting shows that the six regions of the developing world have very different prevalences of stunting, and that the regions have progressed quite differently since 1980. South Asia has the highest prevalence of stunting but, with South East Asia and South America, has had the fastest rate of decrease in stunting. Sub–Saharan Africa as a whole has made no progress in reducing the prevalence of stunting and has, in fact, a higher prevalence of stunting in 1995 than in 1980.

During the 1980 to 1995 period, the trends for improvement or deterioration in stunting have been stable; that is, there is no evidence for a change in the rates of progress. The only exception is Near East/North Africa which shows a slowdown in progress of reducing stunting over the period.

The patterns of stunting across the regions reported here and the patterns of underweight reported in *Update on the Nutrition Situation, 1996* are very much the same for both the prevalence and trends in the prevalence. The prevalence of stunting is uniformly higher than the prevalence of underweight. Stunting is a cumulative process of poor growth that primarily occurs before the age of three years and is not easily reversed. In contrast, underweight reflects a cumulative process of poor growth modified by the effects of periods when the older preschool child may have access to more food that results in weight gain. Thus, for purposes of differentiating regions and countries, stunting is a better indicator for quantifying the number of children who suffer the consequences of poor conditions for young children than is underweight. Stunting is a stricter standard because it is most sensitive for determining malnutrition in countries and because it separates early poor nutrition from later excess relative weight. However, both stunting and underweight equally capture regional differences in prevalence and trends in prevalence.

The pattern of child malnutrition across the regions is paralleled by patterns of underweight in adults. Data compiled by the WHO Programme of Nutrition show that the percentage of adults who are underweight in Africa, Asia and Latin America are 5.1, 9.4 and 3.8, respectively (Bailey, personal communication). Underweight was assessed by the percentage of adults with body mass index (BMI – weight in kg divided by height in meters squared) less than 17. Thus, Asia has by far the highest prevalence of adult underweight, just as it does for child stunting and underweight.

Box 3: Reducing child stunting in the best circumstances

Prepared for the ACC/SCN by S Morris and M Ruel, IFPRI

A simulation exercise was carried out to estimate the rate of response of different age groups to a hypothetical improvement in general conditions. A hypothetical data set with 100 children per age group (six–month intervals) was generated, with a pattern of height–for–age Z–scores that is typical for children growing up in developing countries. Average length–for–age at birth is close to zero (corresponding to the 50th percentile of the WHO/NCHS reference). Height–for–age Z–score at six months was set at approximately –0.5, and decreases to reach –1 at about 12 months and –2 at about 30 months of age. The mean height–for–age Z–score stabilizes at this low value thereafter.

The simulation examined how long it would take for stunting to be appreciably reduced amongst these children if sustained improvements were to be achieved over a five–year period, such that all children would grow at the expected velocity for their age (median of growth velocity references). The figure below shows the patterns of growth of this cohort over five years, expressed in mean height–for–age Z–scores. The intention was not to simulate a short–term achievable goal, but rather to illustrate what can be expected in terms of rate of response, under the very best circumstances. It does not take into account factors such as poor foetal growth or maternal malnutrition which may limit children's post–natal

growth potential and prevent them from growing at the reference median.

Children younger than 24 months of age responded much more rapidly to the improvement than older children. This is because of the high rate of growth in young infants. In year one after the intervention, the mean height–for–age Z–sco of 0–24 month old children was between –0.77 to –0.16 (Figure 4). The prevalence of stunted children dropped from 12.5% to 1.3% among this age group (not shown). This can be compared with a mean Z–score as low as –1.94 amon 24–60 month old children in year 1 after the intervention. The prevalence of stunting among children 42 months and o is not improved even after one year of optimal growth velocity. This is because the expected growth rates at this age a much slower than at younger ages. It took four years of sustained improved growth for stunting to finally be eliminated among the older age groups, and five years for the whole growth curve to be at or above the reference throughout the age range.

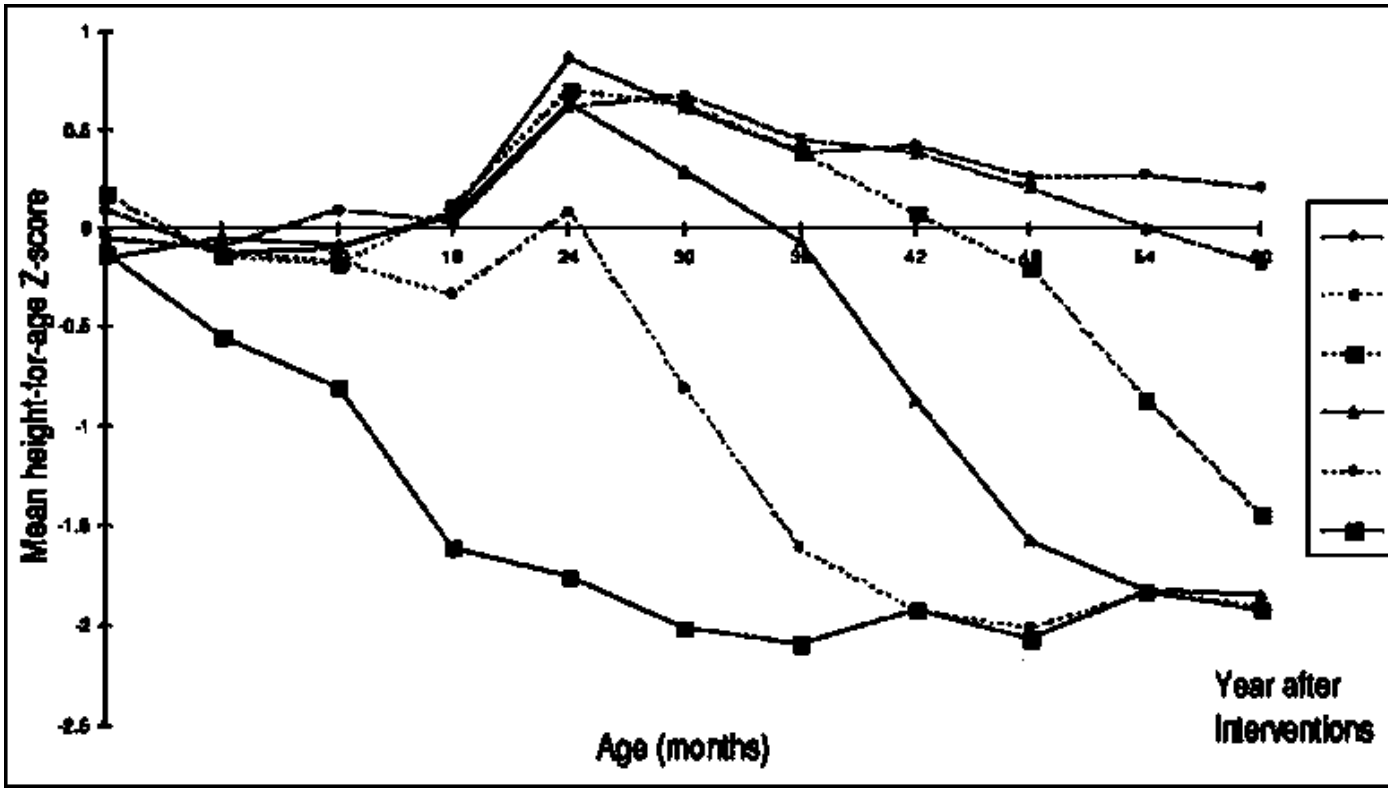


Figure 4: Mean height–for–age Z–score by age and year following improvement in age–specific growth rates NCHS median levels, simulated dataset

The results reported here are consistent with those compiled by de Onis and Blössner and published recently by WHO (1997). The data used for both reports were essentially the same, but different analytical methods and regional classifications were used. The analytical method used for the examination of stunting in this chapter was chosen as the best for the estimation of the trends in the prevalence of stunting. The fact that different analytical methods yielded the same global picture of stunting increases confidence in the findings.

WHO has proposed that the goal for reducing stunting be:

> ***'the prevalence of stunted children in any country (and within specific subgroups) should be less than 20% by the year 2020...'***
>
> ***(WHO, 1998)***

Of 61 countries with trend data on stunting, only about 16 – barely a quarter – meet the target now, i.e. have a prevalence rate of around 20% or less. If past positive trends continue, only some nine additional countries might achieve the goal by 2010 and possibly one–half of these 61 countries would have prevalence rates below 20% by 2020. Yet countries as diverse as Brazil, Chile, Colombia, Costa Rica, Jamaica, Oman, Panama, Sri Lanka, Tunisia and Zimbabwe appear to have made good progress.

To reduce malnutrition rapidly requires focused and systematic action in the areas of health, food security, and child and maternal care. Access to education, health care and safe water, protection from illness and ensuring adequate micronutrient intakes are key elements, together with some system for community follow–up and support of severely and moderately malnourished children.

To have these elements in place is not easy, but when they are, experience shows that rates of malnutrition can be reduced rapidly. This was shown in Oman, Thailand, Uruguay, Viet Nam, and Zimbabwe. Rapid reduction of malnutrition is possible, and is urgently needed. This should be a specific component of all anti–poverty efforts.

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Chapter 2: Micronutrients

INTRODUCTION

This chapter presents new information on trends in micronutrient deficiencies. Since the publication of the Second *Report on the World Nutrition Situation* in 1992, great strides have been taken globally to implement a strategy of universal salt iodization, resulting in significant reductions in iodine deficiency disorders in all regions. One of the most dramatic effects of this global programme is protection from mental impairment for millions of new–borns who now have access to effectively iodized salt. Clinical vitamin A deficiency, resulting in blindness, is also on the decline, a most welcome trend. Iron deficiency anaemia, a problem in almost all countries, including industrialized countries, is finally receiving increased attention. Iron fortification

programmes are getting off the ground in many countries, and preventive iron supplementation is receiving increased policy attention. Short sections on folic acid and zinc deficiency are included. Zinc deficiency may be an important determinant of maternal mortality in African women, and of childhood stunting. The chapter concludes with information on calcium and its purported relationship to osteoporosis.

Iodine Deficiency Disorders

Introduction

Iodine is required for the synthesis of thyroid hormones which in turn are needed for the regulation of metabolic activities of all cells throughout the life cycle. They are also required to ensure normal growth, especially of the brain, which occurs from foetal life to the end of the third postnatal year. Consequently, if severe enough, iodine deficiency will impair thyroid function, resulting in a lower metabolic rate, growth retardation and brain damage. The long−term consequence is irreversible mental retardation.

Iodine deficiency is the most prevalent cause of preventable mental retardation in the world (reviewed by Delange, 1994).

Reconceptualizing the Problem

Up to the early 1980s, goitre was considered the single and almost exclusively cosmetic consequence of iodine deficiency. Endemic goitre was seen as an exotic disorder affecting populations in developing countries especially those living in isolated subsistence economies. The concept was then developed by Dr Basil Hetzel and others that goitre was only the tip of the iceberg and that the consequences of iodine deficiency were much broader, including physical and mental retardation, increased perinatal mortality and other defects. From about 1983, these various effects have been grouped and referred to as iodine deficiency disorders or IDD (Hetzel, 1983). To date, IDD is still poorly recognized by the medical profession in many countries and is given short shrift in some of the major textbooks on paediatric nutrition.

Due to the coordinated efforts of a series of international organizations, including the International Council for Control of Iodine Deficiency Disorders (ICCIDD), the importance of IDD is now better recognized internationally. The sustainable elimination of IDD by the year 2000 was accepted as one of the priorities in the field of nutrition by the WHO and UNICEF in 1990, and was further endorsed by the World Summit for Children the same year.

Knowledge of the impact of iodine deficiency on intellectual development and the resulting costs to societies, including delayed socio−economic development, has played a significant role in mobilizing scientists, public health administrations and political leaders the world over to deal effectively with IDD (Pandav, 1996).

Changes in approach

Up to the early 1960s, the correction of IDD was almost exclusively focused on the administration of iodine in the form of solutions of potassium iodide or Lugol's solution. In spite of several effective salt iodization programmes in the United States and in Switzerland in the early 1920s, large preventive programmes were virtually untried in the developing world. Pilot studies using iodized oil as a source of long−lasting iodine supplementation at a population level were implemented in New Guinea in the early 1950s (McCullagh, 1963).

These were followed by campaigns offering iodized oil by the intramuscular route in several countries, including Ecuador, India, Nepal, Peru and the former Zaire. These campaigns resulted in a spectacular regression of goitre for periods up to ten years after one single injection. This approach also prevented the occurrence of endemic cretinism and endemic mental retardation (Dunn, 1987, p. 127). The efficacy and safety of iodized oil used during pregnancy in the prevention of endemic goitre and cretinism have been established (Delange, 1996).

In the late 1970s, concern emerged about disease transmission through the use of syringes for intramuscular injection of iodized oil. This was mostly in connection with the AIDS epidemic. Oral iodized oil was tried and its efficacy established, but, the period of protection was observed to be much shorter. At the same time, it was felt that the use of iodized oil (by either route) was not ideal for the long term because it required use of medical personnel and depended on access to individuals and communities.

The long−term solution for the sustainable elimination of iodine deficiency would more likely take place through increasing the iodine content of the general food supply. Although there had been iodization trials using drinking water, bread and sweets, the most promising vehicle was clearly common table salt. By 1991 universal salt iodization, i.e., all salt for human and animal consumption, was identified as the preferred means of reaching populations, including those consuming salt produced by small−scale artisanal saltworks. Thus the focus shifted from treatment of cases to working with the salt industry to upgrade technologies and management. The application of salt iodization technology to developing country settings has progressed enormously during the past five years. Comprehensive technical guides are available (Sullivan et al., 1995; Mannar and Dunn, 1995).

Iodine dietary requirements

Current recommendations made by WHO for dietary intake of iodine are shown in Table 5. These are slightly higher for three vulnerable groups (young infants, pregnant and breastfeeding women) than previous recommendations made by the National Academy of Sciences in the USA (NAS, 1989). This change was based on new information from iodine balance studies in infants. Delange (1993) has since recommended intakes of 90 ?g iodine per day from birth to six years of age. This recommendation has now entered paediatric practice in a number of countries in both western and eastern Europe. This recommended level covers the needs of all infants, including pre−term infants.

Indicators

The indicators recommended by the involved agencies for assessing iodine deficiency and for defining degrees of severity are shown in Table 6. The selection of these criteria, made by an expert group convened in late 1992, was based on technical feasibility, cost and performance. They are purposely oriented towards public health action in the field and are not intended to cover the needs of an individual clinically affected by IDD.

The prevalence of goitre gives an idea of the past history of iodine nutrition at the population level. Palpation is the simplest method for measuring thyroid size. However, palpation becomes imprecise as the majority of goitres in a population diminish in size, i.e., following implementation of a national salt iodization scheme. In this case measurement of thyroid volume is more accurately performed by ultrasound. Portable ultrasound machines are available. Much of the recent IDD assessment work done in Europe was accomplished by ultrasonography transported across countries and borders by van (Delange et al., 1997). New normative values for thyroid volume in school−age children for assessment of IDD in populations were derived from this work. They were recently endorsed by WHO and ICCIDD (Table 7). These new norms are based on pooled samples of iodine−replete schoolchildren living in Europe and are applicable the world over.

Table 5: Recommended Dietary Intakes of Iodine for Populations

Age range/state	*Intake ?g/d (WHO, 1996)*	*RDA ?g/d (NAS, 1989)*
0−12 months	50	0−6 mths 40 6−12 mths 50
1−6 years	90	1−6 yr 70−90
7−12 years	120	7−10 yr 120
12 years to (and through) adulthood	150	150
Pregnancy	200	175
Lactation	200	200

Source: WHO (1996b, p.62) and NAS (1969, p.213)

Table 6: IDD Prevalence Indicators and Criteria fora Public Health Problem

Variable	*Normal*	*Mild IDD*	*Moderate IDD*	*Severe IDD*
Prevalence of goitre In school–age children (SAC) (%)	< 5	5–19.9	20–29.9	? 30
Frequency of thyroid volume In SAC >97th centile by ultrasound (%)	< 5	5–19.9	20–29.9	? 30
Median urinary Iodine In SAC and adults (?g/L)	100–200	50–99	20–49	< 20
Frequency of neonatal TSH >5 mU/L whole blood (%)	< 3	3–19.9	20–39.9	? 40

Source: WHO/UNICEF/ICCIDD (1994, p. 28)

Table 7: Upper Limit of Normal Thyroid Volume Measured by Ultrasonography in Iodine–replete Children aged 6–15 years as a Function of Sex and Age

Age (years)	*Thyroid volume – Upper limit of normal (ml)*	
	Boys	**Girls**
6	5.4	5.0
7	5.7	5.9
8	6.1	6.9
9	6.8	8.0
10	7.8	9.2
11	9.0	10.4
12	10.4	11.7
13	12.0	13.1
14	13.9	14.6
15	16.0	16.1

Source: Delange, F. et al. (1997) and WHO/ICCIDD (1997)

Urinary iodine measures current dietary intake of iodine. The frequency distribution of urinary iodine concentrations is usually skewed towards elevated values. Population status is better expressed by the median (50th per–centile) obtained from 50 to 100 casual urine samples. Twenty–four–hour urine collection is not necessary. Urinary iodine: creatine ratio need no longer be used as it does not provide additional information and is very labour–intensive.

Neonatal thyroid stimulating hormone (TSH) assesses saturation of brain cell receptors and consequently measures the supply of thyroid hormones to the developing brain. Elevated neonatal TSH is therefore the only indicator which allows prediction of possible impairment of mental development. National screening programmes for congenital hypothyroidism, most usually based on the detection of elevated TSH, are in place in all industrialized countries. Evidence of elevated neonatal TSH has also been used to generate information on the extent of IDD in crowded urban slums in developing countries for advocacy purposes (Nordenberg et al., 1993).

Magnitude

The first evaluation of the magnitude of goitre on a world scale was published by WHO in 1960 (Kelly and Snedden, 1960, p 28). The total was reported to be "not far short of 200 million". This figure is an obvious underestimation because a number of countries were not surveyed. Also, the only indicator used was goitre by palpation which can underestimate both the true prevalence of goitre and the importance of iodine deficiency.

Estimates of populations affected by IDD about the time of the World Summit for Children were around 600 million people (WHO, 1990). It was not until 1994 that IDD, and not only goitre, was assessed country by country and for all regions. This new work applied the concept of *risk* of IDD, defined as 'living in areas with iodine deficiency and a total goitre rate above five per cent'.

By applying this criterion (and lowering the goitre rate cutoff from ten to five per cent), IDD was found to be a significant public health problem in 118 countries, affecting 1572 million people worldwide. This was higher than all previous estimates. In addition, some 655 million were affected by goitre, that is, 12% of the global population. This survey also yielded key information which provided the main motivation to eliminate IDD as a public health problem: some 11.2 million humans were affected by overt endemic cretinism and another 43 million people were affected by some degree of mental impairment (WHO/UNICEF/ICCIDD, 1993, p. 5).

Trends in Salt Iodization Rates since 1992

Rates of salt iodization in all regions have increased significantly since publication of the Second Report in 1992. These trends have been documented by the series of *Progress of Nations* reports put out by UNICEF, as well as periodic reports by WHO. In 1994, UNICEF helped to draw considerable media attention to the reporting of salt iodization rates by ranking countries according to efforts made to iodize salt. At that time 12 of the most seriously affected countries had household rates ranging from zero to 95% (UNICEF, 1994, p. 9).

In 1996, WHO reported on salt iodization rates for those countries with a population over one million and where IDD was recognized to be a public health problem, or where IDD *would be* a public health problem if salt iodization programmes ceased (WHO, 1996a).

Nineteen countries for which information was available were iodizing more than 90% of all salt produced for human consumption. A further 15 countries were iodizing more than 70% of their salt. Thus more than one half (57%) of the population of surveyed countries (some 2500 million) were obtaining iodine through consumption of iodized salt. In many of the remaining countries surveyed, the infrastructure to produce iodized salt had already been established and the proportion of salt iodized was judged likely to reach or exceed 90% by the year 2000. For this to occur, awareness of the importance of the problem and its cost–effective solution, as well as appropriate national and international political choice, would need to be maintained.

Some countries with an IDD public health problem which were unable to fully implement universal salt iodization (USI) were using iodized oil as a temporary measure.

Thirty–eight countries reported using iodized oil supplements, up from 21 countries in 1992. WHO stated however that 'no country has yet been identified in which universal salt iodization has been demonstrated to be impossible or less cost–effective than any feasible alternative' (WHO, 1996a).

During 1995 and 1996, UNICEF conducted household surveys on the use of iodized salt as part of their cluster surveys designed to evaluate progress towards the Summit goals. UNICEF reported towards the end of 1996 that 27 countries had reached the goal of 90% iodization (UNICEF, 1996, p. 20). A further 15 countries reported between 75% and 90% of household salt was iodized. Forty–eight developing countries with IDD which had no significant salt iodization programmes in 1994 now iodized more than half of their salt. Nigeria, with the largest population in Africa, reported reaching 97% salt iodization. The Democratic Republic of the Congo (formerly Zaire), where severe iodine deficiency has been documented for many decades, was reported to have access to iodized salt.

An updated report on salt iodization produced by UNICEF in 1997 summarized further impressive progress (UNICEF, 1997). This report provided more examples of very poor countries with historically severe IDD reaching significant national objectives. For example, Laos and Nepal reported iodization rates of more than 75%. All countries in South Asia and South–East Asia, including China, have national iodization schemes in place. Progress has also been impressive in Sub–Saharan Africa where all but four countries have implemented salt iodization programmes. While iodization rates tend to be lower in Sub–Saharan African, with only 11 of the 40 countries in this region reporting more than 75% of salt adequately iodized, progress

continues to be made and momentum is high.

Progress has been dramatic in Central and South America, which have historically had very high prevalences of IDD. Half of the countries in this region iodize more than 90% of their salt. This can be attributed in part to longstanding and effective legislation. In 20 countries in this region, more than 90% of salt is iodized and in an additional 14 countries the rate is between 75% and 90%. There are still some countries in other regions where special efforts need to be made, including Afghanistan, Azerbaijan, Estonia, Kyrgyzstan, Latvia and Lithuania, where special efforts need to be exerted to set up effective programmes.

In summary, the implementation of universal salt iodization on a worldwide basis is a remarkable achievement that will have lasting effects on the lives of many millions of people. IDD elimination could, in due course, be named the most spectacular public health success of this century. It bears repeating, however, that the management systems put in place so far are fragile. They are extremely vulnerable to a range of both national or international factors that could easily interupt the supply of adequately iodized salt to families and communities. Vigilance, care and good monitoring (discussed below) are needed well into the future.

Table 8: Proportion of total population at risk of IDD by region in 1994 and 1997

WHO Region	% Population at risk of IDD	
	1994	**1997**
Africa	32.8	23.4
Americas	23.1	6.6
Eastern Mediterranean	42.6	30.3
Europe	16.7	10.7
South−East Asia	35.9	14.4
Western Pacific	27.2	9.8
Total	28.9	13.7

Source: WHO/UNICEF/ICCIDD (1994) and WHO (1997a)

Trends in the Prevalence of Goitre and Urinary Iodine

The decline in the proportion of the global population at risk of IDD following implementation of universal salt iodization is shown in Table 8. Between 1994 and 1997 this figure decreased from 28.9% to 13.7%, a reduction of over one half. Further progress may be especially challenging because of limited access to populations not yet reached.

Table 9: Impact of Salt Iodization on Goitre Prevalence and Urinary Iodine over a Nine−Year Period in Peru

Variables	*1986*	*1995*
Iodized salt		
Production (30−40 ppm) (% needs)	56	112
Consumption at household (%)	20	81
Iodine level at household (%)		

		0 ppm	32	3.2
		> 20 ppm	36	75
Follow up of clusters of SAC				
	(Sierra + Silva)			
	Population at risk (M)		6	1.2
	Urinary Iodine (?g/L)		70	139
	TGR (median %)		47.7	10.8

Source: ICCIDD (1996a)

Table 10: Impact of Salt Iodization on Goitre Prevalence and Urinary Iodine over a Nine–Year Period in Cameroon

Variables	***1990***	***1991***	***1992***	***1993***	***1994***	***May 1995***	***November 1995***
Iodized Salt							
Iodine level at household (%)		USI					
0 ppm			33.5	21.2	13.7	8.5	9.6
> 50 ppm			13.8	49.3	71.5	85.2	60.8
Follow up of a cluster of SAC							
Urinary Iodine (?g/L)	67			68			104
TGR (%)	64.2			38.9		16.8	21.1

Source: From Lantum and Delange (unpublished)

Table 11: Impact of Salt Iodization on Goitre Prevalence and Urinary Iodine over a Nine–Year Period in Bhutan

Variables	***1985***	***1996***
Iodized Salt		
Production (60 ppm) % needs	0	> 100
Iodine level at household (%)		
0 ppm	100	0
> 15–20 ppm	0	82
Follow up of clusters of SAC		
Urinary Iodine	62% < 50 ?g/L	76% > 100 ?g/L
TGR (%)	64.5	14

Source: Adapted from: Royal Government of Bhutan (1996)

The relationship between implementation of universal salt iodization and its biological impact at the population level has not yet been documented on a global basis using national data. This is being planned by the ACC/SCN for the Fourth Report. The relationship between rising iodization rates and median urinary iodine (or goitre prevalence) is not necessarily a straightforward one, however, because of the nature of the indicators and the way survey data are collected. The rate of salt iodization can easily be established on a national basis if the number of production or importation sites is limited. Surveys to determine use of iodized salt in the household reflect better access at the family level. In contrast, surveys to determine goitre prevalence and urinary iodine are often performed at selected sites. Median urinary levels and goitre prevalence vary markedly from one region to another in the same country. In this case, national figures do not exist and statistical methods have not yet been developed to produce them with accuracy.

A number of country case studies are now available; three sets of results are presented in Tables 9 to 11. In each of these studies, longitudinal follow–up was organized in sentinel sites by national authorities. An evaluation was then carried out by nationals in partnership with an international team, including senior members of ICCIDD.

In Bhutan, Cameroon and Peru, the increase in availability and consumption of adequately iodized salt at the household level was accompanied by an almost complete normalization of urinary iodine levels and a dramatic reduction in the prevalence of goitre. In Peru, within a period of nine years, the population at risk of IDD decreased from 6 to 1.2 million (ICCIDD, 1996a).

Peru did not have endemic cretinism in the past, but its neighbour, Ecuador, had both endemic cretinism and mental retardation. Both these conditions are now prevented by the salt iodization programme. Both Cameroon and Bhutan had endemic cretinism in the past, up to ten per cent in Bhutan. These dramatic consequences of iodine deficiency are now also prevented in Bhutan.

Trends in the Prevention of Mental Retardation

The main effect of dietary iodine deficiency is on the developing brain. The prevalence of the most severe form of brain damage, i.e. endemic cretinism, can be as high as one to ten per cent of the total population. This was seen in the past in parts of Bhutan, Democratic Republic of the Congo and Ecuador before the introduction of control programmes (Delange, 1994). The incidence of neonatal hypothyroidism, one of the mechanisms involved in the pathogenesis of endemic cretinism, can be as high as ten per cent of neonates. This rate is around 1/4000 (0.025 per cent) in iodine replete populations. Endemic cretinism is prevented by the correction of iodine deficiency in populations especially before and during pregnancy.

Cretinism is an extreme form of brain damage resulting from iodine deficiency. Even in populations known to be at risk of IDD where there is no evident cretinism, there is a downward shift in the frequency distribution of IQ in schoolchildren. This has been documented in Italy and Spain (Stanbury, 1993). The Ministry of Health of Indonesia estimated that before its current preventive campaign, 140 million IQ points were lost each year due to iodine deficiency (ICCIDD, 1996). A meta–analysis has indicated that iodine deficiency reduced the average population cognitive capacity by 10% to 15% (Bleichrodt and Born, 1993).

It was estimated that, up to 1990, about 40 million infants – one–third of all babies born each year in the world – were at some risk of mental impairment due to inadequate iodine in the maternal diet. In 1997, because of the worldwide increase in the use of iodized salt, 12 million children were expected to be spared that risk. In addition, the number of babies born as cretins was expected to have dropped by more than half, from around 120,000 in 1990 to under 55,000 worldwide (UNICEF, 1997a, p. 54).

Further research into the impact of iodine deficiency on intellectual development in conditions of mild deficiency (such as exist in Europe) would be beneficial.

Programme Monitoring

The massive implementation of salt iodization described in this Report is a spectacular achievement, but is not sufficient to ensure the sustainable elimination of IDD. Once set up, a salt iodization scheme needs constant monitoring so that corrective actions can take place without delay. Quality control of iodized salt production and consumption as well as surveys of representative groups are the main tools of monitoring (Dunn, 1996). Clinical and biochemical evidence of adequate iodine intake, regression of goitre and prevention of mental retardation are also important aspects of programme monitoring. Indeed in a Resolution

made during the 49th World Health Assembly in 1996, WHO urged Member States to

'increase efforts for the sustainability of the elimination of IDD by continuing monitoring, training and technical support, including advice on appropriate health legislation, and social communication...'

Criteria for monitoring progress towards the goal of IDD elimination as a public health problem have been established by WHO/UNICEF/ICCIDD (1994, p.36). These criteria include both process and impact indicators: i.e., the proportion of households consuming effectively iodized salt should be above 90%, less than 20% of the population should have urinary iodine <50 ?g/L and the prevalence of enlarged thyroids by palpation or ultrasound should be below five percent. A cut−off for neonatal TSH was also presented: 97% of newborns should be < 5 mU/L of whole blood.

Iodized salt The goal is to ensure that 90% of household salt is adequately iodized. The level of iodization required to provide 150 ?g of iodine per day via iodized salt is influenced by several factors. These include average salt intake, degree of iodine deficiency in the region, and estimated iodine loss from producer to consumer. Consequently the level of iodization at the production site will vary from one country to another and has varied from five to 100 ppm. Current recommendations are contained in WHO/UNICEF/ICCIDD (1996). They are 20 to 40 ppm at the site of production in order to ensure a median concentration of iodine of 100 to 200 ?g/L in the urine.

Regular quality control of iodine concentration in salt at the production site can be done by titration methods or, in the case of imported salt, at the border by using rapid test kits. Periodic monitoring of salt iodine levels in retail shops, schools and households should also be performed using rapid test kits. Recent survey work conducted in Africa has indicated a need to continually improve available test kits, even for qualitative assessment which determines simply the presence or absence of iodine.

The second criteria is *urinary iodine.* The value 100 ?g/L, recommended as the minimal desirable population *median,* was chosen because 100 ?g corresponds to the requirements for daily synthesis of thyroid hormones. It also corresponds to the level below which iodine stores in the thyroid start to decrease. Monitoring urinary iodine is the best way to assess current access of populations to iodine. Unfortunately, at the moment, this still requires the transfer of samples collected in the field to well−equipped laboratories. There is an urgent need for rapid field test kits for urinary iodine and some applied research is being undertaken.

The third criteria is *thyroid size.* The cut−off of five per cent was proposed considering that in iodine replete populations up to five per cent of the population may have abnormal thyroid enlargement due to factors other than iodine deficiency.

Neonatal TSH The cut−off of not more than three per cent of values >5 mU/L was selected because it corresponds to the frequency found in iodine replete areas, such as Australia where this has been extensively documented (reviewed by Delange 1997). One good example of the use of neonatal thyroid screening to monitor an IDD programme is in Poland. Before salt iodization in Poland, the frequency of neonatal TSH above the cut−off point was about 40%. The normal value is below three per cent. Implementation of salt iodization was followed by a rapid shift of neonatal TSH to tower values. Four years later, the frequency of abnormal neonatal TSH was only about ten per cent and continues to decline (Delange, 1997). Neonatal thyroid screening implies technology and cost. However, because of the extreme sensitivity of this indicator we are likely to see more developing countries implementing neonatal TSH to monitor IDD control programmes in the near future.

Iodine−Induced Hyperthyroidism The critical importance of monitoring was recently illustrated by cases of iodine−induced hyperthyroidism (IIH) in Zimbabwe and possibly the former Zaire (Todd et al., 1995; and Bourdoux et al., 1996). IIH is included in the spectrum of abnormalities which can result from iodine deficiency and its correction. It is a severe condition and can be fatal. In these two countries, IIH resulted from the sudden introduction of uncontrolled and excessively iodized salt. In Zimbabwe 14 deaths occurred. IIH is fortunately extremely rare and measures can be put in place to identify and appropriately treat cases. Furthermore, the occurrence of new cases spontaneously decreases after a couple of years. It classically affects old individuals with large nodular goitres. The conditions of maximum risk are long−standing severe iodine deficiency and massive and rapid introduction of excessively iodized salt.

Other Control Measures

Iodized oil As indicated earlier, this procedure was initially used in emergency in severely affected areas where salt iodization was not feasible. About 12 million closes of iodized oil have been administered worldwide since 1955. Spectacular results have been achieved in terms of prevention and correction of goitre and prevention of endemic goitre and endemic cretinism, especially when the iodine supplementation was administered before or during early gestation. There are anecdotal reports from women participating in these programmes of feeling better and stronger after receiving capsules of iodized oil. This is conceivable considering the extremely low values of serum levels of thyroid hormones before the introduction of an iodized oil programme in severely affected populations. Extremely rare side−effects have been noted (Stanbury, in press) and the cost is low, some five US cents per individual per year of protection.

Iodized oil will remain an important technology well into the future for some parts of some countries. Iodized oil may also be of great value in emergency settings when dramatic political events disrupt the supply of iodized salt. It will be of use, as well, in circumstances of severe relapse of IDD due to rapid socio−economic decline, for example in the former USSR.

Iodized water Drinking water can be iodized by release of iodine from elastomers or by dropping iodine into the community water supply. This method has been tried on a pilot basis in a number of countries including: Burkina Faso, Cambodia, Central African Republic, Chile, China, Malaysia, Mali, Mexico, Sudan and Thailand, as well as Sicily in Europe and the US. An evaluation of these trials was carried out by the ICCIDD in 1996 (ICCIDD, 1997). Results showed that, when properly monitored, water iodization is efficacious in controlling iodine deficiency. Side−effects such as IIH are rare, and are probably similar in frequency to other methods. It is generally more expensive than iodized salt in large−scale national programmes. Its main use will be for targeted populations where special circumstances make iodized water more cost−effective and quicker to implement. One limitation is that water iodization is unlikely to be sustainable in poor rural communities and thus may require continual external funding. Water iodization can frequently compare favourably with iodized oil in terms of cost.

Iodized bread Pilot studies in the iodization of bread were conducted, especially in Russia, and these appeared efficious (Gerasimov et al., 1997). However, iodization of bread is probably not effective on a large scale in many countries because of marked regional differences in bread intake.

Vitamin A Deficiency

Introduction

Global progress is being made in combating ocular consequences of vitamin A deficiency (VAD), but efforts need to be intensified if the mortality−risk consequences associated with subclinical deficiency are to be fully controlled. Because VAD is caused by habitually low intake of vitamin A in relation to requirement, sustainable solutions lie in improving intake and controlling preventable factors that elevate requirement. The underlying cause of inadequate consumption and high need is related to poverty. Economic, social and environmental deprivation limits accessibility to, and consumption of, vitamin A−containing foods. This is particularly the case when physiological needs are greatest, namely during periods of rapid growth and development, i.e., infancy, early childhood and pregnancy, and during lactation when breastmilk carries the vitamin in a highly absorbable form from mother to infant. The major non−physiological factor that increases need is frequency of infections, including diarrhoea and other febrile illnesses such as measles. Strategies for sustained elimination of VAD, therefore, will have to consider both improving vitamin A consumption and limiting the risk of infection.

Indicators

Vitamin A status is best assessed by the total body content of vitamin A, which can be viewed as a continuum from deficiency to excess, with obvious health consequences at either extreme (Figure 5). The extremes are marked by specific indicators, for example in the case of severe depletion, by ocular signs (xerophthalmia, including night blindness) and very low serum retinol levels (<0.35 ?mol/L). Physiological functions, however, are impaired before tissues are depleted. It is this stage of subclinical depletion of body stores that defines VAD and is thought to be the beginning of an increased occurrence in the severity of infectious illness and risk of death. Monitoring the prevalence of disease severity and deaths is too non−specific for attribution to a single nutrient, and, unfortunately, currently available biological indicators lack specificity and sensitivity for identifying subclinically depleted body stores. This has necessitated using prevalence values below arbitrary cut−offs specific for different vitamin A indicators. Blood retinol levels are the most commonly measured indicator of vitamin A status in surveys and, using a cut−off of 0.7 ?mol/L, a prevalence > 10% has been set

as defining a public health problem (WHO, 1996, p. 7).

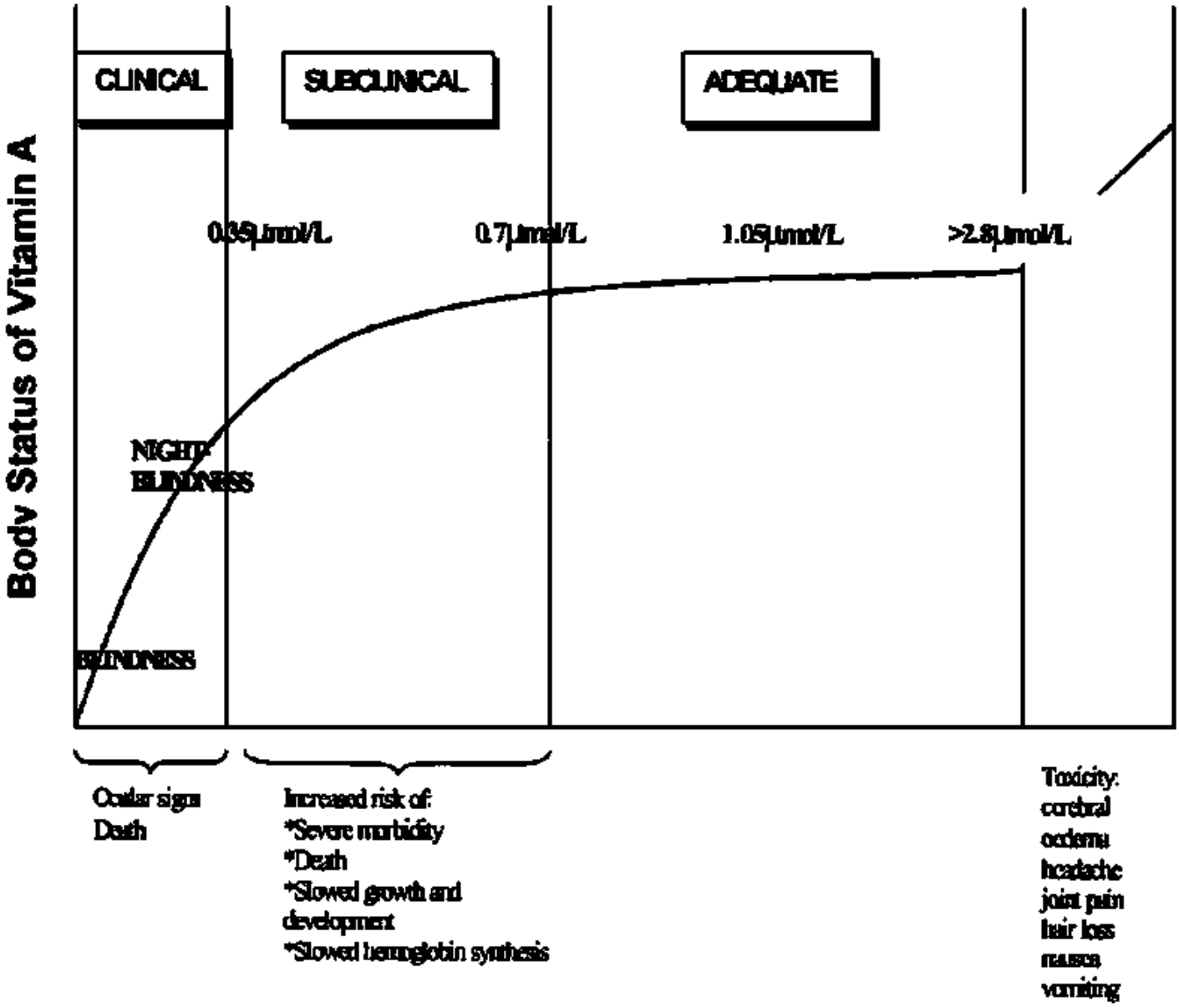

Figure 5: Vitamin A Status

Consequences

The most obvious health consequences of severe VAD involve the visual system, affecting vision in low light or darkness, and dryness (xerosis) and disruption in the integrity of the surface of the conjunctiva and cornea (Bitot's spot, corneal clouding, ulceration). Occurrence of these signs is associated with elevated risk of blindness and death. Hidden consequences that occur even before eye signs are detectable include changes in surface linings of the gastrointestinal, respiratory, excretory and reproductive systems. In addition, the integrity of the immune system is impaired. Risk for severe disease and death is increased by these hidden changes. Only in the last decade have the mortality–associated risks of sub–clinical VAD been appreciated. A recent study from Nepal found that mortality risk is not limited to children. During pregnancy, even relatively mild night blindness was associated with greatly increased mortality risk (West et al., 1997). VAD also contributes to impaired growth and development, and to inefficient utilization of iron for haemoglobin production (Underwood and Arthur, 1996).

Goals

In 1990, the end of decade goal set for vitamin A was the virtual elimination of VAD and all its consequences, including blindness. Global progress in achieving this goal is tracked in this report by trends both in reduction of prevalence of xerophthalmia and low serum levels of vitamin A. The expectation is that as deficient

populations progressively ascend on the continuum toward adequate vitamin A status (Figure 5), clinical signs will virtually disappear and the tower portion of population–based blood vitamin A distribution curves will shift toward adequacy. The risk of health consequences from VAD will remain, however, until serum retinol levels reach adequacy, which for relatively healthy vitamin A–sufficient populations means above 1.05 ?mol/L (Flores et al., 1991).

To achieve and maintain adequate serum retinol levels among deprived populations, attention will need to be given not only to an increased dietary intake of vitamin A but also to infectious disease control, including protecting, promoting and supporting breastfeeding, immunizations and parasite control programmes. Acute and chronic infections independent of vitamin A status suppress serum retinol levels (Filteau et al., 1993). Hence, tracking serum retinol levels of vitamin A may in part serve as a proxy for progress in achieving other health–related goals even after clinical eye signs have been eliminated. This is the rationale WHO used in establishing two cut–off prevalences marking ascension toward adequacy on the vitamin A status continuum, e.g., less than 10% prevalence of serum levels under 0.7 ?mol/L as a public health problem specific to VAD, but less than 5% for elimination of risk of *all* consequences of VAD (WHO, 1996). This section of the paper reports current prevalence of VAD, trends in progress toward the goal and progress in implementing control strategies.

Table 12: Trends in Prevalences of Clinical Signs of VAD Calculated from Instances where Multiple Surveys have been Reported

Country	*Year*	*Indicator*	*Prevalence (%)*	*Percent Change per 10 years*	*Trend (percentage points/10 yrs)*
India	1976	X1B	1.40		
	1979		0.90		
	1988–90		0.70	–42.0%	–0.58
Nepal	1979–80	X1B	0.60		
	1981		0.64		
	1996		0.50*	–10.0%	–0.06
Sri Lanka	1975–76	X1B	1.10		
	1987		0.33	–60.0%	–0.64
Indonesia	1977–78	X1B	1.01		
	1992		0.30	–48.5%	–0.49
Aceh (Regional)	1977	X1B	2.42		
	1982–83		1.23		
	1989		1.28	–40.0%	–0.95
Philippines	1982	Total	3.20		
	1993		0.50	–78.0%	–2.50
Ethiopia	1980–81	X1B	1.00		
	1996		0.50*	–32.3%	–0.32
Niger	1988	XN	2.01		
	1992		2.47	+57.2%	+1.15
Bhutan	1976	Total	1.30		
	1989		0.70	–35.6%	–0.46

Source: WHO (1995) and UNICEF et al. (1997b, p.20)

** Estimated X1B, actual data was XN only. See Annex 5 for explanation of X1B and XN.*

Note: In cases where there are three different surveys, the difference between the earliest and the latest years is taken.

Magnitude

Clinical VAD Early in the 1980s, xerophthalmia was estimated to afflict 4–8 million pre–school age children and to cause half million cases of childhood blindness, two–thirds of whom died (Sommer et al., 1981). A large amount of data has been compiled since these estimates were made (WHO, 1995), and additional information obtained from UNICEF field offices and country reports at recent meetings (IVACG, 1997). In the last decade, the degree of increased activity related to VAD is reflected by the fact that 72 countries have conducted nationally representative surveys, 32 of which included assessment of ocular signs and symptoms and 40 of which included serum retinol. An additional 16 countries have surveys planned[2] (UNICEF et al., 1997b). Xerophthalmia rates in most surveys were based on night blindness (XN) and Bitot's spot (X1B) as the two most commonly reported clinical signs, and prevalence of serum retinol levels under 0.7 ?mol/L as the most common expression of subclinical VAD. To date, only a few of these surveys were re–assessment surveys that could be used to document trends, particularly following implementation of control programmes.

[2] *The survey in Eritrea was reported at the IVACG XVIII in Cairo in September 1997.*

Table 13: Prevalence Estimates of Clinical VAD for Children aged 0–60 months, 1985–1995

Region	***Percent Clinical Prevalence***		***Numbers of Children Affected (millions)***		***Percent change per 10 years***	***Rate of Prevalence Change, 1985–95, percentage points/10 yrs***
	1985	***1995***	***1985***	***1995***		
South Asia	1.79	0.95	2.67	1.58	–47%	–0.84
East Asia/Pacific	0.43	0.25	0.66	0.40	–42%	–0.18
Latin America & the Caribbean	0.35	0.24	0.17	0.12	–31%	–0.11
East/South Africa	1.80	1.06	0.69	0.53	–41%	–0.74
West/Central Africa	1.40	0.87	0.53	0.45	–38%	–0.53
Middle East/North Africa	0.63	0.27	0.24	0.12	–57%	–0.36
Total	1.06	0.63	5.00	3.30	–41%	–0.43

Source: UNICEF et al., (1997b, p.21)

Multiple ocular survey data are available for the eight countries shown in Table 12. From these limited repeat surveys, country–specific trends are suggested. The limited comparability of the data make further inferences difficult. In India, Indonesia and the Philippines, vitamin A supplement distribution programmes have been in effect for several years, and Sri Lanka has used supplements in a programme targeted to high–risk groups. All of these countries have experienced reduction in clinical VAD, which may be attributable in part to the supplementation programme. In Nepal and Niger, minimal or no improvement occurred during a period when there were no broad based control programmes in effect. Both countries now have implemented programmes and future surveys will indicate if these programmes are associated with an improved situation. The limited data in Table 12 are too few for calculating global trends; for this a model approach was used.

Data from 35 surveys of clinical VAD prevalence, judged to be sufficiently comparable for estimating regional prevalence at different time points, were used to develop a model from which the situation in 1985 could be more precisely interpolated. These 35 surveys are listed in *Annex 4.* This established a baseline against

which to evaluate progress. *Annex 5* provides a description of the method used.

Table 13 presents the clinical VAD prevalence and trend estimates by region for 1985 and 1995. The model estimates that five million children were clinically afflicted in 1985 in comparison to 3.3 million in 1995. The model estimate for 1995 is somewhat higher than the 2.8 million estimated by WHO using a different methodology (WHO, 1995, p. 4).

Regional variations in prevalence reductions are evident. Their meaning in terms of achieving elimination goals is clear when calculated in terms of percentage points per 10 years (pp/10 yrs). Global reduction in prevalence was occurring at a rate of 0.43 pp/10 yrs, with region−specific variations from a low of 0.11 in Latin America and the Caribbean to a high of 0.84 in South Asia. The end−of−decade global goal of elimination of the risk of VAD−related blindness will not be achieved at these rates.

Table 14: Year when Elimination of Clinical VAD will Occur at Current Reduction Rates, by region

Region	***Percentage points/10 yr***	***Percent Clinical Prevalence (%)***		***Expected Years of Elimination of Clinical VAD***
		1990 (year of the World Summit for Children)	***2000***	
South Asia	−0.84	1.37	0.53	2006
East Asia/Pacific	−0.18	0.34	0.16	2008
Latin America/Caribbean	−0.11	0.29	0.18	2014
East/South Africa	−0.74	1.43	0.69	2009
West/Central Africa	−0.53	1.34	0.81	2015
Middle East/North Africa	0.36	0.35	–	–
Total	−0.43	0.84	0.41	2009

Table 14 shows the year when the risk of blindness – part of the decade goal – would be achieved, predicted by the model and barring circumstances that could disrupt current progress, e.g., civil unrest and disasters. Only the Middle East and North Africa region would achieve the year 2000 goal. Latin America and the Caribbean, with the lowest prevalence (0.29%) in 1990 would not reach the goal until 2014 and a similar time is needed by Western and Central Africa, where the prevalence in 1990 was four times higher (1.34%). Hence, although trends are encouraging, global reduction rates would have to increase and regional rates will need to be considerably accelerated.

This discussion of prevalence and trends has been based primarily on data available for pre−school−age children. In areas of endemic VAD, there are increasing numbers of reports that prevalences of night blindness in pregnant and breastfeeding women are similar to or exceed those in children (IVACG, 1997a). Due to limited survey information, this vulnerable group is only recently beginning to enter the global estimates of those with VAD. In view of recent reports from Nepal showing a reduction in maternal mortality brought about by weekly supplements of beta−carotene or vitamin A equivalent to 23,000 IU vitamin A (West et al., 1997), priority should be given to assessing populations of VAD pregnant women and including them in programmes.

Subclinical VAD The results of 42 surveys of sub−clinical VAD, assessed biochemically on the basis of low serum retinol in children under five years old, were compiled from WHO (1995) and UNICEF field office reports (UNICEF et al., 1997b). These are listed in *Annex 6.* Some of these surveys are subnational and extrapolation to a national basis has limitations. The cut−off of serum retinol less than 0.7 ?mol/L although not usually associated with ocular signs, carries mortality−related risk. The prevalence of children under five who are subclinically deficient is much higher than for clinical VAD. Reported ranges exceed 70% in Burkina Faso and Mali, and are more than 40% in Côte D'Ivoire, Honduras and Mauritania. The prevalence rate in Indonesia is about 58%, according to a 1991 survey.

Global trends in sub−clinical prevalence estimates are less easily tracked than clinical deficiency. Confounding disease−related factors that vary in intensity from country to country, making cross−country and regional comparisons difficult to evaluate, influence serum retinol levels. Few data are available from representative repeat serum retinol surveys, particularly at a national level; in fact repeat survey data are currently available from only four countries, all of them in Latin America. These limited data are insufficient to develop a reliable predictive model from which to interpolate global or regional prevalence at different time points. Presumably global progress in reducing clinical VAD is being reflected by progress in reducing subclinical VAD, but it is not possible to substantiate this until sufficient data from repeat surveys become available.

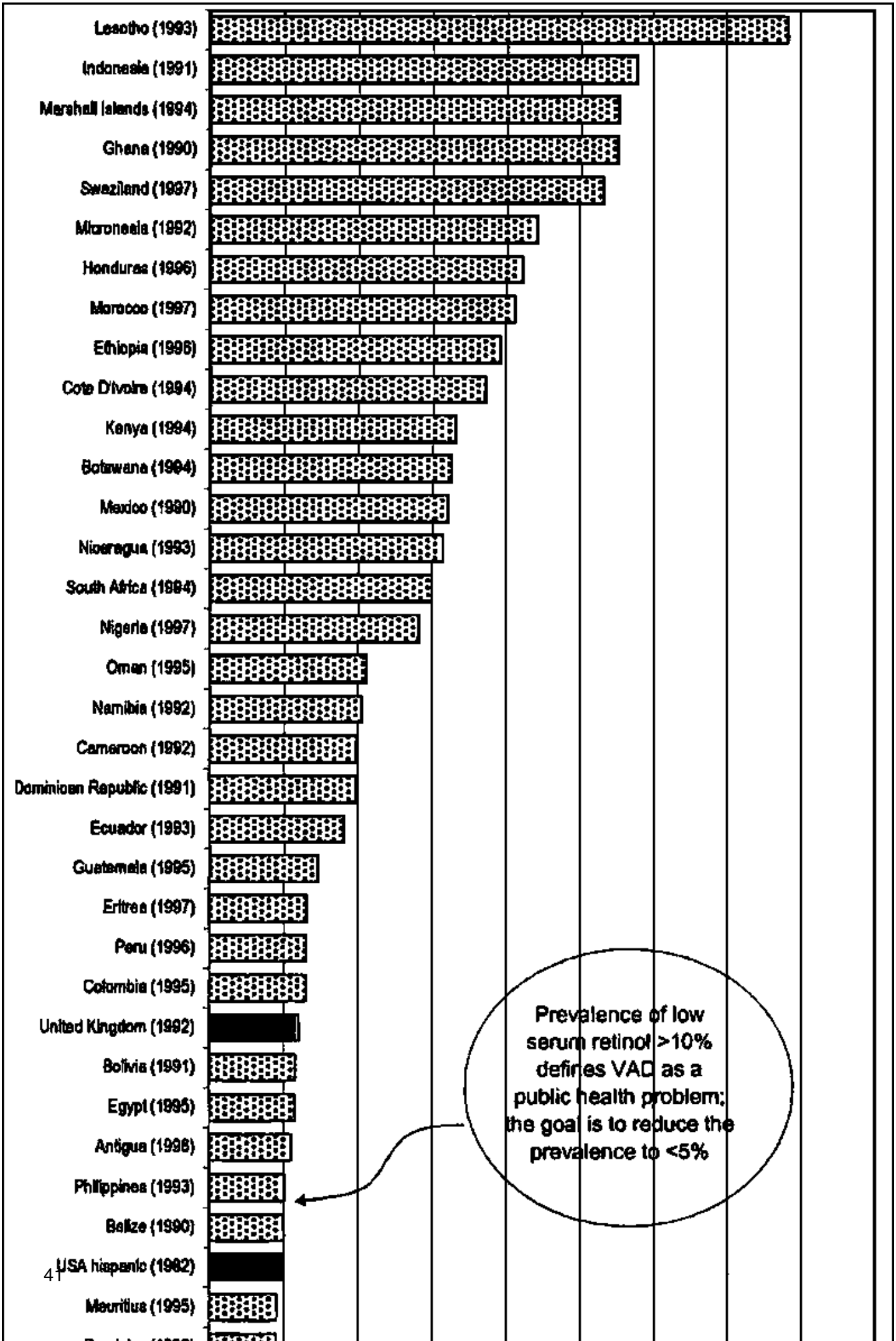
Lesotho (1993)
Indonesia (1991)
Marshall Islands (1994)
Ghana (1990)
Swaziland (1997)
Micronesia (1992)
Honduras (1996)
Morocco (1997)
Ethiopia (1996)
Cote D'Ivoire (1994)
Kenya (1994)
Botswana (1994)
Mexico (1980)
Nicaragua (1993)
South Africa (1994)
Nigeria (1997)
Oman (1995)
Namibia (1992)
Cameroon (1992)
Dominican Republic (1991)
Ecuador (1993)
Guatemala (1995)
Eritrea (1997)
Peru (1996)
Colombia (1995)
United Kingdom (1992)
Bolivia (1991)
Egypt (1995)
Antigua (1998)
Philippines (1993)
Belize (1990)
USA hispanic (1982)
Mauritius (1995)
Prevalence of low serum retinol >10% defines VAD as a public health problem; the goal is to reduce the prevalence to <5%

Figure 6: Prevalence of Low Serum Retinol Levels in Countries in which Nationally Representative Surveys have been Undertaken since 1990

Source: Adapted from UNICEF et al., 1997b, p. 31

Nonetheless, some notion of how far we must progress to eliminate subclinical VAD is gained by noting the prevalence of inadequate serum levels from surveys done this decade. Figure 6 summarizes data since 1990 for 38 countries where surveys were nationally representative or thought to reflect the situation in at least half of the country. Although data for the United Kingdom used a cut−off prevalence below 0.87 ?mol/L, these data as well as a value from Hispanic children living in the southwestern USA (Pilch, 1987) are included to provide relative comparisons[3]. The figure reveals that most Latin American and Caribbean countries, except Dominican Republic, Ecuador, Mexico and Nicaragua, have achieved or are close to achieving a prevalence under 10% which designates a public health problem, while most of the African region, Indonesia and parts of the Western Pacific lag behind.

[3] *There is virtually no recent data for minority children in Canada.*

Status of Programmes to Reduce VAD

Of the 78 countries where VAD is known to be a public health problem, 61 (78%) have policies supporting regular vitamin A supplementation of children (UNICEF et al., 1997b, p. 8). The majority of countries implementing vitamin A supplementation programmes have adopted the policy recommended by WHO/UNICEF/IVACG (1997). This calls for children aged 6−12 months to receive a 100,000 IU dose, and for children aged 12 months and over to receive a 200,000 IU dose of vitamin A once every four to six months. Fifteen countries use alternative supplementation regimens in which a lower dose, usually 50,000 IU, is provided. Coverage has been increased in recent years by providing supplements during National Immunization Days (NIDs) or other mass campaigns such as periodic anti−helminth campaigns. Thirty−four of 78 countries which have used NIDs for delivery increased coverage rates of children under five (UNICEF et al., 1997b, p. 22 and p. 32). While NIDs typically take place on a yearly basis, several countries have organized additional periods, such as Vitamin A week' or Vitamin A month', to achieve extensive biannual distribution.

It should be noted that in many countries NIDs are organized to eradicate polio and may be discontinued after the year 2000. In the long term, it is critical to integrate vitamin A supplementation into ongoing routine child immunization programmes or to develop other more sustainable ways to ensure that children receive supplements regularly until adequate intake from food sources is achieved. In many countries, vitamin A supplementation of young children has been successfully integrated into routine maternal child health visits, or is often linked to community−based nutrition improvement programmes.

Where VAD is a public health problem, WHO/UNICEF/IVACG (1997) recommend that all breastfeeding mothers receive a high dose supplement within eight weeks of delivery to improve her own status and raise the level of vitamin A in her breastmilk. Of 78 countries with recognized VAD, 46 have adopted this policy although coverage is highly variable (UNICEF et al., 1997b, p. 11).

Food−based approaches to increase the quantity and quality of micronutrients in diets, particularly to improve vitamin A intake, include home−based horticulture promotion and fortification of processed foods. Fortification of commonly consumed foods, such as sugar, cereals, flours, margarine and oils, is being pursued by governments in over half of the countries with a recognized VAD problem. In South East Asia, instant noodle fortification is occurring and other vehicles are being explored elsewhere. Although supplements continue to be routinely provided to address the immediate situation found in some of these countries, it is anticipated that a phase−in of fortified foods will sustain the progress achieved and allow supplementation to be phased−out. In other countries, such as Guatemala where xerophthalmia is rare but subclinical deficiency is still prominent, mandatory fortification of sugar has moved the country toward adequate vitamin A status. This has occurred in the absence of supplementation, and it is expected that the progress will continue and be sustained as long as fortification continues.

Lessons learned from the Guatemala fortification experience are valuable guidance for other Central American countries that have fortified sugar or have sugar fortification under preparation − Colombia, Ecuador, El Salvador, and Nicaragua − and for several countries in Asia, Africa and South America where feasibility is being explored. Reliance on a single fortification approach to control micronutrient deficiencies is a fragile strategy, even though it may not require changes in food−habits or knowledge. This was illustrated in

Guatemala when the vitamin A fortification programme temporarily stopped in the 1980s and evidence of VAD reappeared. Similarly, in Venezuela when national economic adversity temporarily stopped flour fortification with iron, anaemia prevalence increased (Institute of Medicine, 1997). In the past, identification of a single widely consumed food vehicle to fortify has dominated efforts, but the potential to fortify different products to take advantage of more localized food availability and consumption patterns is increasingly clear. In addition, social marketing of fortified products is advised so as to inform consumers of the benefit of making wise food choices, both from natural food sources and what is likely to become a variety of fortified foods available in the future.

Another lesson learned from fortification experiences is the need for early government–private sector alliances, as well as alliances with other stake–holders (*Ending Hidden Hunger,* 1991). This is important to create among the private sector a sense of social responsibility for control of micronutrient deficiencies, and, in turn, elicit government recognition of private–sector economic risk concerns. Where possible, accommodating some private sector needs has provided incentives for voluntary private sector involvement. For example, in the Philippines where margarine is fortified, a government endorsement visible on the product as an 'acceptance seal' and for cost–recovery of initial capital investments was found to be an appropriate incentive. Now in the Philippines, the private–sector on its own initiative is considering a variety of food products for fortification. Multiple nutrient fortification is also being explored. In Venezuela, for example, wheat and maize flour are fortified with both iron and vitamin A.

Horticulture approaches are increasingly recognized for their effectiveness and potential sustainability in improving not only vitamin A status, but also micronutrient status generally. Recent evaluation of the large–scale horticultural intervention in Bangladesh has shown effectiveness in improving vitamin A status of those households that have home gardens, including increased consumption by children of vitamin A–rich garden produce (UNICEF, 1997a). Moreover, homestead gardening lends itself to adapting traditional preservation and preparation practices to improve nutrient retention, for example the indirect rather than direct sun solar drying of mangoes in Haiti and West Africa. Since several food sources of provitamin A also are rich sources of vitamin C, and contain iron, increased consumption of these foods addresses multiple nutrient needs. The importance of combining increased vitamin A levels in the food supply with nutrition education and appropriate social marketing that promotes consumption by the vulnerable groups is increasingly recognized (IVACG, 1997).

Socio–economic progress itself in many countries, including direct poverty–reduction programmes, probably accounts for part of the notable improvement in reducing prevalence of VAD. Specific interventions, however, have undoubtedly made an important contribution to VAD control, both through provision of vitamin A itself and through other health promotion and social measures. For example, during the early years of life, promotion of breastfeeding and supplementation of breastfeeding mothers immediately post–partum (breast milk being the infant's primary source of vitamin A), broad immunization coverage and oral rehydration therapy (ORT) use in diarrhoeal disease control are likely to have contributed significantly. Measles immunization may account for another part of the improvement, as higher measles immunization coverage can be shown to be associated with lower clinical VAD prevalence, taking account of economic status. And programmes that enhance the social status of women and empower them have been linked to family nutrition improvements.

Attention is given to the importance for sustainability of embedding VAD control programmes into community programmes. Supplementation programmes for the 6– to 72–month population accelerated around 1994, and using the measles immunization contact for delivery around nine months of age expanded. Thus supplementation and measles immunization may account for part of the global improvement in the last few years, particularly in the reduced prevalence of xerophthalmia.

It is crucial to take advantage of the present opportunity to firm up the evaluation experience from various health promotion programmes and to determine the relative impact of large–scale supplementation programmes. It is noteworthy, for example, that Indonesia, where supplementation has been a national programme since 1974, declared the country xerophthalmia–free at a public health level in 1994. However, Figure 6 shows that subclinical VAD persists in Indonesia at over 50% prevalence. Recently the Indonesian government has expanded its efforts to control VAD through supplementation of mothers and promotion of consumption of foods rich in vitamin A (UNICEF, 1997a), while private sector involvement in providing fortified foods, e.g., instant noodles, is being pursued.

With the continuation of present trends, clinical VAD may be eliminated in many parts of the world on average in the next 15 to 20 years. But many, especially children, will remain affected by sub–clinical deficiency, unless intervention programmes that include sustainable solutions are actively implemented and/or given

increased emphasis. This is necessary to underpin the trend toward decreased prevalence of VAD. Therefore, it will be necessary to sustain major efforts to deal with both clinical and sub−clinical VAD for at least the next two decades.

Iron Deficiency Anaemia

Introduction

Iron deficiency anaemia (IDA) is the most prevalent nutritional deficiency worldwide. It is a major public health problem with adverse consequences especially for women of reproductive age and for young children. Over 90% of affected individuals live in developing countries. The consequences of IDA are numerous as iron plays a central role in the mechanism for oxygen transport, and is essential in many enzyme systems. Of greatest concern is that IDA in infants and children is associated with impaired physical and cognitive development. In adults, IDA is associated with weakness and fatigue which reduce capacity for physical work and productivity. In pregnant women, it contributes to maternal morbidity and mortality, and increases the risk of foetal morbidity, mortality and low birth weight (reviewed by Viteri, 1997).

Table 15: Haemoglobin Levels Indicative of Anaemia

Age/sex group	*Haemoglobin level (g/dl)*
Children 6m−5y	<11
Children 6y−14y	<12
Adult males	<13
Adult females (non pregnant)	<12
Adult females (pregnant)	<11

Source: WHO, 1968

Severe anaemia may be a contributory factor in up to 50% of maternal deaths, and is the main cause of up to 20% of maternal deaths in developing countries (ACC/SCN, 1991).

At the World Summit for Children in 1990, there was political commitment to reduce IDA in women of reproductive age to one−third of 1990 levels by the end of the decade. At the International Conference on Nutrition in 1992, this goal was expanded to include young children, with specific reference to the impact of IDA on cognitive development.

Iron deficiency and anaemia

Iron deficiency occurs when an insufficient amount of iron is absorbed to meet the body's requirements. This may result from inadequate iron intake, reduced bioavailability of dietary iron, increased need for iron (e.g., during growth or pregnancy) or chronic blood toss.

Iron deficiency encompasses a range of iron depletion states. The least severe is diminished iron stores, diagnosed by decreased serum ferritin levels. Decreased iron stores are not usually associated with adverse physiological consequences, but do represent a vulnerable state. Iron deficiency without anaemia occurs when iron depletion is severe enough to affect normal production of haemoglobin, but without haemoglobin levels falling below the clinical criteria defining IDA. This is characterized by decreased transferrin saturation levels and increased erythocyte protoporphyrin.

The major clinical manifestation of iron deficiency is IDA, which occurs when haemoglobin production is compromised by lack of iron to such an extent that the haemoglobin concentration falls below defined age− and sex−specific cut−off values (Table 15). Epidemiological criteria can be used to define severe (>40%), moderate (10−39.9%) or mild (<10%) prevalence of anaemia within populations (WHO, 1996, p. 8 and elsewhere).

'...In Sub−Saharan Africa, bioavailability of dietary iron was the most important determinant of anaemia...'

Intestinal helminths, especially hookworm infections, cause gastrointestinal blood toss and are one of the major causes of iron deficiency anaemia. There are a number of causes of anaemia other than iron deficiency, including malaria (Weatherall, 1988), congenital haemolytic diseases such as thalassaemia, and other micronutrient deficiencies (e.g., vitamin A deficiency, Suharno and Muhilal, 1996). The relative importance of anaemia determinants has recently been assessed by different geographical region from a life−cycle perspective (Micronutrient Initiative, in preparation). In Sub−Saharan Africa, bioavailability of dietary iron was considered the most important determinant of anaemia in every age group except pregnant women (Figure 7). In pregnant women, malaria is a more important determinant of anaemia than iron deficiency in primagravidae. For multigravidae, iron deficiency appears to be a more important determinant. The importance of helminth and other infections (e.g., AIDS), genetic disorders and other factors as determinants of anaemia was also ranked for different age groups. Worldwide, at least half of anaemia is due to nutritional iron deficiency, and subclinical iron deficiency is as widespread as IDA. In areas with high anaemia prevalence (above 50%), it can be assumed that almost all the population is iron deficient (WHO/UNICEF/UNU, in preparation).

Table 16: Prevalence of Anaemia among Different Populations, Based on National Data

Regions[1]	***Children***				***Women (15−59y)***				***Men(15−59y)***	
	0−4y		***5−14y***		***Pregnant***		***All***			
	%	***Pop (million)***	***%***	***Pop (million)***	***%***	***Pop (million)***	***%***	***Pop (million)***	***%***	***Pop (million)***
Africa	33.1	35.5	52.0	85.2	46.9	9.6	37.9	57.6	28.0	41.9
Non−industrialized Americas	22.9	13.0	36.9	39.5	39.0	3.8	31.0	44.9	11.0	15.8
South East Asia	52.7	93.8	63.9	207.8	79.6	22.2	60.0	218.6	42.4	184.8
Eastern Mediterranean	38.3	28.1	30.8	37.9	63.9	8.8	51.1	60.6	32.7	41.5
Non−industrialized West Pacific	14.7	19.7	56.9	156	38.5	9.4	33.8	152.9	36	172.5
Total	34	190	53	526	56	54	43	535	34	456.5

1. WHO regions as defined in WHO'S World Health Report, 1997 (Note: South Asian countries are included in the South East Asia region) Source: WHO (in preparation)

Table 17: Life−Cycle Anaemia Risk Matrix for Sub−Saharan Africa (The numbers in each box represent the priority attached to the determinant at each life cycle stage, with 1 being the most important).

Determinants	**Infant (0−1y)**	**Preschool (1−5y)**	**School−aged (5−15y)**	**Adolescent (12−19y)**	**Reproductive−a women (15−45y**
Diet	– iron content of complementary foods – composition/bioavailability of dietary iron – lack of exclusive breastfeeding (1 or 2)	– iron content and bioavailability of complementary foods. – continuity of breastfeeding (within 2nd year) – content and bioavailability of family diet – vitamin A?	– bioavailability of dietary iron (1)	– bioavailability of dietary iron – high iron requirements – iron density of diet – seasonality (1)	– bioavailability dietary iron (1) – increased iron demand – folate deficienc (3) – lactation may increase iron absorption?

		(1)				inta bio of (ne sup
Malaria	– biggest cause of anaemia (1 or 2)	– diminishing with age as immunity acquired – dependent on local transmission (2, but main cause of life–threatening anaemia)	(4)	(4)	(5)	– prir (1) – mu (2) – c birt and sto new – s
Helminths		– increasing problem, unknown scale in Africa (3)	– hookworm (2) – schistosomiasis increasing (3)	– helminths and schistosomiasis (2) but little data on schistosomiasis related to anaemia	– hookworm (3) local transmission variation	– h (4) diff
Genetic	– sickle cell disease (4) (1–2% newborns)	– surviving sickle cell disease (4)	– sickle cell disease diminishing (5)			– s dis
Other infections	– poor appetite, catabolic losses, raised requirements, AIDS	poor appetite, catabolic losses, raised requirements		– AIDS, TB (3) especially girls	– AIDS, TB and related infections (2) – HIV and malaria interaction	– A
Other factors	– low birth weight – maternal nutrition			– excess blood loss		

Source: Micronutrient Initiative. Expert Consultation on Determinants of Anaemia, MI, Ottawa, September 1997.

Magnitude of the problem

Calculations using the most recent estimates of anaemia prevalence from WHO suggest that 43% of all women and 34% of all men are anaemic in developing regions (Table 16). South East Asian countries have the highest prevalence of anaemia, with almost 80% of pregnant women in this region being anaemic. In all regions, the prevalence of anaemia is higher in pregnant women than in non–pregnant women. These updated estimates are based on available national prevalence data starting from the 1970s, up to and including data from 1997, and using population data from 1995 (DeMaeyer and Adiels–Tegman, 1985; WHO, 1992; AbouZahr, Ahman and Bailey, in preparation; WHO, in preparation).

Estimating trends in anaemia prevalence over time remains problematic. This would require representative longitudinal data. Comparing summary data from one database with summary data from the same, updated database can be difficult to interpret without detailed information concerning which components have been updated. Further analysis is required, both to compare data from representative surveys over time in specific countries, and to combine the existing data in more meaningful ways.

Control and Prevention of IDA – Current Status of Programmes

Strategies to improve IDA include supplementation, fortification, dietary modification and parasitic disease control. It is generally acknowledged that progress in addressing IDA has lagged behind progress for iodine

and vitamin A deficiencies. However, there are many programmes currently implemented, including widespread adoption of iron/folate supplementation in pregnancy, and growing support for fortification of staple foods. Many control programs are currently implemented, including widespread adoption of iron/folate supplementation in pregnancy, and growing support for fortification of staple foods with iron.

There is still lack of agreement on dosage and optimal duration of supplementation for certain target groups. The most recently published statement from WHO (DeMaeyer et al., 1989) recommended universal iron supplementation for pregnant women (60 mg of elemental iron + 250 ?g of folic acid, once or twice daily) to be taken throughout the second half of pregnancy. In 1995, the UNICEF/WHO Joint Committee on Health Policy (JCHP) endorsed iron/folate supplementation as the strategy of choice and recommended that where the prevalence of IDA in pregnant women exceeds 30%, countries should implement universal supplementation through antenatal clinics, regardless of women's individual haemoglobin status (UNICEF/WHO, 1995). The International Nutritional Anaemia Consultative Group (INACG) recently drafted guidelines for iron/folate supplementation, which make a similar recommendation but where anaemia prevalence in pregnant women is greater than 40% (Stoltzfus and Dreyfuss, 1997).

To update the current status and progress of programmes to control and prevent iron deficiency anaemia, UNICEF recently conducted a survey. Questionnaires were sent to all UNICEF field offices in August 1997. Specific objectives of this exercise were:

? to review the global situation of IDA assessments conducted and planned;

? to report on the status of policies adopted by countries to support antenatal supplementation of pregnant women;

? to report on the procurement, utilization and cost of iron/folate supplements;

? to summarize the composition and dosages adopted by countries supporting antenatal supplementation;

? to review the status of related policies to supplement young children with iron and to support regular de−worming of women and young children.

Completed questionnaires were received from 57 (35%) of the 163 countries where UNICEF has programmes.

Table 18: Type of Supplements used by Countries Supporting Iron/folate Supplementation Programmes

Supplements used	***Number of countries***
Ferrous sulphate 200 mg (60 mg elemental iron) + 250 ?g folic acid. One tablet daily.	43
Ferrous sulphate only (60 mg elemental Iron). One tablet dally. (No folate supplementation)	8
Folic acid 1 mg. One tablet dally In addition to the Standard ferrous salt/folic acid preparation.	2
Ferrous salt (60 mg), one tablet dally in addition to the Standard ferrous salt/folic acid preparation.	2

Source: UNICEF

Additional information was obtained from annual reports of UNICEF country offices for 1995 and 1996, USAID−funded Demographic and Health Surveys from 1987 to 1996, and UNICEF's Supply Division in Copenhagen. Of the 163 countries, fewer than half (43%) have conducted at least one nationally representative survey to assess IDA prevalence. Eleven countries are planning to conduct surveys in the near future but very few countries have completed repeat surveys.

Status of Supplementation Policy and Programmes for Pregnant Women

According to the UNICEF survey, 49 countries have adopted a universal preventive supplementation policy for pregnant women. Eleven countries have policies whereby only those pregnant women found to be anaemic (determined by blood test or by clinical judgement) are given supplements. Six countries do not have a clear targeting policy.

Of the countries supporting supplementation programmes for pregnant women, 43 use the previously recommended iron/folate combination, 60 mg iron + 250 ?g folic acid. In December 1997 the Essential Drugs Committee of WHO approved increasing the folic acid content of the iron/folate tablet used in the programme to 400 ?g. The survey showed that eight countries give iron supplementation without folic acid. In two countries, folic acid tablets are given in addition to the iron/folate preparation, and in two others, iron tablets are given in addition to the iron/folate preparation (Table 18). National anaemia control programs in Bangladesh, Bhutan, Oman and Pakistan include iron/folate supplementation through the post−partum period. In other countries, such as Madagascar and India, the current policy requires that pregnant women receive supplements for at least 100 days.

Eight countries [in the survey] give iron supplementation [to pregnant women] without folic acid. This practice must be corrected.'

Even though the evidence supporting the effectiveness of weekly iron supplementation is limited (Ridwan et al., 1996), eight countries are introducing such a policy for supplementation during pregnancy. Chad alone has a policy of monthly supplementation of pregnant women.

The survey showed that there are 29 countries where at least 50% of pregnant women receive iron/folate supplements during routine ante−natal care. In 11 of these 29 countries, more than 80% of pregnant women presenting for antenatal care receive iron supplements. The percentage of women using antenatal services may be a proxy for potential supplement coverage through these facilities.

Regular supplies are obviously important for programme effectiveness, but so is compliance. It has long been argued that gastro−intestinal side effects, with associated nausea, reduce compliance. More recent work has shown that few women stop taking iron pills if they are counselled that side effects may occur and that they are not serious (as reviewed by Galloway and McGuire, 1996). In one unsupervised supplementation trial in India, it was found that counselling and reassurance, especially in the first ten days after starting supplementation, played a crucial role. Side effects also reduced with time. Only 11% of women receiving 180 mg/d reported side effects at 32−36 weeks gestation (Seshadri et al., 1994).

Status of Supplementation Policy and Programmes for Children

Full−term healthy infants who are exclusively breastfed until about six months of age are not at high risk of developing anaemia. From six months onward, the infant's iron needs must be met by the family diet. Rapid growth during this period increases the need for iron, and in older children, high prevalences of intestinal helminth infections, especially hookworms, increase the risk of iron deficiency. The JCHP called for preventive iron supplementation for all infants and young children in situations where the prevalence of IDA in pregnant women exceeds 30% (UNICEF/WHO, 1995). More recently, a USAID/UNICEF consultation on anaemia in young children recommended supplementation of children aged 6−9m with 12.5 mg oral iron per day unless there is strong evidence that children's diets contain adequate available iron (Nestel and Alnwick, 1996; Stoltzfus and Dreyfuss, 1997). In older children, supplementation dosage depends on the child's age and weight: the INACG draft guidelines recommend 20−30 mg elemental iron daily for children aged 2−5y; 30−60 mg for children aged 6−11y; and 60 mg for adolescents (Stoltzfus and Dreyfuss, 1997). Periodic cycles of daily iron supplements and treatment of those already anaemic, plus periodic de−worming, are recommended by WHO (WHO/UNICEF/UNU, in preparation).

The UNICEF survey showed that 23 countries have adopted supplementation of pre−school or school−aged children as a policy. In six countries (Ecuador, El Salvador, Honduras, Mongolia, Niger and Thailand) over 10% of preschool and/or school−aged children routinely received supplements in 1996, with over 50% of children receiving supplements in Ecuador and El Salvador.

Status of Food Fortification Programmes

Fortification of foods with iron is a preventive measure that aims to improve and sustain iron nutrition on a long−term basis. One of the recommended actions of the JCHP was for countries to study the feasibility of food fortification as a means to reducing iron deficiency anaemia (UNICEF/WHO, 1995). Fortification with iron has been practised for many years in industrialized countries such as Canada, UK and USA. Although it is

generally held that fortification has contributed to a reduction in anaemia prevalence in developed countries, there are almost no studies confirming its effectiveness. In developing countries, five large studies have demonstrated the effectiveness of iron fortification (in Guatemala, India, South Africa, Thailand and Venezuela), but only when based on careful planning and well–established guidelines (reviewed by Viteri, 1997). These include an evaluation of the national food fortification programme in Venezuela, which was shown to be effective in reducing anaemia prevalence in school–age children (Layrisse et al, 1996).

The availability of iron fortificants with increased bioavailable iron and greater stability, together with the potential for multiple nutrient fortification, suggest that fortification is an attractive solution in countries where a significant proportion of vulnerable groups consume centrally processed foods. In Latin America and the Middle East, wheat flour is widely consumed by all population groups and most wheat flour is centrally milled, making the fortification of flour with iron an attractive intervention. The UNICEF survey showed that 42 countries are implementing or strongly considering fortification of flour (wheat or other types) and/or infant cereals with iron. The majority of countries in Latin America and the Caribbean (81%) have already planned or implemented flour fortification programmes, and laws mandating the fortification of flour with iron have been introduced in Chile, Guatemala, Peru, Trinidad and Tobago and Venezuela. Iron fortification of flour is being pursued by well over half of countries in the Middle East and North Africa region (WHO/UNICEF/MI/PAMM, 1996), and the countries of Central Asia have also developed an area–based programme to fortify all wheat flour.

Dietary Diversification

Improvement in supply, consumption and bioavailability of iron in food is an important strategy to improve the iron status of populations. There are two types of dietary iron; haem (present in meat, fish and blood products), and non–haem (present to varying degrees in all plant foods). Non–haem iron is the most important source of dietary iron, especially in many parts of the developing world, where a vegetarian diet is an economic necessity. Leguminous seeds are an important source of iron in many regions, however food supply data indicate that the per capita availability of leguminous seeds is declining, especially in south Asia (FAO, 1992). In general, the availability of iron–rich foods has lagged behind that of energy and protein. This gives cause for concern.

The bioavailability of iron in foods is influenced by other food components and food preparation methods. Vitamin C, meat, fish and an acidic pH all enhance iron absorption. There are many vegetables that are good sources of iron and vitamin C, and the promotion of their use in combinations that favour iron absorption should be undertaken (see Viteri, 1997, p. 17). Phytates, polyphenols and tannins inhibit iron absorption, and decreasing the consumption of foods such as tea, coffee, chocolate and soy products reduces the intake of these inhibitors. There are no programmatic experiences thus far to show that dietary diversification can effectively reduce iron deficiency anaemia.

Status of Other Anaemia Control Programmes

Malaria and intestinal parasites (especially hookworm) are important contributors to anaemia in endemic areas. A number of countries have explicitly included malaria and intestinal helminth control as part of their anaemia control programmes. The UNICEF survey showed that 20 countries have policies of regular de–worming or distribution of anthelmintics to school–aged children (e.g., Cuba, El Salvador, Indonesia, Niger, Sri Lanka, Thailand and Viet Nam). In many countries, de–worming activities are carried out via the school system, but several countries have special bi–annual mass campaigns to de–worm women and children.

In populations where hookworm is prevalent, effective treatment of this helminth infection has been shown to reduce the prevalence of iron deficiency and anaemia in school–aged children (Stolzfus et al., 1997). The role of anthelmintics and micronutrient supplements in the control of iron deficiency anaemia for this age group is also being addressed within the framework of the Partnership for Child Development – an international programme established in 1992 to improve the health, nutrition and education of children through school–based services. Currently, six countries are involved in this programme; Colombia, Ghana, India, Indonesia, Tanzania and Viet Nam. Although each country participating in the Partnership has different priorities for health intervention, all have a core package of interventions – anthelmintics, micronutrient supplements and participatory health education. These address the most common causes of ill–health in schoolchildren and offer greatest benefit at least cost (PCD, 1996).

Until recently, the use of benzimidazole anthelmintics during pregnancy and breastfeeding has been contra–indicated. A recent WHO consultation however concluded that, given the safety of anthelmintics,

'single dose, oral anthelmintic treatment can also be given to pregnant and lactating women' (WHO, 1995a). However, as a general rule, no drug should be given in the first trimester.

Vitamin A deficiency also contributes to anaemia. National policies ensuring vitamin A supplementation of children (reviewed in the previous section of this chapter), are in place in at least 61 countries. In 46 countries, women are routinely provided with a high–dose vitamin A supplement soon after delivery. In many countries, AIDS is also a major contributor to anaemia, particularly severe anaemia, and AIDS control programmes may be expected to play a part in anaemia reduction.

Folic Acid

Folic acid is a water–soluble vitamin needed for DNA synthesis – folic acid is essential for cellular replication and differentiation. Vegetables, especially green leafy vegetables, cruciferous vegetables, legumes, citrus fruits, melons and organ meats are the principle sources of folic acid in the human diet. Fortified breakfast cereals, now widely consumed throughout Central and South America and in parts of the Middle East, make important contributions to folic acid intake in those regions. Dietary intakes will be low wherever effective access to folate–rich foods is limited, or where cooking practices lead to high loss. Folic acid is sensitive to certain storage conditions and to heat, oxidation, and ultraviolet light. It is estimated that 50% to 90% of folic acid in food is destroyed during cooking (Institute of Medicine, 1997, p. 18). Reducing agents such as vitamin C preserve folic acid.

Folic acid deficiency leads to megaloblastic anaemia, a condition where red blood cells are characteristically large and pale. Interest in folic acid has heightened recently because of conclusive findings showing that, in industrialized and Eastern European countries, additional folate consumption during the peri–conceptional period significantly reduces the risk of recurrence of neural tube defects such as anencephaly and spina bifida (MRC, 1991). Recent data also suggest that a poor folate status is related to high blood homocysteine levels, which in turn have been identified as a risk factor for cardiovascular disease (Selhub and Rosenberg, 1996).

Recommended intakes of folic acid for developing countries are expressed in ?g/d (FAO/WHO, 1988). These are 170 ?g/d for female adults, 370–470 ?g/d for pregnant women, and 270 ?g/d for breastfeeding women. This FAO/WHO report advises that folate requirements during pregnancy 'are very high' and strongly recommends daily supplements during both pregnancy and breastfeeding. Folate as well as vitamin B12 requirements are elevated by malaria and other haemolytic conditions (Fleming, 1996). The FAO/WHO recommendations will be brought up to date at an expert consultation planned for late 1998 (FAO, personal communication).

Extent of Folic Acid Deficiency

As an anaemia prevention and control strategy, for many years the WHO has recommended adding 250 ?g of folic acid to iron–containing tablets provided to pregnant women in developing countries (DeMaeyer et al, 1989). As mentioned in the previous section, this level was recently increased to 400 ?g (see page 38). Research conducted in many countries shows that haemoglobin levels during pregnancy improve more when folic acid is given together with iron than when iron alone is given (Baker and DeMaeyer, 1979).

There is a dearth of information on the epidemiology of folic acid deficiency in developing countries. Although data collected over two decades ago suggested that it may be prevalent, more recent studies suggest regional variations. A study conducted in rural Mexico did not identify folic acid deficiency (Black et al., 1994), but rather vitamin B12 deficiency (Allen et al., 1995) among children and pregnant and breastfeeding women. By contrast, studies in South Africa have found that folic acid deficiency is very common among pregnant women in their last trimester (Fleming, 1996). There are no internationally agreed criteria for the establishment of folic acid deficiency as a public health problem in developing countries.

The proportion of anaemia cases that can be attributed to folic acid deficiency in developing countries is generally unknown. FAO/WHO stated about ten years ago that folate deficiency is the second most common cause of nutritional anaemia (FAO/WHO, 1988, p 83). However there are virtually no current epidemiological data to back this up. Similarly there are no data on trends in folic acid status in developing countries. There are numerous nutritional (iron, folate and vitamin B12 deficiencies) and non–nutritional primary causes (e.g., parasites such as hookworm and malaria, and genetic disorders) of anaemia. In addition, both folic acid deficiency *and* B12 deficiency can cause megaloblastic anaemia. Work is needed to describe the current epidemiology of folic acid and vitamin B12 deficiency, and the independent role that these nutrients play in the

development of anaemia in different regions of the world. One attempt to assess relative contributions of different causes of anaemia is presented on page 36 of this Report.

Folic Acid and Neural Tube Defects (NTDs)

Recent findings linking additional folic acid intake during the peri−conceptional period to significantly reduced risk of a recurrent NTD pregnancy led the US Center for Disease Control and Prevention to recommend 4000 ?g/d of folic acid for women who had experienced a previous NTD pregnancy. This amount is to be administered under the supervision of a physician when a pregnancy is planned. Furthermore, the US Public Health Service recommends that all women of childbearing age consume 400 ?g/d folic acid (CDC, 1992). This is in contrast to the existing recommended dietary allowance (RDA) for US women which was set at 180 ?g/d in 1989.

In a controversial decision, the US Food and Drug Administration has approved the fortification of cereal grains with folic acid in an attempt to prevent 1000 cases of NTDs per year in the US. The FDA regulation requires that by January 1, 1998 all enriched cereal grain flours, breads, rice, noodles, macaroni and other grain products be fortified with folic acid at a concentration of 140 ?g/100 g grain. These foods were selected because they are staple products for most of the US population. This will increase average consumption for women of reproductive age by about 100 ?g/d (FDA, 1996). Authorities expressed concern to limit intakes at the upper end because of persons with B12 deficiency who may have a delay in diagnosis.

NTDs do not appear to be more prevalent in developing countries than in industrialized countries (Little and El−wood, 1992). Folic acid−sensitive NTDs are likely to be the result of a genetic defect in the metabolism of folic acid and/or other nutrients such as vitamin B12 (Czeizel, 1995). Women affected by folic acid−sensitive NTD pregnancies may experience mutations in genes coding for folate−dependent enzymes (Whitehead et al., 1995). Although the morbid effects of this genetic disorder are in part overcome by additional folic acid intake, folic acid deficiency does not appear to be the primary cause of NTDs. This may explain why blood folic acid concentrations of women with NTD−affected pregnancies are similar to those with unaffected pregnancies (Picciano, 1996).

The dosage used in the MRC clinical trial was intentionally high, around 4 mg/d. There is evidence that 400 ?g of folic acid daily may be enough to prevent NTDs. This is why the US Public Health Service bases its recommendations for women of reproductive age without a previous history of NTDs on this much tower dosage. Folic acid intakes over 1 mg have the potential of masking vitamin B12 deficiency by correcting the anaemia but not preventing the onset of central nervous system disorders. Since the magnitude of B12 deficiency is virtually unknown on a world scale the potential risks posed by broad implementation of folic acid fortification programmes in the developing world are also unknown. In addition, there is some indication that additional folic acid intake may interfere with the action of some malaria medications (Perez−Escamilla, 1995).

Programmes

Folic acid has been offered along with iron in tablet form for many years in all regions, especially to women during pregnancy. These programmes have historically been justified on the basis of widespread iron deficiency anaemia. Consequently the impact on folic acid deficiency has been relatively neglected (Yip, 1996; Galloway and McGuire, 1996). There are very few documented programmes aimed at reducing folic acid deficiency. One pilot trial in South Africa demonstrated that corn−based meals can be successfully fortified with folic acid and have a positive impact on haemoglobin levels of pregnant women (Fleming, 1996).

Zinc

Introduction

Zinc was shown to be an essential nutrient in the mid−1930s (Todd et al, 1934). It was not until 30 years later, however, that widespread zinc deficiency was identified as the underlying cause of stunted growth and delayed sexual maturation in adolescent boys in western Asia and the Middle East (Prasad et al, 1963). Zinc deficiency is now known to occur in many population groups in developing countries, and is increasingly felt to be an important public health problem (Hambidge, 1997). The main effects of zinc deficiency are poor child growth, delayed maturation, poor appetite and impaired immune function.

Zinc has a role in a large number of metabolic synthetic reactions and is essential for all forms of life. Periods of rapid growth such as infancy, adolescence and late pregnancy, when requirements are highest, are most susceptible to zinc deficiency. Dietary sources of zinc are protein–rich foods including meat, fish and shellfish, and whole grains. Roots and tubers are low in zinc, while zinc in cereal staples is most often poorly bioavailable.

Magnitude and Causes

The prevalence of zinc deficiency is unknown; mild and moderate forms are likely to be widespread and until recently largely overlooked (WHO, 1996).

Zinc deficiency may contribute significantly to growth stunting in young children in many regions (Sandstead, 1991). What has been termed 'protein energy malnutrition', especially low height–for–age, may be due to poor diet quality, including low levels of bioavailable zinc, rather than an inadequate quantity of either protein or energy. Zinc supplementation has been shown to correct growth failure in Canadian young children (Gibson et al., 1989). Linear growth in low–income preschool children in the US has also responded to supplementation (Walravens et al., 1983). Male children may be more at risk than young girls. Zinc deficiency may also contribute to the major causes of morbidity in young children, as shown by studies in India and elsewhere (Sazawal et al., 1996).

A high proportion of pregnant women in developing countries are also likely to be at risk because of habitually inadequate zinc intakes (Gibson, 1994). Zinc deficiency may be particularly widespread among African women. Studies in Egypt (Kirksey et al., 1994), Nigeria (Mbofung et al., 1987) and the former Zaire have all reported low zinc status among pregnant women. In Malawi (Huddle et al., 1998), zinc deficiency among pregnant women, which was confirmed by biochemical indicators, was associated with low intakes of poorly bioavailable zinc, frequent reproductive cycling, and malarial infection. Low energy intakes partly explained the low intakes of zinc in these Malawian women. Other micronutrients were also low, even after adjusting for energy content, confirming the generally poor diet quality of these women. Some zinc supplementation trials have confirmed that zinc deficiency during pregnancy causes poor foetal growth, delivery complications and increased mortality in mothers and their babies (Tamara and Goldenberg, 1996).

Zinc deficiency may be an underlying cause of the very high rates of maternal mortality in Sub–Saharan Africa.

Prevalence of zinc deficiency is probably similar to that of nutritional iron deficiency because the same dietary pattern induces both. Where diets are plant–based and intakes of animal foods tow, the risk of inadequate intakes of both zinc and iron is very high, even when energy and protein intakes meet recommended levels (Gibson, 1994). In these circumstances bioavailability, rather than amount, is the critical factor. Strategies to address zinc deficiency by increasing intake of flesh foods or by decreasing the content of phytates through cereal fermentation, will also improve iron nutrition in deficient populations.

Assessment Issues

There is as yet no single sensitive and specific indicator for zinc deficiency. Dietary sources of zinc need to be quantified, as well as dietary phytate/zinc molar ratios. Work has been frustrated by incomplete information on food composition. Zinc in some plant staples reflects soil levels. Probability estimates for risk of zinc deficiency can be calculated from dietary data atone. However, to determine the severity of zinc inadequacies, dietary information needs to be combined with biochemical and functional indices (Gibson, 1997). Changes in these indices, though, are not specific for zinc (WHO, 1996c). Thus, focusing on zinc as a single deficiency will be particularly problematic in populations where undernutrition is a public health concern. Response to zinc supplementation at physiological levels will more reliably diagnose zinc deficiency; however, this approach is prohibitively costly at the population level in most circumstances.

Recent Research

Important research on the impact of zinc supplementation has been carried out in recent years in a range of settings in developing countries. This research has yielded valuable findings that may be incorporated into advocacy messages and will help to bring zinc higher up on the nutrition agenda. Zinc supplementation has been shown to reduce the prevalence, severity and duration of diarrhoea (Roy et al., 1992; Sazawal et al., 1995). This has significant implications for mortality reduction in many countries. Certain types of malarial morbidity may be reduced by zinc supplementation. Field research done in Papua New Guinea showed that

both clinic attendance and fever were tower in a zinc–supplemented group of children followed for ten months (Shankar, unpublished). The incidence of acute respiratory illness and pneumonia is also responsive to zinc supplementation (Xuan Ninh et al., 1996). Treatment regimes for severely malnourished children produce more rapid weight gain when zinc levels are adequate (Waterlow, 1992, p. 164).

Activity levels and frequency of childrens' play, important for long–term developmental and cognitive outcomes, have increased with zinc supplementation. In an Indian study, zinc–supplemented children spent significantly more time moving about and exploring their environment (Sazawal et al., 1996). Work in China has documented positive effects on neuromotor and cognitive functions in school–aged children living in urban areas (Penland et al., 1997).

Summary

In summary, zinc deficiency is likely to be widespread where animal foods are priced out of reach of the poor and where zinc absorption from plant foods is tow due to high phytate. Prevalence rates are not known and work in this area is hampered because there is no reliable indicator for zinc deficiency. However, a rich research base has accumulated in recent years which will facilitate advocacy efforts as well as help to improve the design of effective community–based strategies to control zinc deficiency. Comprehensive guidelines for zinc supplementation, fortification and dietary–based interventions are in press (Gibson and Ferguson, in press). Dietary modification interventions include improved cereal varieties, addition of enhancers of zinc absorption, and reduction of phytic acid content via phytase hydrolysis induced by germination and fermentation, as well as via non–enzymatic degradation by soaking.

Calcium: an emerging issue for developing countries?

Calcium Requirements and Calcium Deficiency

There is no consensus on the dietary intake needed to ensure calcium requirements are met. Table 19 compares current recommendations by FAO/WHO (FAO/WHO, 1962), the European Union (Commission of the European Communities, 1993) and USA/Canada (Food and Nutrition Board, 1997). Similar contrasts are seen between other advisory bodies. The disparities largely reflect the fact that no nutritional deficiency syndrome for calcium has been defined amongst otherwise healthy individuals, despite a wide variation in calcium intake. In addition, there are resulting differences in emphasis placed on outcomes of calcium balance studies, on estimates of calcium accretion and losses, and, more recently, on the putative relationship between calcium nutrition and osteoporosis.

Animal milks and their products are particularly rich sources of calcium in the human diet. Estimates based on recent FAO Food Balance Sheets show that there is considerable variation (400–fold range) in milk supply between different regions of the world.

Table 19: Selected Examples of Calcium Recommendations

?Ca/d	*USA/Canada[A]*	*EU[B]*	*FAO/WHO[C]*
Adults <50y	1000	700	400–500
Adults >50y	1200	700	400–500
Children 1–3 y	500	400	400–500
Boys 11–18 y	1300	1000	500–700
Girls 11–18 y	1300	800	500–700
Pregnancy women	1000	700	1000–1200
Breastfeeding women	100	1200	1000–1200

In each case, the figures are equivalent to the intake which is deemed sufficient to meet the needs of practically all members of the population, although the nomenclature differs:

A = adequate intake; B = population reference intake; C = practical allowance

There are foodstuffs in the human diet with a calcium content similar to or greater than that of milk. Examples include certain leaves, nuts, shellfish and small, bony fish. In addition, local culinary practices can lead to calcium–rich materials, such as plant ash, lime and herbs, being incorporated into food (Prentice and Bates, 1993). In industrialized countries, there is an increasing trend towards use of calcium supplements and for commercial calcium fortification of foods. However, it is rare for these food components to increase calcium intake to the extent attained with milk and, in general, populations with a low intake of milk and dairy produce have a low total calcium intake.

In a recent WHO/FAO/IAEA (WHO, 1996c) study, the range of intakes for adults was from 210 to 1650 mg/d, with a median value of 760 mg/d. Despite the limited data for many areas of the world, it is apparent that low levels of intake are mostly found in developing countries. Highest intakes are found in countries with diets rich in dairy products. Calcium intake of populations with a low milk supply is generally close to or less than the FAO/WHO practical allowance for adults of 400–500 mg/d and considerably below the 1000 mg/d US/Canadian reference for young adults.

Detailed quantitative studies in a rural Gambian village, typical of many in the sub–Sahelian region, have shown that, although calcium is supplied by a variety of foods and condiments, the overall calcium intake is low, at 300–400 mg/d, and only 7% comes from milk (Prentice et al., 1993; Jarjou et al., 1993).

Epidemiology of Osteoporosis

Osteoporosis is a crippling disease that affects many millions of people worldwide. It is characterized by loss of bony tissue from the skeleton and deterioration of bone structure, and is associated with enhanced skeletal fragility and an increased propensity to fracture under minimal trauma (Consensus Development Conference, 1991). Worldwide variation in the incidence and prevalence of osteoporosis is difficult to determine because of problems of diagnosis. The WHO definition of osteoporosis is a bone mineral content (BMC) or bone mineral density (BMD) that is > –2.5 SD below the young adult mean for the population (WHO, 1994). This is a useful working definition within populations, but it is unhelpful in comparing populations as both BMC and BMD are strongly influenced by body size. Populations of short stature have lower bone mineral status than Western populations but do not have higher rates of clinical osteoporosis (Aspray et al., 1996; Prentice et al., 1994; Russel–Aulet et al., 1993).

Because of this, the most useful comparison between populations is the fracture rate amongst older people. However, this is not without problems. Many fractures, including those of the spine and wrist, are not life–threatening, can be asymptomatic, and may not come to medical attention. Only population–based screening can accurately determine prevalence rates for these fractures, and few such studies have been conducted. Hip fractures are the exception and many countries have hip fracture registers that can be used to estimate incidence. Even so, quantitative data from many developing countries are scarce, and may be unreliable, given the lack of access to medical facilities by older people in these regions and the uncertainties of determining exact age and cause of fracture in those populations.

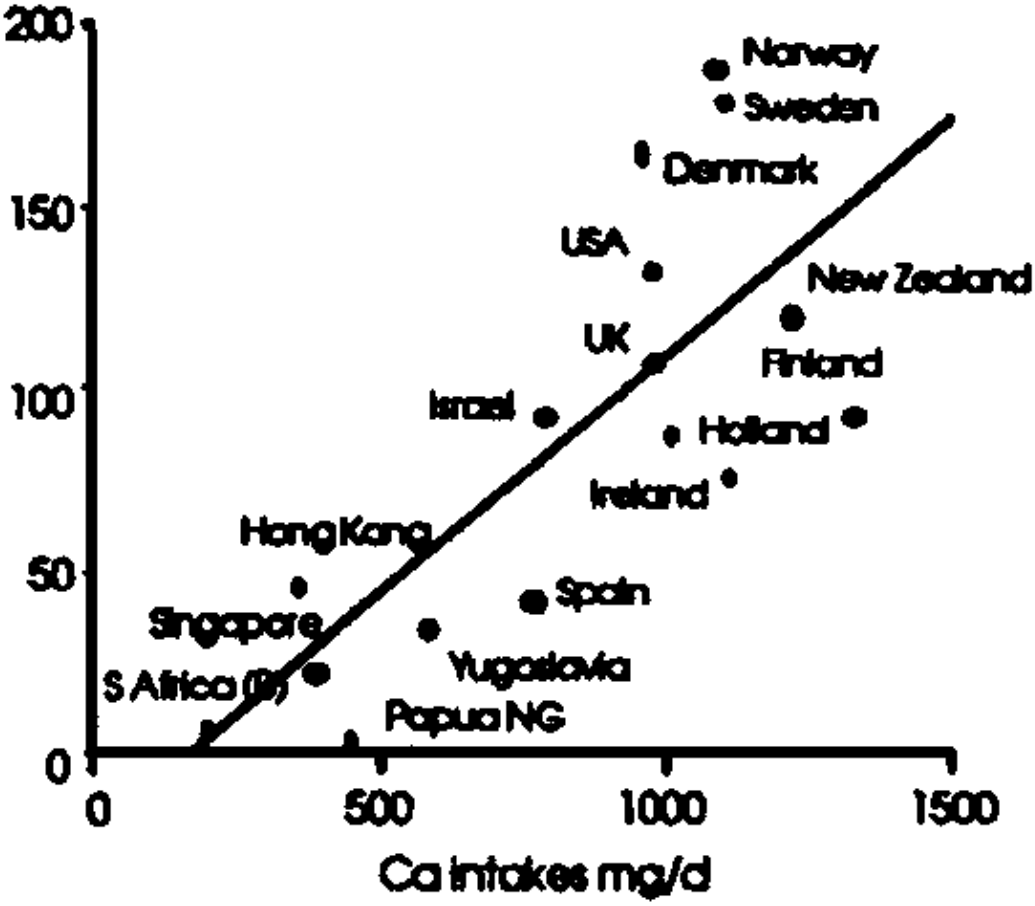

Figure 7: Hip fracture and Calcium Intake

Source: Abelow, Holford and Insogna (1992)

Despite these caveats, the current consensus is that approximately 1.66 million hip fractures occur worldwide each year. The incidence is set to increase fourfold by the year 2050 because of the increasing numbers of older people. Age−adjusted incidence rates are many times higher in Western countries than in Asia and Sub−Saharan Africa (Abelow et al., 1992). Countries in developmental transition, such as Hong Kong, have seen significant increases in age−adjusted fracture rates in recent decades while Western countries appear largely to have reached a plateau (Lau and Cooper, 1996). In countries with high hip fracture incidence, rates are higher amongst women (up to fourfold) but in the countries where rates are low, men and women are more equally affected (Maggi et al., 1991).

Role of Calcium in Osteoporosis

The reason for this large variation in fracture incidence is unknown. Many theories abound, including effects at the genetic, anatomical, biochemical, nutritional and lifestyle level (Prentice, 1997). There is increasing evidence that the variation is not due specifically to differences in the deterioration of bone mineral mass, since bone loss at the menopause and low bone mineral status in old age appear to be universal phenomena (Aspray et al., 1996). Other aspects of bone health, such as turnover, microstructure and resilience, or propensity to fall, are likely to be more important factors.

Because calcium is a major bone−forming mineral, it has long been assumed that primary or secondary calcium deficiency must, in some way, underlie osteoporosis and fracture risk. The evidence that a low calcium intake is implicated in osteoporosis is, however, equivocal. On a worldwide basis, calcium intake cannot explain variation in osteoporosis since, paradoxically, those countries with a low calcium intake have low hip−fracture incidence, while the highest rates of fracture occur in those populations with a high calcium intake (Figure 7).

A recent meta−analysis relating fracture incidence to habitual calcium intake showed a 4% reduction in fracture risk associated with an increment of 300 mg/d in groups of postmenopausal women with mean calcium intakes varying from 168−700 mg/d (Cumming and Nevitt, 1997). Whether these results represent the correction of an underlying nutritional deficiency or are due to a pharmacological action of calcium by

suppressing bone resorption is not known. It is also unclear whether the same effects can be achieved by dietary modification without the use of mineral (or vitamin D) supplements, or indeed whether calcium alone is always the limiting nutrient.

Calcium supplementation has been shown to increase bone mineral in children and adolescents. However, there is evidence that this is reversed once the supplement is withdrawn and that calcium supplementation is associated, as with the elderly, with a decreased bone turnover. Whether this represents a benefit for the growing skeleton is uncertain (reviewed by Prentice, 1995).

Also unknown is whether the results of studies conducted in Western populations, where osteoporosis is common, are relevant to developing countries, where fracture rates are low. Recent studies in China, the Gambia and Hong Kong have shown positive effects of calcium supplements on bone mineral of older women and of children and adolescents (Lee et al., 1994; Dibba et al., 1997; Lau et al., 1992) but not on bone mineral status or breastmilk calcium secretion of breastfeeding women (Prentice et al., 1995). The results were similar to those obtained in studies conducted in Australia, the UK and the USA both in the skeletal regions that responded and in the magnitude of the effects. This suggests there are no fundamental differences in calcium biology between people in developed and developing countries.

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Chapter 3: The Nutrition of Refugees and Displaced Populations

INTRODUCTION

This chapter is a summary of the ACC/SCN's *Reports on the Nutrition Situation of Refugees and Displaced Populations* which are published quarterly. Using information available from January 1995 through mid–1997, it is intended to update information that was presented in the *Update on the Nutrition Situation, 1994* (ACC/SCN, 1994). Much of the background and explanatory information that was presented in the original chapter is not repeated here.

Assistance by the Office of the United Nations High Commissioner for Refugees (UNHCR) is provided to over 26 million people worldwide – either refugees, internally displaced people (IDPs) or returnees – representing one out of every 220 people in the world (UNHCR, 1996). The total number of refugees alone worldwide has continued to decrease, albeit marginally, due mainly to a reduction in the number of Afghan refugees in Pakistan, and to repatriation movements in the former Yugoslavia, the Benin/Ghana/Togo region, Kenya, and Mozambique region. Figure 8 illustrates the trends in numbers of refugees (both assisted and unassisted) over the last 25 years, based on data provided by UNHCR.

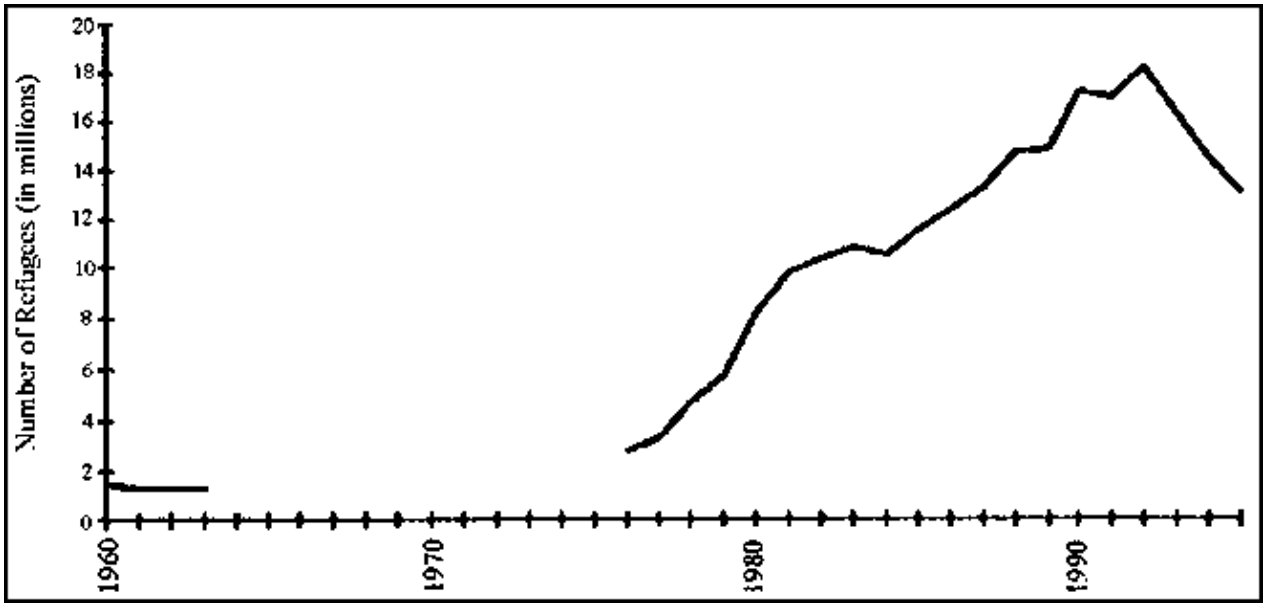

Figure 8.: Trend in the Global Number of Refugees 1960–1995

Figures on internally displaced people are far more difficult to obtain, but a variety of sources estimate that there are at least 30 million internally displaced people worldwide (UNHCR, 1996). In the situations involving IDPs covered by the *Reports on the Nutrition Situation of Refugees and Displaced Populations,* total numbers affected appear roughly stable during the time period covered in this chapter.

However, based on information available to the ACC/ SCN, it is apparent that although the total number of refugees and displaced people in Sub–Saharan Africa is decreasing, the number estimated to be at heightened nutritional risk, defined as high levels of wasting and/or mortality due often to factors like inaccessibility, has remained roughly constant. Furthermore, the sociopolitical situation in many countries in mid–1997, notably the Great Lakes region and Somalia, is very tense and could easily deteriorate, leading to population displacement, which in many cases may involve the second or third such displacement in as many years for a very large number of already destitute people. Trends in population numbers and associated nutritional risks in Sub–Saharan Africa are shown in Figure 9.

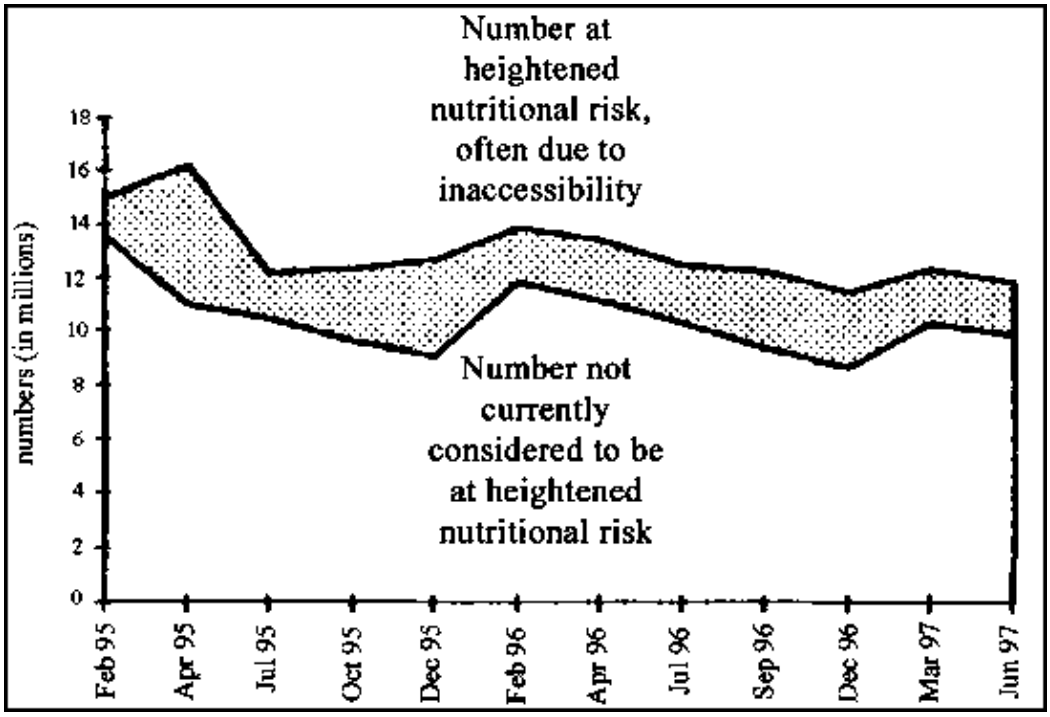

Figure 9.: Number (in millions) of Refugees and IDPs in Sub–Saharan Africa and Nutritional Risk over Time

Box 4: Indicators

WASTING is defined as less than –2SDs, or sometimes 807. wt/ht by NCHS standards, usually in children of 6–59 months. For guidance in interpretation, prevalences of around 5–10% are usual in African populations in non–drought periods. We have taken more than 20% prevalence of wasting as undoubtedly high and indicating a serious situation; more than 40% is a severe crisis. **SEVERE WASTING** can be defined as below –3SDs (or about 70%). Any significant prevalence of severe wasting is unusual and indicates heightened risk. (When "wasting" and "severe wasting" are reported in the text, wasting includes severe – e.g. total percent less than –2SDs, *not* percent between –2SDs and –3SDs.) Data from 1993/4 show that the most efficient predictor of elevated mortality is a cut–off of 15% wasting (ACC/SCN, 1994, p81). Equivalent cut–offs to –2SDs and –3SDs of wt/ht for arm circumference are about 12.0 to 12.5 cms. and 11.0 to 11.5 cms, depending on age. **BMI** (wt/ht^2) is a measure of energy deficiency in adults. We have taken BMI<18.5 as an indication of mild energy deficiency, and BMI<16 as an indication of severe energy deficiency (WHO, 1995).

OEDEMA is the key clinical sign of kwashiorkor, a severe form of protein–energy malnutrition, carrying a very high mortality risk in young children. I+ should be diagnosed as *pitting* oedema, usually on the upper surface of the foot. Where oedema is noted in the text. it means kwashiorkor. Any prevalence detected is cause for concern.

A CRUDE MORTALITY RATE in a normal population in a developed or developing country is around 10/1.000/year which is equivalent to 0.27/10,000/day (or 8/10,000/month). Mortality rates are given here as "times normal", i.e. as multiples of 0.27/10,000/day. [CDC has proposed that above 1/10,000/day is a very serious situation and above 2/10,000/day is an emergency out of control.] Under–five mortality rates (U5MR) are increasingly reported. The average U5MR for Sub–Saharan Africa in 1995 was 175/1,000 live births, equivalent to 1.4/10,000 children/day, and for South Asia the U5MR was 0.7/10,000/day (see UNICEF, 1997, p. 98).

FOOD DISTRIBUTED is usually estimated as dietary energy made available, as an average figure in kcals/person/day. This divides the total food energy distributed by population irrespective of age/gender (kcals being derived from known composition of foods); note that this population estimate is often very uncertain. The adequacy of this average figure can be roughly assessed by comparison with the calculated average requirement for the population (although this ignores maldistribution), itself determined by four parameters: demographic composition, activity level to be supported, body weights of the population, and environmental temperature; an allowance for regaining body weight lost by prior malnutrition is sometimes included. Formulae and software given by James and Schofield (1990) allow calculation by these parameters, and results (Schofield and Mason, 1994) provide some guidance for interpreting adequacy of rations reported here. For a healthy population with a demographic composition typical of Africa, under normal nutritional conditions and an environmental temperature of 20° C, the average requirement is estimated at 1,950–2,210 kcals/person/day for light activity (1.55 BMR). Raised mortality is observed to be associated with kcal availability of less than 1500 kcals/person/day (*ACC/SCN*, 1994, p. 81).

INDICATORS AND CUT–OFFS INDICATING SERIOUS PROBLEMS are levels of wasting above 20%, crude mortality rates in excess of 1/10,000/day (about four times normal – especially if still rising), and/or significant levels of micronutrient deficiency disease. Food rations significantly less than the average requirements, as described above, for a population wholly dependent on food aid would also indicate an emergency.

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There are success stories to be noted, for example the successful completion of repatriation of Mozambican refugees, the gradual improvement of access to populations in need in Angola leading to a dramatic improvement in nutritional status, and the maintenance of levels of wasting less than those seen in the host population among Bhutanese refugees in Nepal. Another important example is the situation in the Great Lakes region, where humanitarian aid was delivered to over two million refugees and IDPs. More specifically, elevated levels of wasting and high crude mortality rates in the Goma camps in the former Zaire were rapidly brought under control and remained below rates seen in the local population throughout 1996. Efforts are underway to better understand how beneficiaries obtain food from all available sources, e.g. food aid, markets, trading, gardens, in order to better target the food aid available for maximum benefit.

The situations described in this chapter need to be viewed against a backdrop of decreasing global availability of food aid. While response to World Food Programme (WFP) appeals for food aid for emergency situations continues to be generous, there is a continuing downward trend in the resourcing for development projects. This could have longer–term implications for the ability of populations to avert or withstand future emergency events.

This chapter is divided into four main sections. First there are summaries of refugee or IDP situations which include information on some situations in Asia and in Sub–Saharan Africa. Within the first section, each country summary begins with background information and the numbers affected so as to give context. Details on nutrition and food security are then presented, often in chronological order, followed by concluding paragraphs). In the case of regional situations, the country summaries are preceded by a regional overview, and overall conclusions are drawn at the end of the country summaries for that region. Micronutrient malnutrition is discussed in the second section, and the third section offers some summary statistics. The concluding section aims to draw out trends based on the information presented and to highlight issues needing further consideration.

Asia

The estimated number of refugees in Asia decreased by 22% from the end of 1993 (5.8 million) to the end of 1995 (4.5 million). Numbers of internally displaced people are difficult to determine with any accuracy, but are at least 1.7 million. For the three situations included here (Afghanistan, Bhutanese refugees in Nepal, and refugees from Rakhine State, Myanmar in Bangladesh), the population in need of emergency programme support has decreased due to the attainment of self–sufficiency of many Afghan refugees in Pakistan, and the on–going repatriation of refugees from Bangladesh to Rakhine State, Myanmar. To give the context with which to interpret some of the nutritional data below, WHO estimates that regionally in South Asia, 17.3% of children under five years old (non–refugees) are wasted (weight/height <–2SD, see Box 4 on page 54).

Afghanistan Region

It has been almost 18 years since civil war broke out in Afghanistan, leading to the displacement of at least five million people. A great many are still displaced within Afghanistan, and over 2.5 million people are living as refugees in Iran and Pakistan. Many of these refugees have attained self–sufficiency in their host countries and do not require humanitarian assistance.

Afghanistan Fighting continued sporadically during 1994 in many parts of the country, although a brief lull in the conflict led to the return of large numbers of displaced people to Kabul in 1995. However, fighting resumed as the Taliban, an Islamic fundamentalist student group, waged an offensive against the government. This led to further population displacements from the capital, with many settling in the IDP camps in Jalalabad. The Taliban eventually took control of most of Afghanistan, including the capital, Kabul. Food supply lines to Kabul were periodically blocked, with prices for most food commodities increasing dramatically. As a result, the population of Kabul faced severe economic hardship, and many people were forced to sell off key assets in order to survive. Once again, the population of Kabul was forced into destitution merely to buy their daily food.

The attainment and maintenance of an adequate nutritional status in Kabul, particularly over the winter months (November to March), has been made possible in large part to the efforts of the international humanitarian community in providing aid, such as fuel, and wheat for bakery subsidy programmes. Nutritional data from the end of 1994 showed 28–40% wasting (using a QUAC stick which measures upper arm circumference for height). Although not directly comparable, survey results from November 1995 indicated a

marked improvement in the situation, with only 6.2% malnutrition. A survey in May 1996 confirmed the improvement, finding 6.7% levels of wasting. No cases of oedema were noted.

There was some fluctuation in the nutritional situation in the camps for the displaced outside of Kabul. This may have been due to persistent problems in supplying sufficient quantities of clean water to the populations. For example, levels of wasting in New Hadda camp near Jalalabad were measured at 6.2% in December 1994. At that time, measles immunization coverage was only 34.7%. In March 1995, wasting was measured at 6.7%, and in September 1995 levels of wasting had risen to 11%. By December 1995, wasting was measured at 4.0% and the measles immunization coverage had risen to 79%, which was higher than coverage for the surrounding local population.

A massive immunization campaign was carried out in Afghanistan in June–July 1996. Over five million children were immunised against polio, measles and DTP. At the same time vitamin A capsules were distributed. In addition, over two million women of child–bearing age were immunized against tetanus.

Areas under Taliban control have been under strict Islamic laws, many of which prevent women from working outside of the home, driving or attending school. This presented serious ethical and practical dilemmas for humanitarian agencies working in Afghanistan. For example, in many situations both international and local female agency staff were not allowed to work. In other cases, income–generating projects for women were stopped, and girls were not allowed to attend school. It was difficult for international agencies to work under these conditions, with their aid benefiting only a portion of the population, and certainly not reaching the most vulnerable, who were made more so by these legislative changes. A few of these restrictions have been subsequently relaxed, and in some cases women are being allowed to work.

Pakistan Despite the unstable security situation in Afghanistan, many refugees in Pakistan had repatriated by the end of 1995, leaving 860,000 refugees out of an initial population of 1.2 million. Many of those remaining were believed to be self–sufficient, and assistance is now only provided for targeted vulnerable groups such as children, the elderly, the disabled, families without an able–bodied adult male and new arrivals. Nutritional surveys in October 1995 showed a generally satisfactory nutritional situation for these refugees, with levels of wasting measured at 0.9–6.0% (below levels found in the general population).

Iran Most of the 1.4 million Afghan refugees in Iran are living and working among the local population. There are no current nutritional data on these refugees, but there is some concern that, as the general economic situation in Iran worsens, it could become more difficult for them to find work so that they may eventually become nutritionally vulnerable.

A major issue arising from experiences over the period under review involves ethical questions concerning working with a discriminatory government. Once the Taliban took control of most of Afghanistan, agencies were forced to deal with a government which discriminates openly against women. It has been difficult for agencies to balance the principles of neutrality and impartiality with equity. This was clearly a problem since the most vulnerable groups – those most in need of aid, in this case women – had restricted access to services. In many cases, aid programmes have continued and negotiations to improve the access of women to available food and health service programmes are on–going.

Rakhine State, Myanmar in Bangladesh

Between December 1991 and March 1992, approximately 250,000 people fled from Rakhine State (then called Arakan state) in Myanmar (then Burma) to Bangladesh. Repatriation began in 1994 and was planned to be completed by the end of 1995. The repatriation process proceeded more slowly than planned, and currently there are 21,000 refugees remaining in two camps in Bangladesh.

At the end of the 1995, there were about 50,000 refugees remained in Bangladesh. The nutritional status of this population had remained satisfactory. A survey in August 1995 showed levels of wasting of 9%. The general ration, which contained fortified blended food, has consistently provided over 2000 kcals/person/day. Despite this, low levels of vitamin B2 deficiency (seen as angular stomatitis) continued to be seen. Investigations into possible reasons for this are continuing.

By the end of 1996, the nutritional status of the smaller number of refugees remaining in Bangladesh showed a deterioration as compared with 1995 information. Wasting was over 15%. It was felt that this deterioration could possibly be attributed to that fact that 'healthier' refugees had already repatriated. Supplementary feeding programmes were initiated to address this problem.

Since the beginning of the repatriation efforts, questions have been raised about the voluntary nature of the process. A report in mid−1996 stated that:

'The repatriation of Rohingya refugees from Bangladesh cannot be considered fully voluntary...

Most Rohingya refugees in Bangladesh believe they have no choice but to return to Burma (Myanmar). Although refugees who may fear repatriation have ample opportunity to inform UNHCR that they do not wish to return to Burma (Myanmar), most do not see such opposition to repatriation as a viable alternative.' (USCR, 1997, p. 127).

Bhutanese Refugees in Nepal

There are estimated to be 92,000 Bhutanese refugees in Nepal. Most of these refugees arrived in the early 1990s, allegedly fleeing persecution in Bhutan. There are currently no plans for the repatriation of these refugees. Levels of wasting in the camps are low; a survey in July 1995 showed 5.7% wasting, and in October 1996, 2.4% (see Figure 10). These prevalences are below those found in the host community.

Cases of micronutrient malnutrition (scurvy, pellagra, beri−beri) were noted in both surveys, and although incidence rates were tow, new cases continued to be reported. Some possible explanations for persistently low levels of micronutrient deficiencies, despite the inclusion of fresh vegetables and a fortified blended food in the general ration, include: mis−diagnosis (especially of scurvy and beri−beri as the symptoms are somewhat vague and can easily be confused with other medical conditions), the sale or exchange of key food commodities containing micronutrients, and intra−household food distribution and consumption patterns which restrict access of some household members to essential micronutrient containing foods.

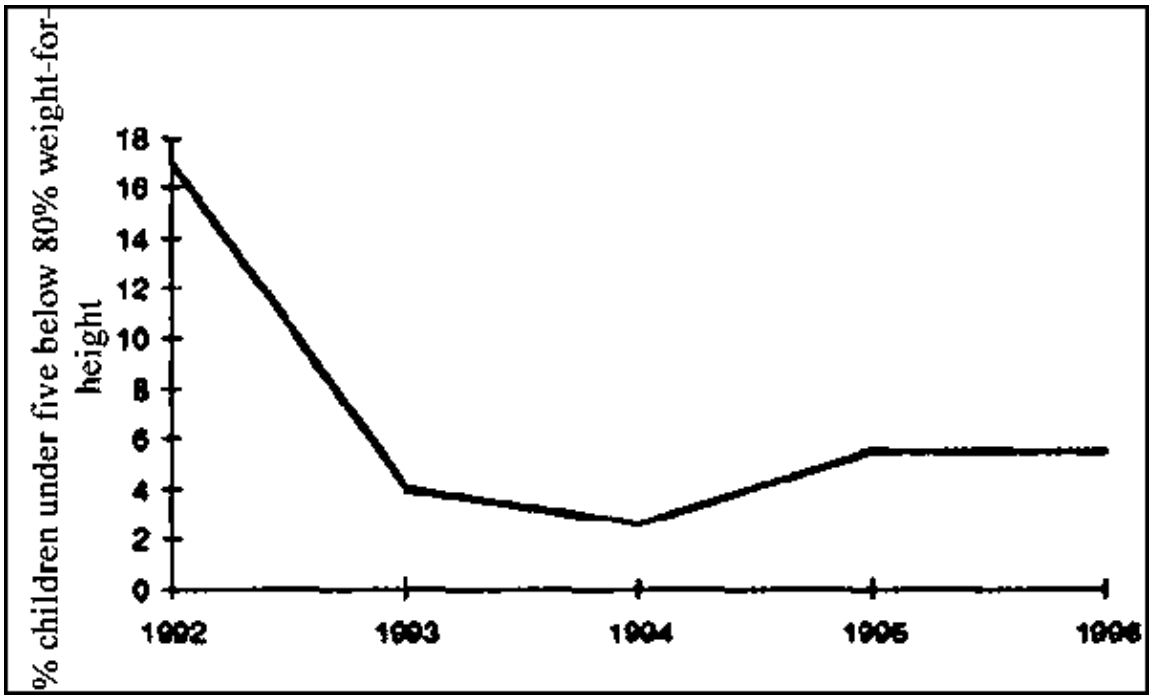


Figure 10.: Nutrition Survey Results for Bhutanese Refugees in Nepal over Time

Taken from: SCF(UK) (1997) *Household Food Assessment of Khudunabari and Beldangi Refugee Camps, Jhapa District, South−East Nepal* SCF(UK). London**.**

Sub−Saharan Africa

Introduction

In the middle of 1997, there were at least 11.8 million refugees and internally displaced people in Sub−Saharan Africa. Most of this population have been affected by nine national and regional emergency situations, the two largest being the Burundi/Rwanda (Great Lakes) region and Liberia/Sierra Leone, which together account for over half of the total refugees and internally displaced people. Descriptions of the

nutrition situation for the refugees affected in the nine largest emergency situations are given in the sections below.

Approximately two million of these refugees and displaced people were considered to be at heightened risk of mortality in June 1997, on the basis of data showing elevated levels of mortality and/or wasting, lack of access to populations identified as being in need of aid, or the presence of micronutrient deficiency diseases. To give context, levels of wasting between 6.0–9.5% are estimated by WHO to be usual in Sub–Saharan Africa. The number of refugees and displaced people can vary quite dramatically during an emergency. One way to assess the magnitude of an emergency situation is to calculate the number of person–years over which a population have been affected, as in Table 20. The number of person–years at high risk are also calculated.

Table 20.: Refugee and Displaced Populations in Sub–Saharan Africa

Country	Number of Person–Years 1994–Jun 97	Number of Person–Years at high Risk 1994–Jun 97
Sudan	2,513,492	133,542
Rwanda/Burundi	3,403,048	1,288,479
Angola	1,903,792	143,779
Liberia/Sierra Leone	2,965,183	755,179
Mozambique Region	838,283	28,333
Somalia	614,500	346,458
Shaba, Zaire	565,000	188,833
Ethiopia	372,644	143,188
Kenya	207,788	54,738
TOTAL	13,383,730	3,082,529

Source: *RNIS Reports #3–20*

A common characteristic among all these situations is that the displacement of many people has largely been due to civil wars, which in many instances have been compounded by other factors such as crop failure. These conflicts have not only led to large–scale displacement, but have often rendered large population groups inaccessible to humanitarian aid. Some humanitarian relief provision is possible inside areas of conflict and undoubtedly mitigates the very worst effects of the emergency. Aid workers often risk their lives, and sometimes die, in an effort to provide aid.

However, relief provision in these circumstances, i.e. Liberia, Sudan and Burundi, is often on an *ad hoc* basis as security permits. These situations have necessitated an adaptation of the usual strategies on the part of humanitarian agencies to a form of "hit and run" procedure where rapid assessments are immediately followed by food aid distributions which may provide as little as one month's supply of food.

Frequently, the end of a war does not guarantee that people can easily return home and re–build their lives. In Angola and Mozambique, the indiscriminate use of landmines during the conflict meant that much arable land could not be used until the time–consuming and costly process of mine clearance had been completed. Many people, therefore, remain dependent on food aid long after a conflict because it is too dangerous to farm in former conflict zones. In addition, the infrastructure of a country is often seriously damaged or destroyed, necessitating a phase of reconstruction, particularly of road and health systems.

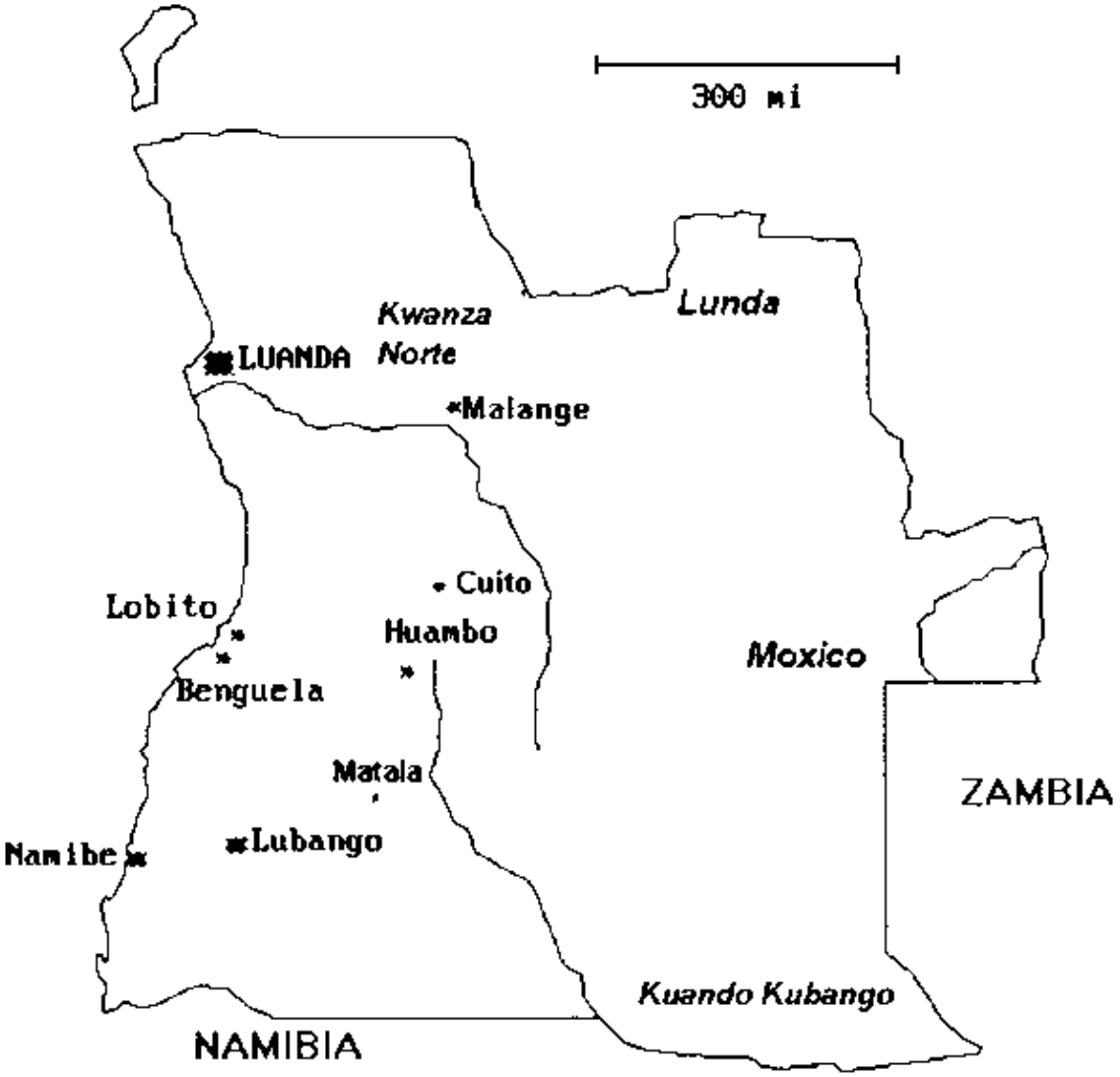
In some circumstances refugees and IDPs may be afraid to return home out of fear of persecution. This was one of the stated reasons given as to why many Rwandan refugees remained in the former Zaire and Tanzania. However, an eruption of civil war in Eastern Zaire (now the Democratic Republic of Congo) during 1996 and an ultimatum by the Tanzanian government eventually led to a massive repatriation of Rwandan refugees. This experience raises issues around the concept and perception of 'voluntary' repatriation.

Angola

Following independence in 1975, a civil war gripped the country and continued for almost 20 years. A series of agreements concluded over those years, which were designed to end the conflict, finally resulted in national elections being held in 1992. However, the results of these elections were not accepted by UNITA rebels, and renewed fighting followed. The peace accord that was signed in November 1994 finally ended almost two decades of civil war. At the time of the signing of the peace accord, at least 3.2 million people were in need of emergency food aid in Angola, approximately 32% of Angola's population. In addition, it was estimated that 300,000 people were living as refugees, mainly in what was then Zaire and Zambia.

At the beginning of 1995, there were some 3.2 million people requiring humanitarian assistance in Angola. By the end of the year the number had decreased to 1.4 million, due to reasonable harvests as a result of provision of agricultural inputs and better access to land, and to improved food aid deliveries. However, only a small number of Angolan refugees have repatriated from the Democratic Republic of Congo and Zambia.

As peace was established, many areas became accessible to humanitarian agencies. In the course of 1995, enhanced security and the clearance of land–mines meant that more humanitarian aid could be transported by roads rather than by more expensive air transport, which was the main mode of transport at the height of the conflict. The experience and pattern of humanitarian aid activities were broadly similar throughout the country. Very high levels of wasting were identified in newly accessible areas and, if security permitted, the regular provision of emergency food aid and essential medical care almost always brought the situation rapidly under control.



Map 1.: Angola

For example, a survey in Cafunfu, Lunda Norte Province, in May of 1995 showed 29% wasting and/or oedema, with 20% severe wasting and/or oedema. Mortality rates were 20 times normal. A general ration programme began in mid–May, and a follow–up survey in July 1995 showed 2.8% wasting and/or oedema

with 0.9% severe wasting and/or oedema. This marked improvement was believed to reflect a number of factors including: food aid provision, previous mortality of children under five and renewal of economic activities amongst the affected population.

In Mexico province, wasting levels were over 20% in April 1995. By the end of the year, food delivery capacity had improved, due largely to improved access. Nutrition surveys at the end of 1995 showed 6.0% wasting and/or oedema.

In many areas, such as Zaire Province and Menongue, a continued lack of basic health services was identified as a major factor contributing to persistently high levels of wasting. While substantive health interventions are now taking place in many areas (e.g., immunization campaigns in Malange), the urgent need to improve immunization coverage and general health service provision is still recognized in many parts of the country.

One legacy of the conflict has been the extraordinarily large number of land–mines throughout the country. This served to restrict movement of humanitarian aid and prevent the resumption of normal life as many farmers are unable to farm their fields, thereby prolonging the dependency on humanitarian aid. De–mining in Angola is a major undertaking, that is likely to continue for some time.

Although considerable reconstruction and development of infrastructure in Angola is taking place, especially with respect to land–mine clearance and rebuilding the health system, in mid–1997 there were signs of a deterioration in the security situation in some regions of the country and efforts are now being made to contain the situation.

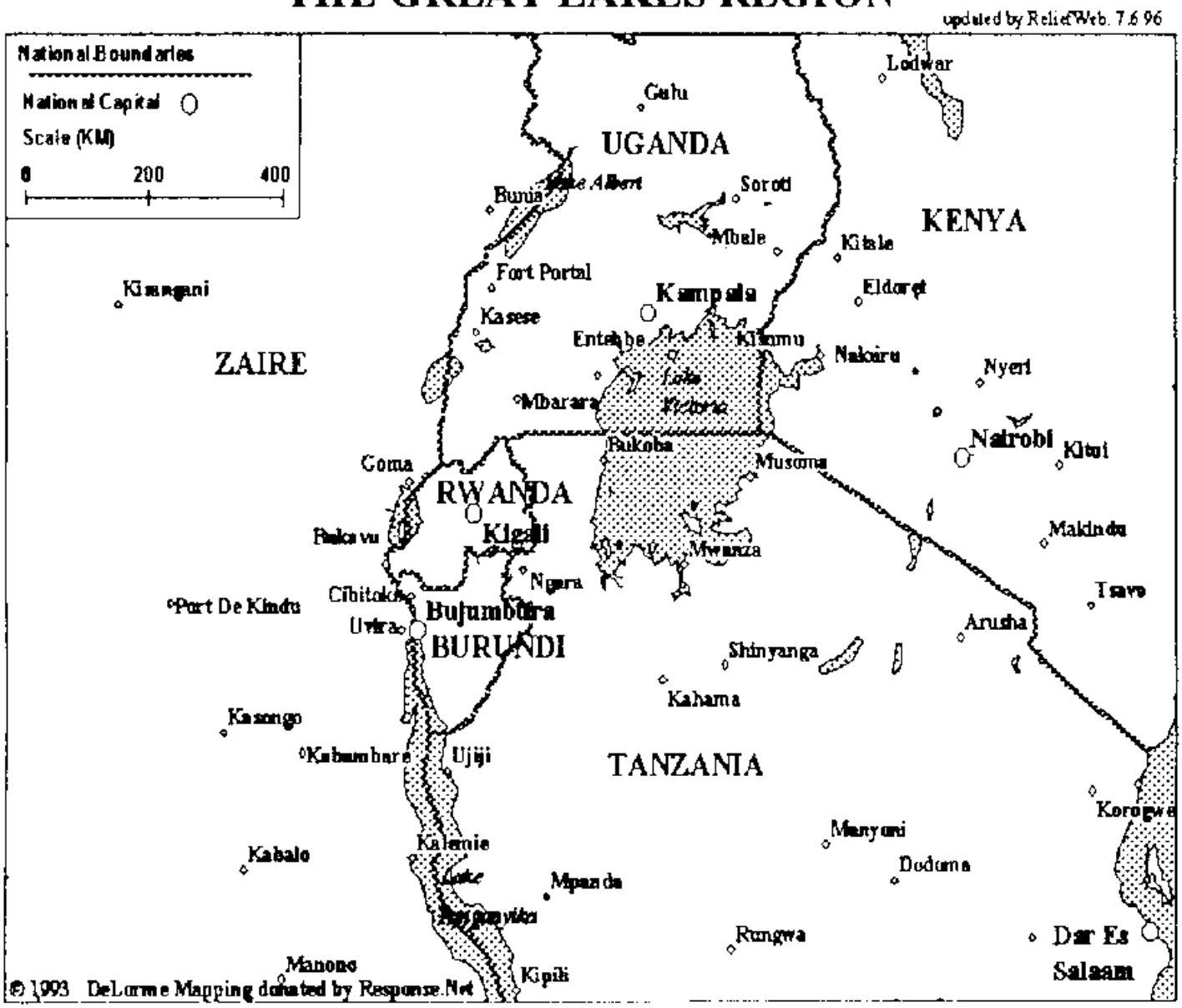
Burundi/Rwanda (Great Lakes) Region

The death of the Rwandan president in April 1994 signalled the start of a genocide that left at least 500,000 dead and led to the displacement of up to five million Rwandans, either internally or as refugees to neighbouring Burundi, the former Zaire and Tanzania. The generally successful provision of emergency aid to this enormous number of people, particularly given the scale and speed of the influx, represents a substantial achievement for the international community.

One reason for this success was the regionalization of emergency food aid provision. This meant that food aid was made available to the region, and was allocated within the region as needs arose. This gave the humanitarian community considerable flexibility in responding rapidly to needs.

Continued insecurity during 1995 and into 1997 in Burundi forced approximately 300,000 Burundis to seek refuge in the Democratic Republic of Congo and Tanzania, and led to repatriation of the approximately 200,000 Rwandan refugees in the country. During this period, a further 200,000 people have been estimated to be internally displaced in Burundi at any given time, although many were only displaced for short periods. Continuing insecurity throughout 1996 and into 1997 led to the government's formation of 'regroupment camps'. The army grouped approximately 200,000 civilians into these camps in order to better protect them from continuing violence. Reports indicated that the health and nutrition situation of these populations was poor.

In the first six months of 1996, the situation for the refugee population appeared to deteriorate. The governments of the former Zaire and Tanzania grew frustrated with a lack of progress in the repatriation of Rwandan refugees. In the case of the former Zaire, this led to restrictions on economic activities of refugees, and restrictions of services provided in many camps to only those considered essential for the refugees. In Tanzania, there were also restrictions on refugees' activities, although the measures taken did not appear to be as drastic as those in the former Zaire. The security situation in Burundi also deteriorated in the first half of 1996, despite international efforts to stop the fighting. This insecurity led to further population displacements within Burundi and also prevented most aid agencies from working, particularly in the northern provinces.



Map 2.: Great Lakes Region

Map taken from ReliefWeb.

The second half of 1996 was characterized by massive population movements. Ethnic fighting in what was Eastern Zaire led to the return of almost a million Rwandan refugees and a smaller number of Burundi refugees. At the same time, this fighting led to the displacement of many people in Eastern Zaire, some of whom remained in the former Zaire, but many of whom sought refuge in Tanzania and Rwanda. The security situation continued to decline in Burundi, leading to the further displacement of people within Burundi and to Tanzania. At the end of 1996, almost 500,000 Rwandan refugees in Tanzania returned to Rwanda.

Further population movements were seen in Eastern Zaire in early 1997 as the rebel forces of the Alliance of Democratic Forces for the Liberation of Congo (ADFL) led by Laurent–Desire Kabila, swept across the country and eventually took power in May 1997. The country was immediately renamed the Democratic Republic of Congo (DRC). Hundreds of thousands of Zairians were internally displaced, and the refugees remaining in the country moved from one makeshift camp to another, with barely time for humanitarian aid to arrive between moves. At the time of writing, there were estimated to be 200,000 refugees unaccounted for in Eastern DRC.

Democratic Republic of Congo (DRC) The nutritional status of refugees in the former Zaire improved in 1995–96 so that levels of wasting in the camps were about the same or lower than what would be expected in

the host population. The security situation during 1995 was relatively calm, so that food aid deliveries were unaffected by security incidents. However, logistical factors and political considerations often determined that food aid deliveries were incomplete. Figure 11 shows levels of wasting in the camps by year.

In the last six months of 1996, ethnic conflict between Tutsi rebels and the army in Eastern DRC, which had been "simmering" at a low level, erupted. This escalation was possibly fanned by the presence of many Hutu militia in the camps. The fighting spread rapidly and led to the dispersement of the refugee camps, first in the Goma region, then in Bukavu and Uvira. In addition, hundreds of thousands of Zairians were internally displaced and a small number of Zairians crossed the border into Rwanda (see section below on Rwanda for details).

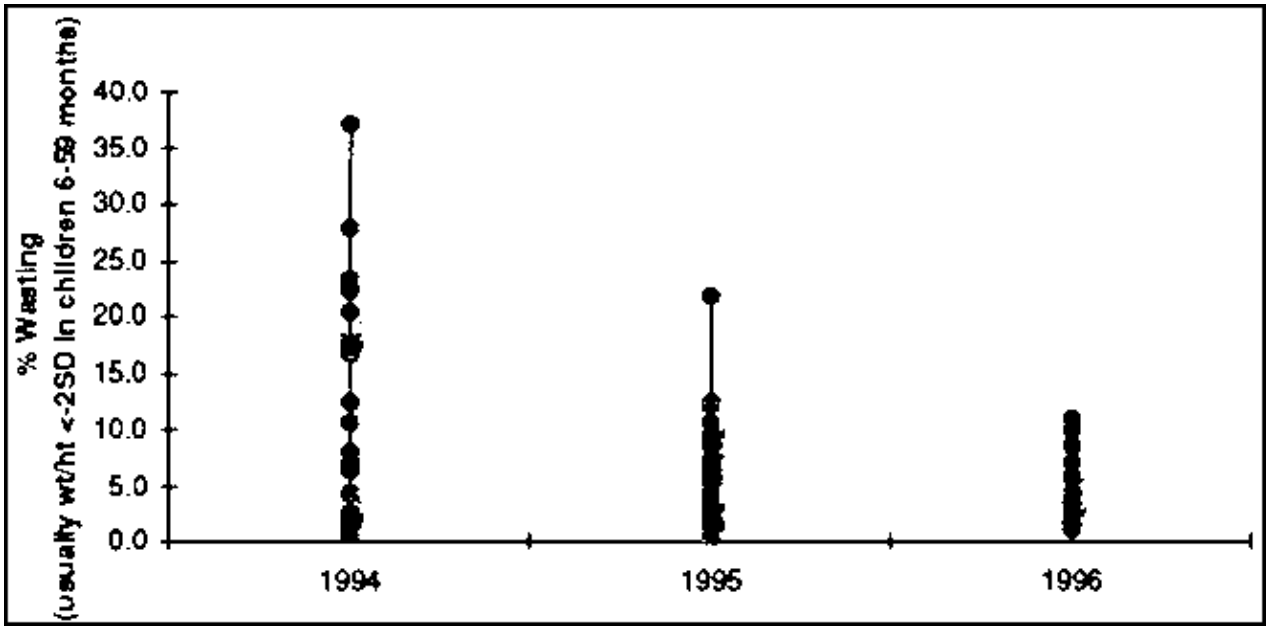


Figure 11.: Levels of Wasting in Camps for Rwandan Refugees, in the former Zaire

Massive numbers of Rwandan refugees began returning home at the end of October 1996, although many had spent several weeks in the bush prior to crossing the border. By December, it was estimated that almost a million refugees had returned. There remained, at the end of 1996, an estimated 300,000 Burundi and Rwandan refugees in Eastern DRC, and an unknown number of internally displaced Zairians. Access to these populations was very limited so that there was mounting concern over the health and nutrition situation of this population, with anecdotal reports of rising malnutrition and mortality.

The Alliance of Democratic Forces for the Liberation of Congo (ADFL) swept across the country in early 1997, arriving in Kinshasa in May 1997 and taking control. The advance westward of Kabila's forces meant that refugees were continually forced to move from one makeshift camp to another, with barely enough time between moves for the delivery of humanitarian aid. Mortality rates were measured at ten times normal in these camps, and cholera outbreaks were reported.

By mid–1997, many refugees and IDPs had either repatriated or returned home. It is estimated, however, that there are up to 200,000 refugees remaining in the eastern part of the country.

In *Goma, DRC,* the nutrition situation for the approximately 730,000 Rwandan refugees was stable throughout 1995 and the first half of 1996. Levels of wasting were below what would be expected in the host population and varied from 1.6–3.5% (see box on page 54), despite a ration which provided on average 1500 kcals/person/day, but sometimes as little as 800 kcals/person/day.

There were approximately 27,000 new arrivals from Burundi at *Uvira, DRC,* in the first half of 1996, bringing the total number of refugees to 220,000. These new arrivals were fleeing intensified insecurity in Burundi. Surveys in April 1996 showed that wasting varied from 2.3–11.0% amongst this population.

There were also approximately 300,000 refugees in *Bukavu, DRC,* whose nutritional status remained stable and adequate throughout 1995 and the first half of 1996. Levels of wasting in May 1996 were 0.9–7.0%.

The adequate nutritional status of these refugees was thought to be maintained due to a variety of factors,

including a thriving market system and economic activities. Many humanitarian agencies were, in fact, unaware of the degree of self–sufficiency, as indicated by events in early 1995 when tow general ration deliveries in the Zairian refugee camps prompted agencies to declare a state of impending emergency. Yet, although the level of rattans distributed remained taw for many subsequent months, the nutritional status of Rwandan refugees in DRC did not deteriorate.

Another factor which contributed to improved nutritional status in the Zairian refugee camps was the changes made to general rattan distribution systems towards the end of 1994 and during 1995. At the start of the emergency in July 1994, general rattan distributions were organized through heads of communes and resulted in open discrimination against various sections of the community. High levels of wasting for the first four months of the emergency were partly attributed to inequitable distribution systems. However, systems gradually moved towards "lower levels" of distribution, e.g. from heads of sectors grouping together many families to cellules grouping together a few families and then eventually to families, so that inequity became far less pronounced.

Furthermore, several 'novel' and apparently successful approaches to general ration distribution were tried by different implementing NGOs. For example, several distribution points were established in a camp based on family size. This enabled each site to distribute equal quantities of food to the beneficiaries. This was felt to reduce opportunities for unfair distributions.

However, a recurrent problem was a shortage of firewood for cooking, which hindered the refugees' ability to prepare food. The government–imposed ban on economic activities alarmed many agency personnel concerned about the refugees' ability to supplement inadequate general rations.

The conflict in Eastern DRC and massive repatriation meant that the refugees remaining in the country created makeshift camps. In early 1997, refugees were regularly displaced from these camps as rebel forces moved westward, with little if any humanitarian relief provided between moves. By April 1997, mortality rates of 11–20/10,000/day (20 to 40 times normal) were recorded. These people, who were relatively healthy when the camps were dispersed at the end of 1996, were reportedly dying of malnutrition and cholera. Difficulties in supplying these camps may be related to political factors as well as logistical considerations. For example, it has been suggested that denial of access was part of the ADFL military strategy.

This situation highlights a few points worth considering further. Levels of wasting in the refugees camps were less than 10% and reflected in part the marked degree of self–sufficiency attained by large numbers of refugees. This was not widely understood by aid agencies at the time, and would have been useful to know. The need and importance of innovative approaches to food distributions, along with a demonstrated utility of improved information about the food economy of a refugee population, were also illustrated in this situation. The political obstacles to providing adequate relief aid to Rwandan refugees after camp dispersal need to be brought into the open so that ways of dealing with this type of problem in the future can be found.

Rwanda The overall security situation in Rwanda during 1995–96 was generally calm. Despite this, there were security incidents reported throughout the year, particularly in the west where there were frequent incursions from the Goma camps. A particularly serious security incident occurred with the forced closure of Kibeho camp (a camp initially set up in the French protection area 'Zone Turquoise' for IDPs in Rwanda), when many thousands of lives were reported lost in the resulting confusion and panic.

Approximately 800,000 people in Rwanda were thought to be nutritionally vulnerable throughout 1995. Fighting in Eastern DRC, and the subsequent repatriation of over one million refugees swelled the numbers considered to be vulnerable. Food aid deliveries in 1995 were relatively unimpeded, and nutritional indicators pointed to a stable situation comparable to that seen before the war. For example, a nutritional survey in Kigali in September 1995 showed 5.0% wasting while another survey at prefecture level showed 2.9% wasting in May 1995.

Ethnic fighting in Eastern DRC precipitated the return of over one million refugees from DRC between October and December 1996. Food aid was distributed to these new returnees at the commune level. Concern was expressed over the ability of the country to reabsorb such a large number of returnees, who needed homes and land to farm, in a short time period. However, the previous influx of returnees during 1995 to mid–1996 had been relatively easily assimilated. A variety of factors were said to have assisted this process, including the government policy of avoiding formation of camps, improved agricultural production allowing for an increased population, and NGO support of health programmes.

This fighting also led to a small influx of approximately 13,000 Zairian refugees, who are housed in Umubano Camp. Having spent some time in the bush before arriving in Rwanda, many of the new arrivals were malnourished. A survey in Umubano Camp in April 1996 (then called Petite Barrière Camp) showed 17% wasting with 7.4% severe wasting. The general ration was set at 1980 kcals/person/day for this camp. By August 1996, levels of wasting were 10.2%. It was felt that levels of wasting remained high due to the malnourished state of new arrivals.

A relatively good harvest in January 1997 was considered to be inadequate to cover the needs of the increased population in Rwanda (see Figure 12). In addition, January–February is generally when crops are planted, so that new arrivals were largely unable to plant and harvest any crops. It was therefore likely that emergency food assistance would be needed for at least the first six months of 1997, and that provision of farming inputs would be necessary for the newly returned population.

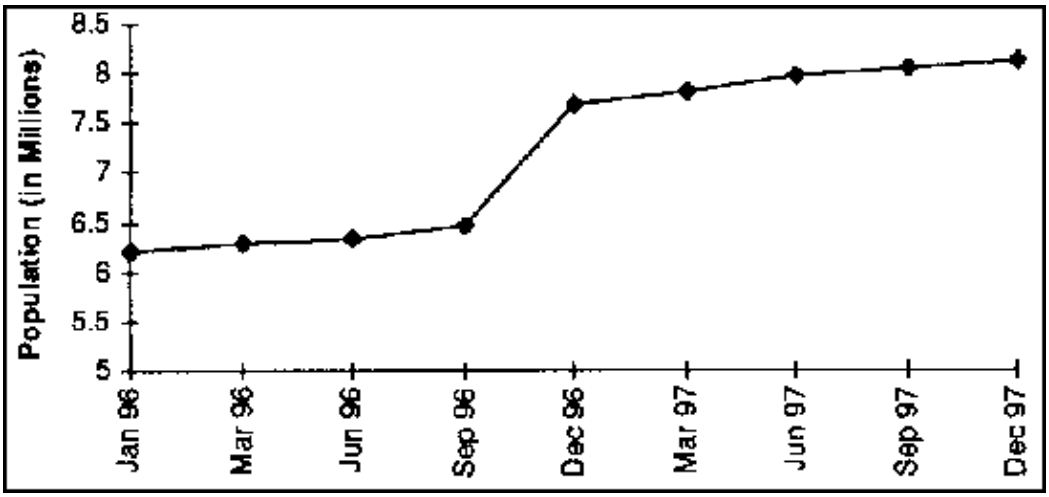


Figure 12.: Estimated Population in Rwanda from January 1996 Projected to December 1997

There are an increasing number of reports of insecurity in western prefectures of Rwanda which are, at least in some cases, leading to the suspension of humanitarian activities. At a time when efforts should be focused on activities to support the reintegration of a large number of returnees, this apparent upsurge in violence gives cause for concern.

Burundi Continuous and widespread insecurity in Burundi has led to population displacements within the country, and temporary evacuation of aid personnel was commonplace in 1995. The security situation continued to deteriorate in 1996, with attacks, looting and fighting reported, especially in the northern provinces. In some instances, the attacks appeared to have been deliberately aimed at aid workers. A tragic example was the murder of three ICRC workers on their way to deliver water in June 1996. This heightened insecurity led to approximately 130,000 people leaving the country, with 100,000 seeking refuge in Tanzania and at least 30,000 in DRC.

It was estimated that at any one time up to 200,000 people were internally displaced by the conflict during 1995. There were also about 200,000 Rwandan refugees in Burundi in 1995, most of whom repatriated by early 1996. Ethnic fighting in Eastern DRC in 1996 led to the return of at least 46,000 Burundi refugees, many of whom arrived in an appalling nutritional state. A screening carried out at Gatumba transit camp in Burundi, showed 18.2% wasting across all age groups; 17% of those under five years old were wasted.

Regroupment camps were set up in some of the more insecure areas to protect civilian populations and housed up to 200,000 people. Conditions were extremely poor in many of these camps, and reports were of high levels of malnutrition and disease among their populations. For example, wasting was measured at 16% in one area, with over 3% severe wasting. The government intends to send people home from the camps as soon as security allows; there were reports of people leaving spontaneously in June 1997.

A rapid, flexible approach to food aid delivery was therefore necessary, given this fluid security situation. WFP developed a system of rapid assessment followed by food aid delivery, which was often determined to be needed only for a short period of time. Nutritional surveys were very difficult to carry out under these conditions; those that were possible frequently showed high levels of wasting. For example, a survey at the end of 1995 in four camps for the internally displaced found levels of wasting ranging from 15–18%. Cholera was also present in Burundi throughout 1995.

International economic sanctions imposed on Burundi after a bloodless coup *d'état* in June 1996 included fuel and food aid, and posed serious threats to the continuation of emergency humanitarian activities. By the end of 1996, some restrictions had been removed but supplies, particularly of fuel, remained limited. Continued sanctions in combination with a security situation that severely restricted the capacity of agencies to work, led to a continuing deterioration of the nutritional and health situation in many areas of Burundi continued to deteriorate in the latter part of 1996.

Tanzania In early 1995, there were estimated to be 630,000 Rwandese and Burundi refugees in Tanzania. This number increased throughout 1995 and into 1996 due to the continuous arrival of Burundi refugees. During the second half of 1996, the growing influx of Burundi refugees and the lack of progress on the repatriation of Rwandese refugees led to growing tensions. In mid−1996, the Government of Tanzania decreed that refugees could no longer cultivate land or conduct economic activities beyond a four kilometre radius of the camps. The government also issued an ultimatum that all Rwandan refugees must return before the end of 1996. This ultimatum was accompanied by the dispatch of Tanzanian troops so some 400,000 Rwanda refugees returned home at the end of December 1996. However, insecurity in Democratic Republic of Congo (then Zaire) led to a new influx of refugees so that by mid−1997 there were a total of 344,000 refugees from Burundi and DRC in Tanzania.

The health and nutritional status of the refugees in Tanzania remained adequate and stable during 1995 and the first half of 1996. Even though general ration deliveries were periodically inadequate during 1995, nutritional surveys continued to show levels of wasting under 5% in the Ngara and Karagwe camps for Rwandan refugees, below levels seen in the local population. This reflected the fact that refugees were able to carry out farming and other economic activities to supplement this ration. In late 1995, food distribution systems changed in the camps from family to communal level distribution based on community participation. The system was considered to be more successful than previous ones as there was greater transparency and equity, and refugee families did not have to spend so long in distribution queues. Furthermore, agencies spent less time implementing food distribution.

Despite restrictions on economic and farming activities, levels of wasting still remained low during 1996. However, cases of vitamin B2 deficiency, seen as angular stomatitis, were identified, especially in the Ngara camps (estimated population 490,000). No further investigations were undertaken regarding the presence of angular stomatitis because this population returned to Rwanda soon after the reports. Throughout this period, water availability remained a problem, particularly affecting the Karagwe camps during the dry season.

The insecurity that accompanied Kabila's takeover of the Democratic Republic of Congo led to the influx into Tanzania of approximately 100,000 refugees in early 1997.

Indicators available for this population point to a generally adequate health and nutrition situation, despite some difficulties with food provision due to poor road conditions. For example, levels of wasting in May 1997 varied from 1.8−7.2%. Organized repatriation of these refugees began before the end of 1997.

Water provision and logistic issues were problematic in the Tanzania camps through the period under review. Despite these problems, the health and nutritional status of the refugees was adequate and stable.

In conclusion, the humanitarian relief operations mounted in the wake of this regional crisis were on a scale rarely, if ever, seen before and were largely successful.

A number of some issues requiring further consideration emerged. It became clear that innovative approaches to food distributions, as seen in Goma and in Tanzania, greatly improved access to rations for a number of families. Information on the food economy in camps would also be useful and would allow the humanitarian community to better target rations and set ration levels. Improvement in these areas depends to a large extent on knowledge of the community and its organization in the camps.

The concept of voluntary repatriation has been questioned here in two instances, ft is difficult to say that repatriation was voluntary for Rwandan refugees in Tanzania and Eastern DRC, on the other hand it is not clear to what extent these refugees, particularly those in Eastern DRC, were kept in the camps against their will. Furthermore, obstacles to humanitarian aid provision put up by the ADFL, which were politically motivated, were in direct conflict with humanitarian goals, and ways of dealing with this situation must be sought for future conflicts.

Ethiopia

In early 1995, there were about 259,000 Somali refugees and 51,000 Sudanese refugees in Ethiopia. The number of Somali refugees increased through 1995 and 1996 due to fighting in north–west Somalia, but in 1997, some small–scale repatriation meant that the total number began to decrease. The number of Sudanese refugees fleeing conflict in Southern Sudan increased gradually from 51,000 in 1995 to 54,000 in mid–1997.

The number of Somali refugees in Ethiopia increased in the early months of 1995 due to fighting in Somalia. Once this influx was over, numbers were stable throughout the remainder of 1995–96. Early in 1995, crude mortality rates were low at 0.2/10,000/day in the camps.

Surveys conducted in March 1995 in some camps in the Jijiga area showed levels of wasting from 12% to 17.3% (see Figure 13). Although these levels are high, they represent an improvement over surveys conducted in 1994 when wasting was approximately 20%. Surveys carried out in July 1995 in the camps not included in the March surveys showed levels of wasting varying from 7.5% to 13.3%. It was felt that these somewhat elevated levels could be due to the continued arrival of malnourished individuals from Somalia.

Surveys conducted in the camps for Somali refugees in the east in May 1996 showed an extremely worrying situation. The nutritional situation had deteriorated in all the camps since the previous set of surveys, and levels of wasting varied from 15.2%–21.1%. The highest levels of malnutrition were seen in Kebri Beyah (estimated population 10,000) and Derwanaji (estimated population 43,000) at 20.5% and 21.1%, respectively. In other camps (i.e. Rabasso and Camaboker), levels of wasting have doubled since surveys were conducted in July 1995. Crude mortality rates were reported to be 1–2/10,000/day (3–7 times normal).

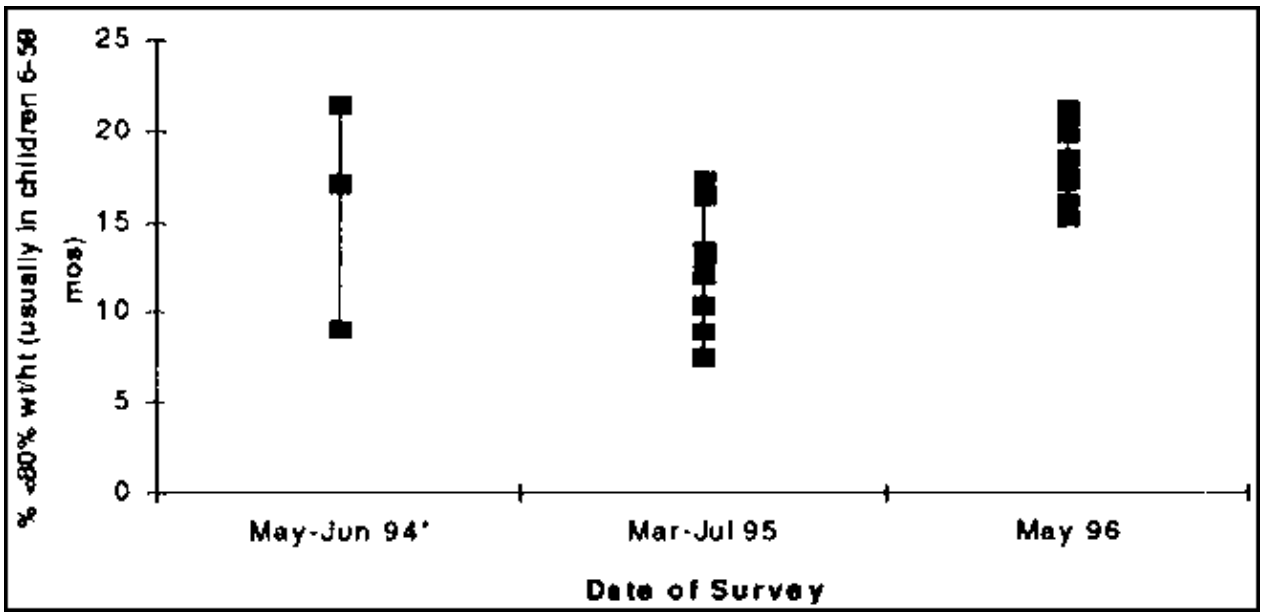
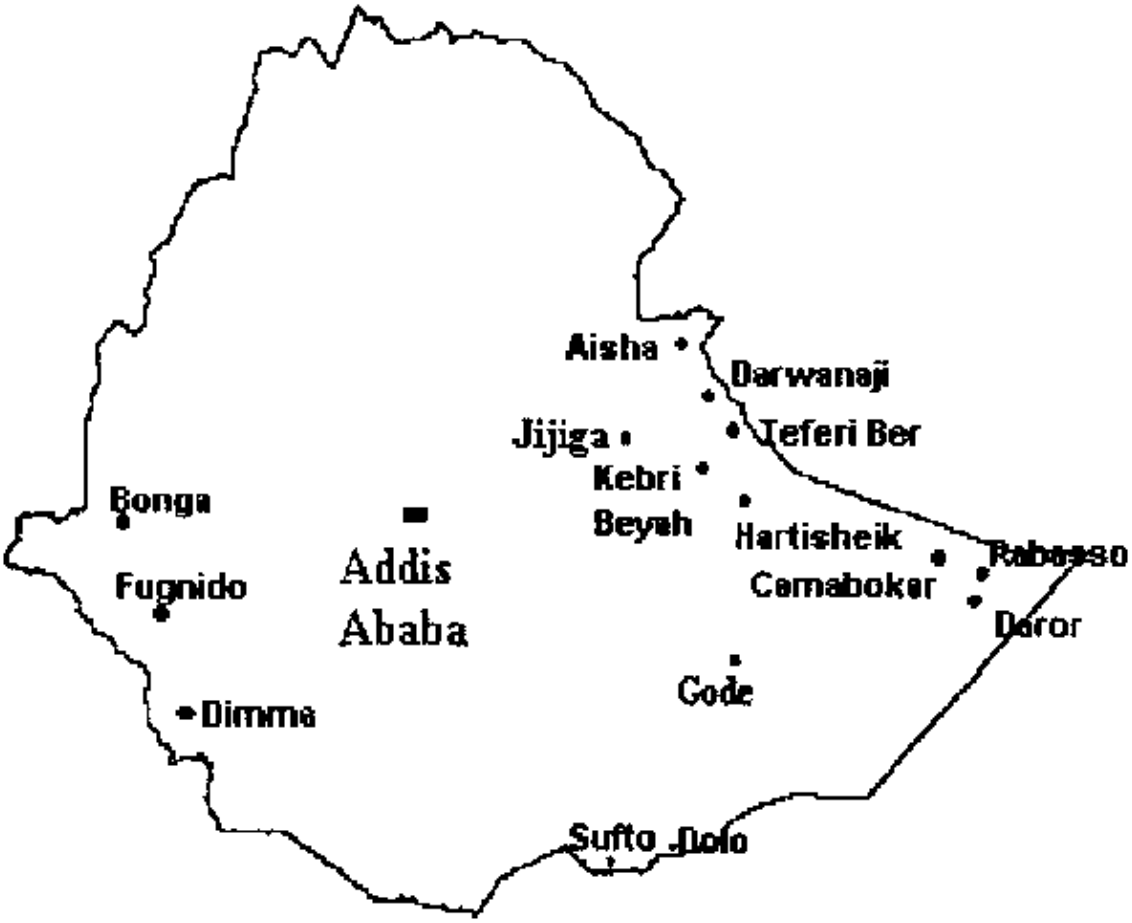


Figure 13.: Levels of Wasting in Somali Refugee Camps in Ethiopia over Time

**includes Hartesheik, Kebre Beyah, Denwonaji, Teferiber.*



Map 3.: Ethiopia

Although an increase in levels of malnutrition is often seen during the 'lean' season, comparison with surveys carried out in July 1995 indicated a marked deterioration. A household food economy assessment conducted by Save the Children Fund (UK) towards the end of 1996 in Kebri Beyah refugee camp provided information on the food security of this refugee population. The assessment found that since food distributions had been irregular, providing less than 100% of caloric needs over the year, each family had to develop income−generating strategies in order to survive. As most families lacked any capital for starting up a business, most of these activities were small−scale and opportunistic, e.g. selling firewood and making charcoal.

The main sources of food for this population are the general ration and food purchased with wages earned by working for local people, which together account for 88−96% of total caloric intake. Another source of food is a blanket feeding programme which provides approximately 6% of an average household's food needs for each child registered in the programme. This programme also appears to have resulted in a reduction in the elevated rates of malnutrition observed in May 1996.

There is a serious water shortage in the camps. Water has been trucked into many of the camps for years, and the 3−4 litres/person/day available is far below the 20 litres/person/day recommended as a minimum. Water shortage has been linked to an outbreak of diarrhoeal disease in the camps in January and February of 1996. Other factors which may be leading to elevated levels of wasting include a lack of ration cards for new arrivals (particularly in Rabasso and Daror camps) and increases in cereal prices due to the devaluation of the Somali and Somaliland currencies.

The numbers of Sudanese refugees increased slowly over the two−year period. The nutritional situation in these camps was variable in early 1995, with levels of wasting from 5.4% to 15.7%. Similar rates of wasting were seen in a survey conducted in July 1995.

In mid−1996, the nutritional situation for the Sudanese refugees in the west appeared to be stable and adequate. Levels of wasting in the camps varied between 6% and 8% with almost no severe wasting. This population is situated in an area where there is greater opportunity for self−reliance than is the case for the Somali refugees in the east. The Sudanese refugees are able to supplement their rations with some limited crop cultivation, some livestock, wild foods and in some cases fishing. However, water is reportedly a major

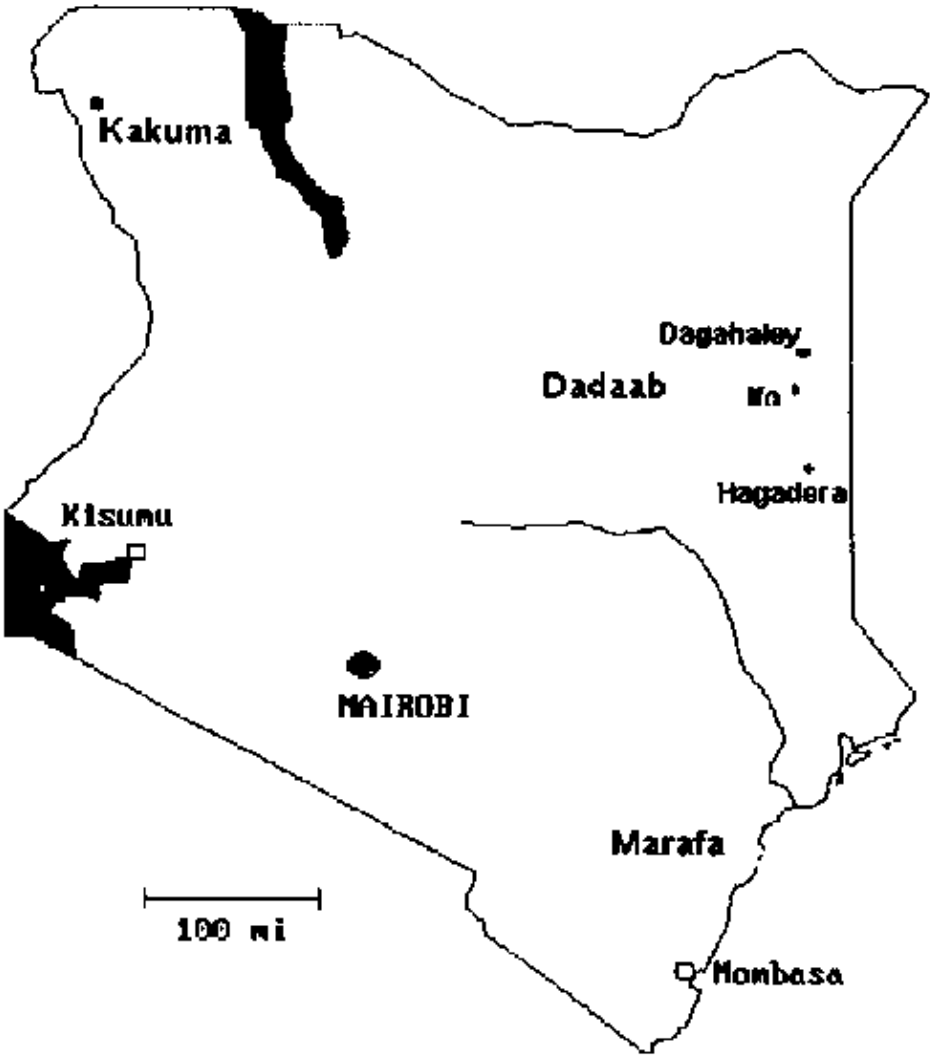
concern of the refugees in Fugnido camp, and existing boreholes and broken hand pumps need to be repaired.

Surveys in early 1997 showed a deterioration in the situation, with levels of wasting of 17%. In response to this situation, supplementary feeding programmes were established to assist children and other vulnerable groups, and a review of the monitoring system is underway.

In spite of the fact that these are relatively settled populations, particularly in the case of the Somali refugees, levels of wasting measured are similar to those seen in the initial phases of an emergency. These indicators continue to describe a very serious situation.

Kenya

In early 1995, there were some 232,000 Somali, Sudanese and Ethiopian refugees in Kenya. Over the period under review, this total number decreased to 173,000 due to repatriation of Somali and Ethiopian refugees and permitted the closure of some camps. The number of Sudanese refugees increased due to continued fighting in that country.



Map 4.: Kenya

In mid−1994, the levels of wasting in the three camps for Somali refugees in the Dadaab area of Kenya were low and varied from about 5.3% to 8.9% (see Figure 14). However, surveys in March 1995 showed an apparent decline in the nutritional status of this population, when wasting was measured at 15.3% in Ifo camp. It was suggested that one reason for this decline might be that even though the officially allocated ration was 2400 kcals/ person/day, distributions to non−registered refugees determined that receipts were likely to be closer to 1800 kcals/person/day.

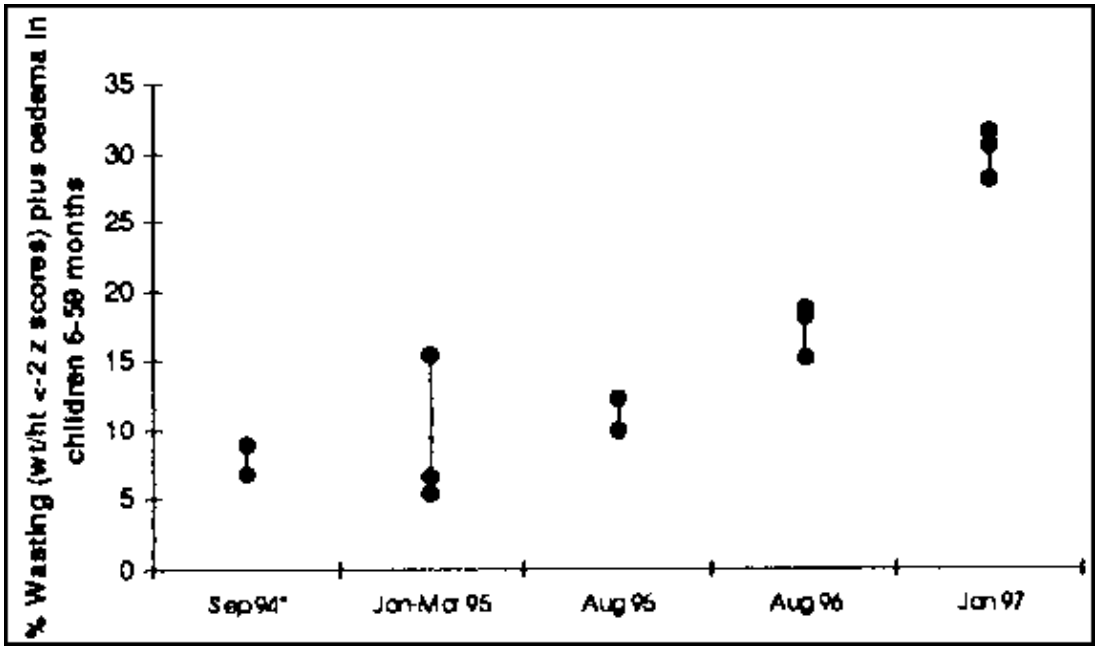


Figure 14.: Levels of Wasting In Dadaab Area Camps for Somali Refugees in Kenya over Time

**Hagadera Camp not included in this group*

Surveys conducted in August 1995, after a reduction in the planned ration to 1800 kcals/person/day, showed wasting levels from 9.8% to 12.1%. By the end of 1995, the distribution of fortified blended foods (CSB) was discontinued. By August 1996, the situation had further deteriorated and levels of wasting were measured at 15.1–18.6%.

Surveys conducted in January 1997 confirmed a declining nutritional status of this population, leading to what was described as a nutritional emergency. For example, a recent survey in Ifo camp showed 33.3% wasting, with 6.7% severe wasting. The general ration provided approximately 1850 kcals/person/day in November 1996 and 1700 kcals/person/day in December 1996. The under–five mortality rate was 5/10,000/day in January 1997 (5 times normal). Coverage of the therapeutic feeding programme was only 63%. Similar situations were described in Hagedara and Dagahaley camps.

Problems with the food supply and distribution systems in the camps have been identified as primary factors contributing to the increased levels of wasting. Since June 1996, there have been problems with the supply of beans and the average number of kcals/person/day supplied in the general ration has been less than 1700. The general ration has not contained blended foods or sugar, despite recommendations made following an assessment mission in October 1996 to include these foods. An increase in the incidence of diarrhoeal disease and malaria may also be influencing nutritional status. Furthermore, some cholera cases were confirmed at the end of 1996.

Scurvy appears to be a seasonal problem in the Dadaab area camps in the September–December period. Indeed, cases were noted in 1996 during this period. Nevertheless, the international community has not, in the past, acted to prevent these predictable outbreaks. Instead, curative action is taken after the outbreaks occur.

Indicators in Sudanese camps in early 1995 were normal, with a CMR of 0.17/10,000/day and an under–five mortality rate of 0.67/10,000/day. However, an assessment of Kakuma camp, where 32,000 refugees live, revealed a very high rate of severe anaemia among boys aged 8–20 years. Some possible explanations for this were that most of this population were unaccompanied minors with little linkage to household economies in the camp. Furthermore, the average per capita kilocalorie requirement for this age group (2200 kcals/person/day) was not being met by the 1900 kcals/person/day provided by the ration. The ration was also deficient in bioavailable iron and vitamin C, which enhances iron absorption.

A high proportion of this population was known to be selling off some of their rations in order to purchase non–food items. This is most likely to be due to a lack of those items among distributed commodities. High levels of intestinal worm infestation may also have been contributing to this unusual pattern of anaemia. In response to this problem, a school feeding programme including CSB was recommended.

It should be noted that there are serious difficulties in supplying the Kakuma and Dadaab camps with food aid. These camps are very isolated and road conditions, particularly during the rainy season, are not good. In addition, the availability of some foods locally, for example fresh vegetables or meat and fish, is poor. However, indicators from the camps, including high rates of wasting and micronutrient malnutrition, point to a very serious situation, which should not be seen in a stable refugee population.

Liberia/Sierra Leone Region

Fighting in Liberia broke out in 1989 and continued virtually unabated until 1994. The conflict between rebel factions continued throughout 1995, but a peace accord signed in August 1995 led to an improvement in the security situation and a gradual opening up of areas in the country to humanitarian aid. A Council of State was installed as the governing body, and ECOMOG, a West African peace−keeping force, began to be deployed outside the capital city, Monrovia. For most of 1995, the city was relatively calm. However, factional fighting broke out there in April 1996, displacing almost 300,000 people and leading to the evacuation of almost all international aid personnel. The security situation since then has gradually improved, with disarmament beginning in November 1996, raising hopes for a more durable peace. The election of Charles Taylor as president in what has been termed fair and transparent elections are further strengthening hopes for a lasting calm in the country.

In Sierra Leone, democratic elections took place in March 1996, calming years of rebel activity. The installation of a democratically elected government and subsequent peace talks with rebels led to a marked decrease in insecurity and rendered most needy populations accessible to humanitarian relief. However, the improving situation changed abruptly with the military takeover of the government; insecurity led to disruptions to and in many cases cessation of humanitarian relief by June 1997.

By then, there were some two million people affected by the conflicts in Liberia and Sierra Leone, some of whom still remained inaccessible or only periodically accessible to humanitarian aid.

Liberia Almost two million people in Liberia were estimated to require humanitarian assistance throughout 1995 and 1996. Many of them were inaccessible for extended periods of time due to insecurity. The number of people requiring aid began to decrease in 1997 as the disarmament process took hold and following Charles Taylor's election as president.

As the villages in the Liberian countryside became accessible to humanitarian organizations, extremely high levels of wasting were often seen. For example, in Lower Bong and Upper Margibi, wasting was almost 20% and oedema was measured at 37%. A follow−up survey was conducted after the implementation of general ration and selective feeding programmes. Wasting and/or oedema had decreased to 6.4%.

A similar situation prevailed in Tubmanburg, a village which was cut off from humanitarian aid for almost eight months. Once access was gained, a catastrophic situation was seen. Wasting levels of almost 40% were measured, with 32% severe wasting. Mortality rates were 40 times normal and under−five mortality rates were 50 times normal (see Figure 15). After one month of emergency aid deliveries, the crude mortality rate had decreased to 5.4/10,000/day. White this marked an extreme improvement, mortality rates were still ten times the normal rate in mid−October 1996.

In other newly accessible areas, levels of wasting were not as high as expected. For example, in Buchanan in July 1995, wasting was measured at 8.9% and in Harbel Unification Town in April 1995,7.4%.

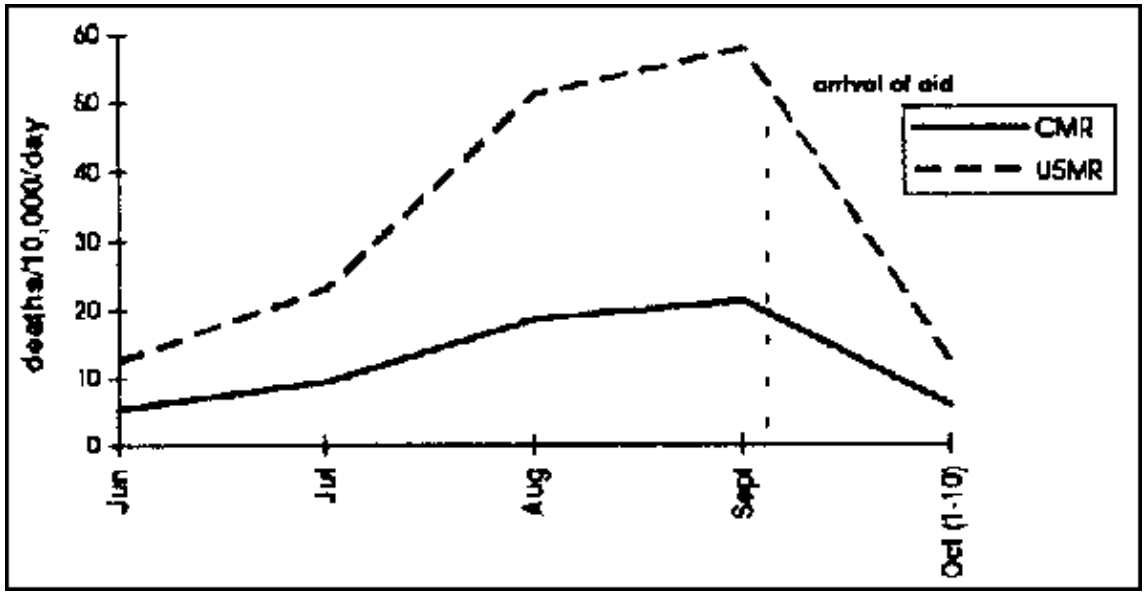


Figure 15.: Crude Mortality Rates and Under−five Mortality Rates in Tubmanburg, Liberia between 1 June 1996 and 10 October 1996

Data from 'Demographic and Nutritional Assessment Tubmanburg Bomi County, Liberia'
Médecins sans Frontières and EPICENTRE, October 1996.

It is estimated that the factional fighting which broke out in Monrovia in early 1996 led to over 80,000 people being displaced in the capital city, about 20,000 of whom sought refuge in over−crowded conditions in the Greystone compound of the US embassy or Barclays Training Centre. The health status of these populations was extremely worrying, with reports of diarrhoea and measles due to poor environmental and sanitary conditions. Concerted efforts were made to improve water supplies, and although both areas were periodically cut off from outside agency support, food was delivered on an *ad hoc* basis as security allowed, thereby preventing widespread malnutrition.

However, the destruction of infrastructure and equipment caused by this resurgence of violence in the capital had a longer−term impact on the ability of the humanitarian aid community to work. A survey in Monrovia in July 1996 revealed an alarming situation. Wasting among the displaced and resident population was measured at 21.2% and 13.3% respectively. Measles immunization coverage was tow at about 60%. A follow−up survey in February 1997 showed a much improved situation. Wasting among the displaced populations had decreased to 13.2%, with 0.9% severe wasting, and among the resident population wasting was measured at 6.1%.

Humanitarian agency policy with regard to emergency general ration provision in Liberia has been to phase out this form of support by introducing the targeting of general rations. However, this policy, which effectively began in 1992, has been criticized on the basis that lack of socio−economic data led to indiscriminate ration reductions, without taking into account the differential capacity of populations to employ coping strategies. In addition, it was not always possible to deliver the targeted ration due to insecurity.

Insecurity and looting also led to the decision to replace rice distribution, a highly valued commodity often looted by the military factions, with buglur wheat, a commodity less likely to be looted. This required an extensive campaign to prepare the populations, as this commodity was unfamiliar to them.

Security at distribution points, nevertheless, remained a problem, and beneficiaries stated their preference for supplementary feeding programmes as opposed to general distribution. They felt they would not be put at so great a risk if they participated in these programmes.

However, there has been criticism over the implementation of selective feeding programmes. There is agreement that these were necessary during the early phase of the emergency when levels of wasting were extremely high. However, feeding programmes were believed to be inefficient and costly in the context of a frequently inadequate general ration, leading to high numbers of re−admissions and default. One view is that resources would have been more effectively allocated to support the general ration programmes in order to prevent the need for selective feeding.

Sierra Leone Rebel activity in the Sierra Leone countryside throughout 1995 led to large–scale displacement and rendered many areas periodically inaccessible to humanitarian relief agencies. The estimated number of displaced people requiring food aid assistance increased from 490,000 to 730,000 during the year. There were estimated to be a further 800,000 people internally displaced who were not in need of emergency assistance. By the end of 1996, the security situation had improved to the point where some people had begun to return home, leaving approximately 600,000 people dependent on emergency food aid.

Elections were successfully held early in 1996, and the installation of a new government and subsequent peace talks gave rise to hopes for a lasting peace. Rebel activity decreased markedly, and almost all areas of the country were accessible to humanitarian relief. However, a military coup ousted the elected president in May 1997, and periodic outbreaks of violence once again led to population displacements and at the same time restricted humanitarian activities. Information prior to the *coup d'etat* is presented here.

Once areas that had been inaccessible opened up, high levels of wasting and mortality were most often found. In Kenema Town, wasting in August 1995 was measured at 21% with 8% severe wasting. Mortality rates were eight times the normal. In camps around Kenema, wasting was 37% and severe wasting was 11%. Mortality rates were 17 times normal. A follow–up survey three months later showed 6.8% wasting in Kenema, and 5.6% wasting in the camps. This rapid improvement was felt to be largely due to general ration distributions.

As rebel forces were increasingly pushed to the west of the country, some alarming situations were uncovered. For example, a group of 500 people who had apparently been held captive for up to four years and forced into slave labour by rebel fighters were discovered in mid–1996 in Blama, near Kenema. Among this population, estimates of levels of adult malnutrition were 25%. This group was moved to a camp near Kenema, where preparations had been made for their arrival. It was believed that there were at least a further 1500 similarly affected people hiding in the bush, whose nutritional status was likely to be catastrophic. It was also believed that this situation was not unique and that there were many other brutalized captive populations throughout the country who would emerge from the bush in the coming months.

Insecurity following a *coup d'état* in May 1997 meant that many areas were once again inaccessible, and it is likely that this lack of access is resulting in a decline in the nutritional status of many people in Sierra–Leone.

Cote d'Ivoire There are approximately 305,000 Liberian refugees in Cote d'Ivoire. Repatriation plans are in place, but no time frame has been established for this programme. There are no new nutritional data on this population, but it is believed that the adequate nutritional status of this population shown in a 1994 survey (wasting of 8%) has not changed.

Guinea There are also about 600,000 Liberian and Sierra Leonean refugees in Guinea. These refugees are also expected to return home as soon as security allows.

The Sierra Leonean refugees are in the Forecariah Prefecture, and a survey conducted in 1995 showed 8.2% wasting. Since the ration distributed provided only 1300 kcals/person/day at the time, it was felt this population had attained some degree of self–sufficiency. The recent upsurge in violence in the country has led to the arrival of approximately 10,000 new refugees.

New refugees continued to arrive in Guinea from Liberia in 1995, many of whom arrived in a dire nutritional state. A survey carried out in early 1995 showed 30% wasting among new arrivals; wasting among those who had been in Guinea was 4%. Another survey in August 1996 showed levels of wasting from 1.1 –3.2%.

This regional crisis has highlighted some issues for further consideration. The inaccessibility of population groups has been evident in many instances and is an obvious obstacle to the provision of adequate humanitarian aid. The problem of inadequate general ration provision is also highlighted, and the efficacy of selective feeding programmes, particularly in the absence of adequate general rations, is also questioned.

Shaba, Democratic Republic of Congo

Ethnic violence in the Shaba region of the former Zaire in 1992 led to the displacement of about 600,000 people to the Kasai region further north. During the migration, many people stopped in villages along the route north, while others settled permanently on these sites. Since the end of 1995, there has been little further displacement from the Shaba region.

Survey information shows varying degrees of self−sufficiency have been attained by this population. Wasting and mortality rates among the displaced populations, and to a lesser extent the resident populations hosting them, were extraordinarily high in 1993 and 1995. However, the nutritional situation in many areas where displaced people are now staying has since improved. For example, surveys in Likasi at the end of 1995 showed 5.5% wasting and in Lupata wasting was measured at 9.9%.

In contrast, the nutritional situation in Mwene Ditu remains critical. Throughout 1993−1994 levels of wasting in the town and the camps for the displaced were consistently over 25%. In October 1995, wasting among the resident population was measured at almost 18%. In the camps for the displaced, wasting was measured at 43% with almost 10% severe wasting. These extremely high levels of wasting were thought to reflect a variety of factors. For example, many of the displaced people were not farmers, therefore they had difficulty finding work in these rural surroundings. Furthermore, there was little household income available to spend on health care so that untreated childhood illnesses often led to malnutrition. The survey was conducted during the pre−harvest season. It is likely that the establishment of income generating projects for both the resident and displaced populations of Mwene Ditu would mitigate some of the worst effects of this chronic emergency.

Mozambique

The signing of a peace accord in October 1992 was a definitive step in ending a 16−year civil war in Mozambique. During the war, over 1.6 million people fled the country as refugees, and at least 3.4 million people were internally displaced. Once it became apparent that the peace would last, refugees began returning home, and by the end of 1995 the repatriation operation was completed. Due largely to a series of successful harvests amongst recent returnees to Mozambique, the estimated number of people requiring food aid has decreased from 1.6 million to 70,000 at the end of 1996. This level of aid was required until the harvest in April 1997, when it was felt that returnees had reached self−sufficiency (see Figure 16).

Levels of wasting reported in 1995 varied from 1.9−5.0% between July−August 1995, although there appeared to be a slight upward trend, based on information available in 1996 when levels of wasting were reported to vary between 11% and 13.2%.

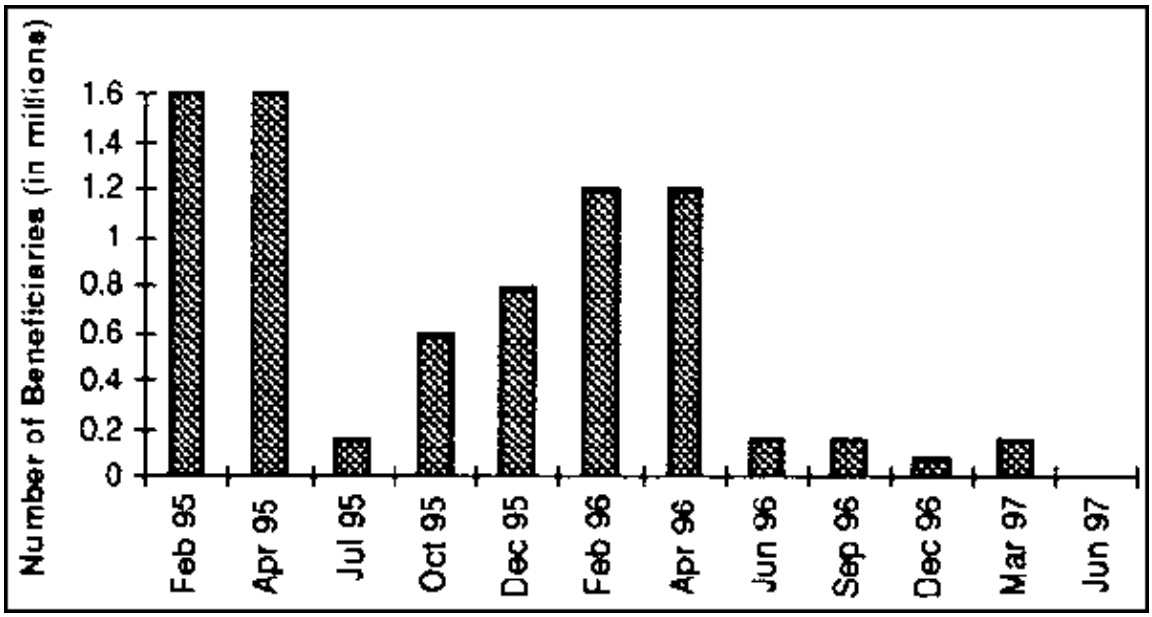


Figure 16.: Number of People Requiring Emergency Food Aid in Mozambique over Time (excluding flood victims)

In October 1995, an outbreak of pellagra occurred, centred mainly in the Mutarara district of Tete Province. A fortified blended food (CSB) was requested by WFP for distribution among the vulnerable population. Once the CSB arrived, administrative difficulties meant that it could not be imported or distributed for three months. Subsequent distributions appeared to lead to a decline in the number of cases of pellagra seen. These outbreaks are likely to be seasonal, and nutrition education programmes are being arranged to address the probable root causes of the outbreaks.

Logistics and health care provision were two major constraints to the continued improvement of the nutrition and health status of populations in Mozambique. For example, there were some areas, such as Gaza province, where a lack of logistic capacity undermined planned general ration distributions. In these areas,

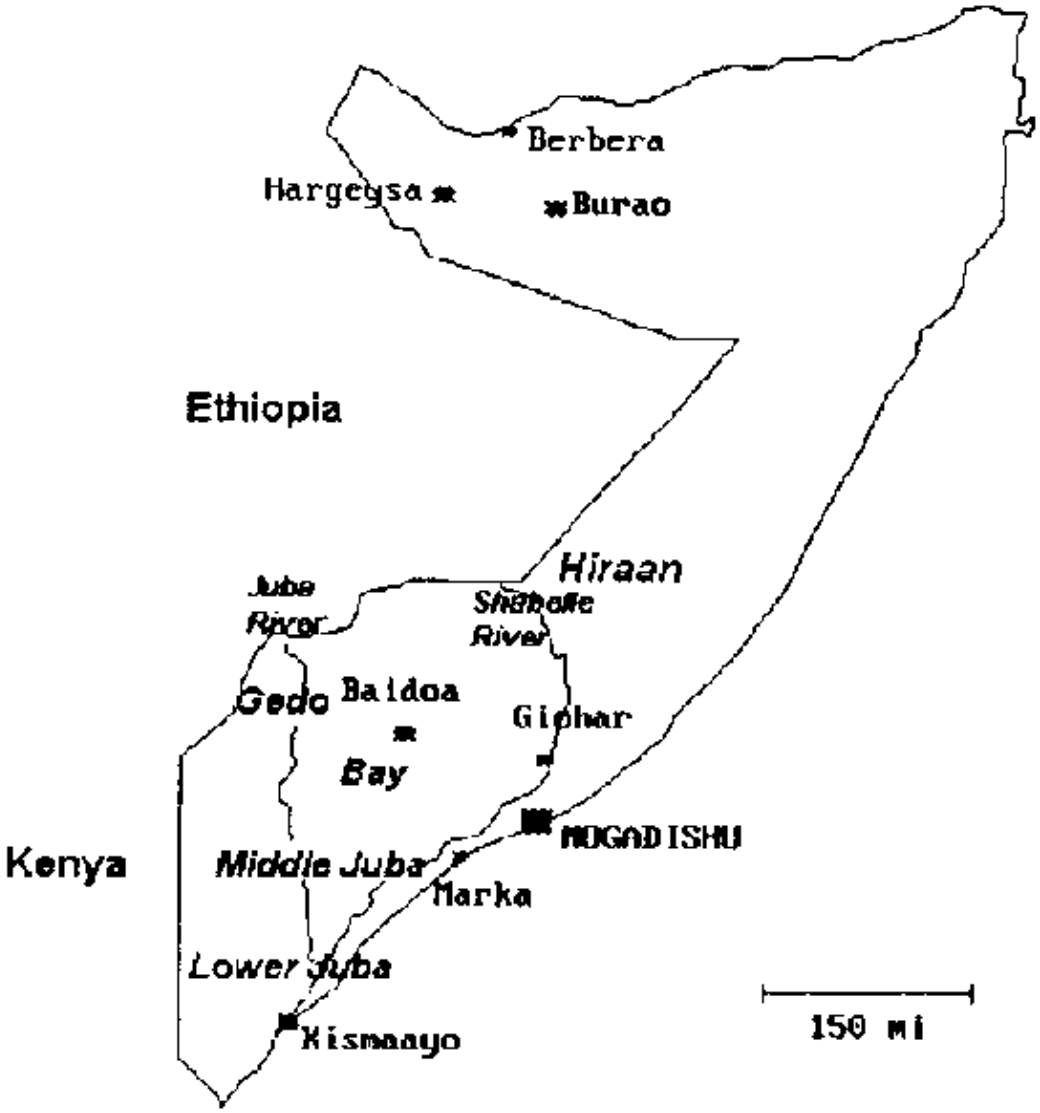
improvement of roads and storage capacity allowed for some stockpiling of foods for vulnerable populations. Reports also regularly underscored the need to strengthen health service provision, particularly for malaria control and measles immunization, and this remains a priority after the emergency aid programmes have ended. In addition, the de−mining process in Mozambique is on−going and, as more land is cleared, the food security situation of the country will most likely continue to improve.

Somalia

A civil war erupted in Somalia in 1991 with the overthrow of the military rulers, and insecurity has persisted in varying degrees of severity since that time. A UN peacekeeping force was established for a time, and it was feared that the end of its mission would lead to all−out interclan warfare. Although this was not the case, periodic and escalating insecurity continued. The death of General Aideed in August 1996 did not lead to the reduction in the conflict that many had hoped for. Indeed, the security situation sharply deteriorated in many areas.

Throughout 1995 and into 1997, food security continued to be adversely affected by variable harvests, and periodic insecurity affected economic activities and agricultural production. For example, following the capture of Baidoa by General Aideed in November 1995, some 20,000 people were displaced, leading to an estimated 67% reduction in food production. Dramatic food price rises due partly to the closure of Mogadishu port have also exacerbated economic hardship for this population.

Throughout 1995 and up to August 1996, an estimated 840,000 people received food aid (600,000 returnees and 240,000 internally displaced people). By August 1996, the numbers estimated to require emergency food provision had dropped to 150,000 people. Populations most affected by food insecurity appeared to be returnees and IDPs, particularly in Mogadishu, Kismayo and Juba valley. By June 1997, the number of people estimated to require emergency assistance had risen to 688,000.



Map 5: Somalia

The security situation remained tense in Somalia throughout most of 1995–97, making humanitarian relief work difficult to carry out. In most cases, however, relief activities were not prevented. Nutritional and health data available for the two–year period illustrate very poor conditions. For example, a survey in June 1995 in Mogadishu showed 24.9% wasting among children 6–59 months old. As a result, feeding centres were set up throughout the city and subsequent surveys/screenings showed a much improved situation, with some areas reporting levels of wasting as low as 2.1–7%. Another nutritional survey in Kismayo town in July 1995 found 17.8% wasting in children under five years old.

A cholera epidemic which broke out in October 1995 illustrated that humanitarian agencies were able to continue working effectively, even under difficult circumstances. Medicines were initially in short supply and, although it took several months, full supply and distribution was possible by June 1996.

In the Juba region, a combination of poor rainfall and subsequent crop failure and increasing insecurity led to population movements toward the cities (e.g., Kismayo) and toward the Kenyan border. A nutritional survey in Bulla Huwain, near the Kenyan and Ethiopian border in October 1996 found 37% wasting and 10% severe wasting. Most of the population were nomadic pastoralists, many of whom were displaced from other parts of Somalia. Logistical difficulties remained the major constraint on relief activities in the Juba valley. A combination of poor roads and insecurity hampered the delivery of humanitarian aid, which was increasingly needed.

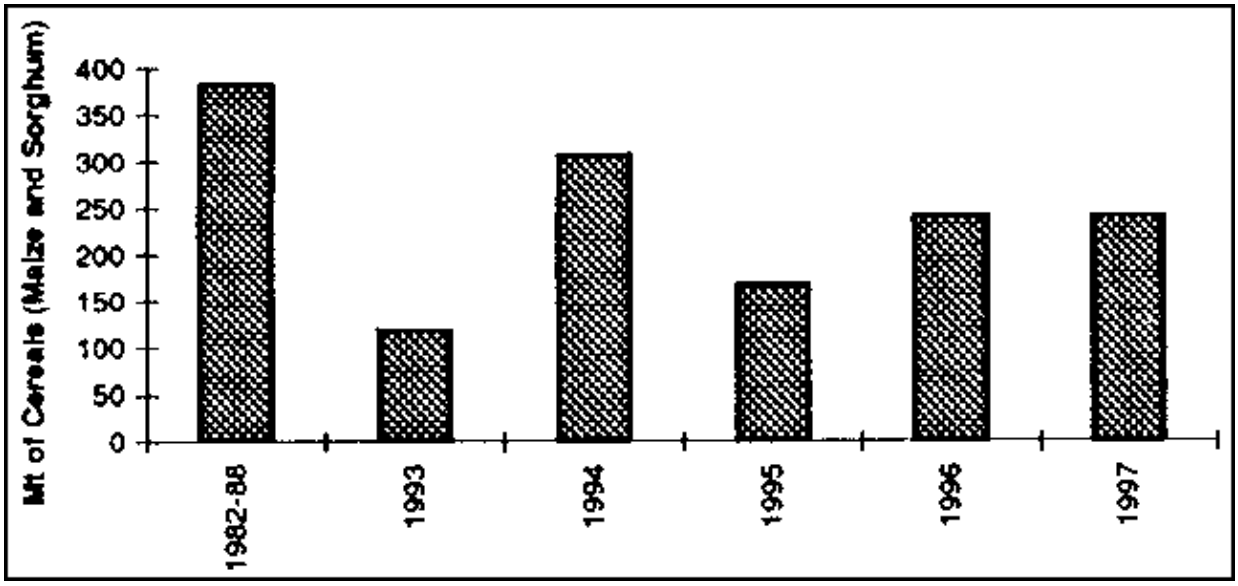


Figure 17: July Harvest Cereal Production in Somalia

From: Food Security Assessment Unit, *Gu Harvest Assessment* 1 Aug 1997.

According to an FAO special alert issued in May 1997, the food situation in Somalia had been deteriorating rapidly following the drought–reduced harvest in January–February 1997 and continued civil conflict. Cereal production was some 60% lower than last year's normal level. Meanwhile, rains made the transportation of emergency food aid to drought–affected areas difficult. From April to June 1997, the communities which experienced a poor January–February harvest had to rely on other means for food until the next harvest season in July and August. Cereal production for the July harvest over time are summarized in Figure 17.

There are signs of a deteriorating nutritional situation in much of the country. Numerous maternal health centres are reporting increasing numbers of wasted children among new admissions. For example, in Kismayo, Lower Juba, MCH centres are finding an increase in the percentage of children admitted with malnutrition for the fourth month in a row. In Hiran region a screening exercise showed an increased level of malnutrition in January and February.

This apparent decline in nutritional status is likely to be exacerbated by a number of factors. Prices of grains, have continued to rise since and cereal stocks are reportedly depleted, particularly in the south. The price of sorghum has quadrupled and is beyond the purchasing power of large sections of the population. Conversely, prices of livestock have declined in rural areas due to increased sales as a result of shortages of water and fodder.

There are reports of population movements, mainly from Bay and Bakool regions towards the Juba valley, Mogadishu and Kenya. The nutritional situation is reported to be alarming in the recently established settlements for the displaced in Baidoa town. Food and water shortages have also resulted in a deterioration in the health situation of the population, with cases of cholera and tuberculosis on the increase.

In summary, the purchasing power of much of Somalia's population has been eroded and assets have been sold off, leading to widespread chronic food insecurity, and in many cases destitution.

It is likely that programmes such as food for work, subsidized food sales and income–generating projects would improve food security for this population.

Sudan

The current phase of Sudan's civil war has persisted for 11 years, pitting the military forces of the government against the Sudan People's Liberation Army (SPLA). The fighting has been concentrated in the southern region, and has led to huge population displacements. At least two million people are thought to have migrated north, a large section of whom live in poverty in and around Khartoum. There are estimated to be almost two million people affected in the south, many of whom have been displaced more than once.

'The protracted war has created a cycle of displacement and malnourishment among the civilian population, has flooded neighbouring countries with refugees, created enormous squatter and

displaced camps, and has caused a chronic humanitarian emergency that has remained one of the UN's most expensive operations.' (USCR 1995. p. 76)

Khartoum There are some data available on the health and nutrition situation for the approximately 120,000 displaced people living in camps around Khartoum. Many of these people have been forced to relocate farther away from Khartoum as former camps have been razed to the ground. Reports indicate under–five mortality rates of 4/10,000/day (13 times normal). A major cause of death is malnutrition, and other causes include diarrhoea, lower respiratory tract infection and malaria. Clinical signs of vitamin A deficiency are also reported.

Map 6: Sudan

In general, the health and nutrition status of this internally displaced population is deteriorating, and this is felt to be largely attributable to increased poverty resulting in decreased access to food. Likely causes are frequent forced population movements as a result of camp demolitions and relocations, and camps being moved farther away from income–earning opportunities and relocated where minimal services can be provided. Provision of water and sanitation, food, selective feeding and curative health care has been increasingly poor.

At the end of 1996, there were hopeful signs that the situation might improve when greater access to the camps was granted. Somewhat improved access allowed humanitarian agencies to begin to address high levels of wasting, and several therapeutic and supplementary feeding centres have now been opened. Priority interventions will include improving the supply of clean water and essential drugs, and establishing nutritional surveillance systems.

Southern Sudan Fighting continues in Southern Sudan, and at least 1.7 million people in the region are affected by the conflict. A ceasefire went into effect in 1996, but the security situation remains volatile. Restrictions on Operation Lifeline Sudan (OLS) activities have made relief work difficult to carry out and many areas remain 'off limits'. Denial of flight clearance for transport of emergency food aid and lack of funds to

cover transport and monitoring costs are among the major problems faced by OLS. Population displacement is a regular feature of life in Southern Sudan and, in recent years, there has been a switch from livestock to subsistence agriculture. This has meant that large sections of the population have become dependent on food aid when even small drops in production due to drought or pest attack occur.

When access has been granted so that nutritional surveys could be carried out, variable situations have been found. For example, surveys made in March 1996 in the Attar region (Upper Nile/Jonglei) showed 25% wasting with 5.8% severe wasting; in Mangalatore Camp wasting was measured at 16%. There has been a shift in policy in southern Sudan away from emergency relief provision and towards a more development−oriented approach. This move is intended to avoid creating dependency and to encourage greater self−sufficiency. In spite of the fact that levels of wasting were as high as in the early stages of the emergency (i.e. often 20% or higher, see Figure 18), general rations were targeted to certain groups or on a seasonal basis. There is some concern, therefore, that levels of wasting that would have triggered immediate food aid intervention in the early years of OLS are now no longer doing so.

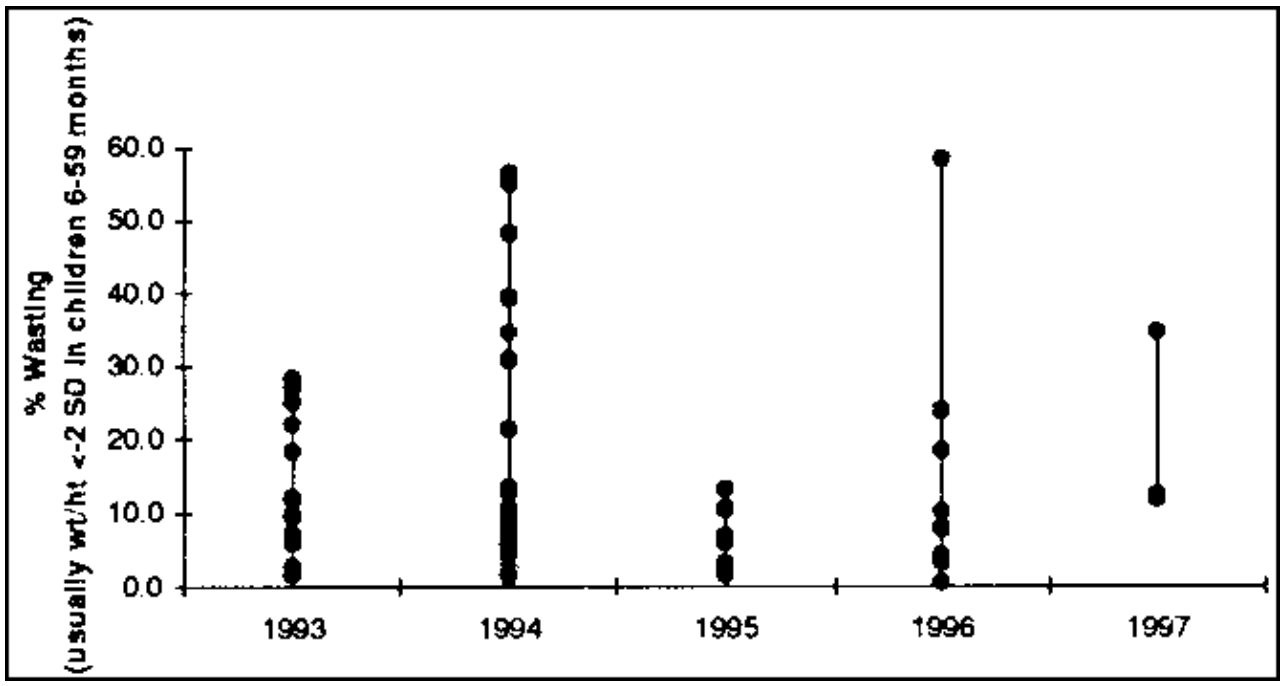


Figure 18.: Levels of Wasting in Southern Sudan over Time (usually wt/ht <−2SD in children 6−59 months)

In 1997, successful advances made by the Sudanese People's Liberation Army (SPLA), along with rebel activity in northern Uganda and eastern Democratic Republic of Congo, have led to the spontaneous return of many refugees. Reports indicate that two of the largest Sudanese refugee camps, Koboko (with a population of 26,516) and Ikafe (with 55,162), had virtually emptied in March and that as many as 60,000 returnees arrived in Southern Sudan. A major area of returnee concentration is Yei, with estimates of up to 100,000 returnees and internally displaced people.

Red Sea State The food security situation in Sinkat and Tokar province in the Red Sea State markedly deteriorated in the four months towards the end of 1996, with food prices increasing dramatically. For example, the price of sorghum increased by 300% in the last six months of 1996. Price increases were largely due to a lack of rain and subsequent harvest failure. Livestock prices have been declining simultaneously as households have been selling animals. A recent survey showed a catastrophic nutritional situation for the approximately 240,000 people in the region, which has led to some population displacement.

Food security in the area has been declining for many years now as successive droughts have led to large numbers of livestock deaths which have significantly affected animal husbandry activities. Furthermore, employment opportunities and wages have been declining while the gradual reduction in food availability has affected traditional coping strategies such as community sharing.

The survey found levels of wasting among the displaced people around Sinkat at 47.8%, with 7.8% severe wasting. Results of a separate survey carried out among displaced people in Tokar are not yet available, but are likely to be as high as those seen in Sinkat. Surveys conducted in rural areas among the non−displaced populations near Sinkat showed 30.4% wasting, with 7.4% severe wasting. Micronutrient malnutrition was

noted in both Sinkat and Tokar provinces. High levels of vitamin A deficiency and anaemia were seen. In addition, some cases of scurvy were noted as well as isolated cases of beriberi. Measles immunization coverage was low, at 30%.

A follow–up visit to the region after the survey revealed no change in the situation. Indeed, displacements to urban areas were continuing and increased population movements were expected. With the onset of winter rains, it was anticipated that the situation would further deteriorate.

Ethiopian and Eritrean Refugees Results from a census conducted in most refugee camps in Eastern Sudan in April 1996 showed that there are 15,000 assisted Ethiopian refugees and 133,000 assisted Eritrean refugees in Sudan. There are a further 270,000 unassisted refugees. There are also 4,400 assisted Chadian refugees in western Sudan. There are no new nutritional data on these refugee populations; the most recent survey information showed a situation that varied considerably between camps with wasting rates ranging from 7% to 15%. Repatriation of Ethiopian refugees from camps is almost completed, and the repatriation of refugees living outside the camps has begun. It is hoped that 100,000 Eritrean refugees will be repatriated in 1997.

Table 21.: Micronutrient Malnutrition

Deficiency	Year	Location	Public Health Problem*
Vitamin A (seen as night blindness)	1996	Camps for Displaced, Khartoum, Sudan	yes
	1996	Somalia (IDPs)	yes
	1996	Red Sea Hills, Sudan (IDPs and residents)	yes
	1994	Ethiopia – IDPs in Gode	yes
	1993	Ethiopia – IDPs in Gode	yes
Scurvy	1996	Red Sea Hills, Sudan (displaced and resident)	mild
	1996	Somali refugee camps, Kenya	moderate, but seasonal
	1996	Bhutanese refugee camps, Nepal	mild
	1995	Bhutanese refugee camps, Nepal	mild
	1994	Somali refugee camps, Kenya	moderate, but seasonal
	1994	Bhutanese refugee camps, Nepal	mild
	1994	Ethiopia – IDPs in Gode	mild
	1993	Ethiopia – IDPs in Gode	moderate
Beri–beri	1996	Bhutanese refugee camps, Nepal	mild
	1996	Red Sea Hills, Sudan (displaced and resident)	mild
	1995	Bhutanese refugee camps, Nepal	mild
	1994	Bhutanese refugee camps, Nepal	mild
Pellagra	1996	Mutarara district, Mozambique – returnees	mild
	1995	Mutarara district, Mozambique – returnees	mild
	1994	Bhutanese refugee camps, Nepal	mild
	1994	Camps for refugees from Rakhine State, Myanmar, in Bangladesh	mild

** See Annex 8 for guidance in interpretation.*

In sum, there is little nutritional data on the displaced population outside of Khartoum, but what data are available point to a poor health and nutrition status. In Southern Sudan, survey results continually show levels of wasting that indicate a serious situation and should trigger emergency relief interventions. Efforts are being made to address this situation, particularly with several methods of food aid delivery in the south including the use of barge, rail and air transportation.

Micronutrient malnutrition

Micronutrient deficiencies occur in refugee situations, frequently after a long period of residence in camps. Many of the deficiencies are also seen in the host population. However, prevention or treatment should normally be easier in a relatively controlled refugee situation where access to health care facilities is often better than in the host community. A major reason for micronutrient malnutrition is poor quality of the general ration. The food basket distributed often provides three commodities only, and fresh vegetables are rarely distributed. Efforts to prevent micronutrient malnutrition, therefore, focus on the distribution of a micronutrient–fortified blended food in the general ration, where populations are totally dependent on food aid and no fresh vegetables are included in the general ration. Vitamin A is also widely distributed.

Anaemia is generally widespread, particularly among young children and women of child–bearing age. However, marginalization of specific groups in camps can occasionally lead to unusually high rates of severe anaemia. This occurred recently in Kakuma camp in Kenya, where severe and life–threatening iron deficiency anaemia was found to be particularly prevalent amongst adolescent unaccompanied mates within the 8– to 20–year old age category.

Riboflavin deficiency, seen as angular stomatitis, is fairly widely seen in refugees camps. Effects of the deficiency on growth and well–being are not yet fully understood. However, presence of this deficiency is thought to be a general indicator of a possible more serious nutritional–problem, and should trigger further investigation into other possible deficiencies.

Data on other deficiency diseases, particularly beri–beri, scurvy, and vitamin A deficiencies, are summarised in Table 20. In some instances, these micronutrient deficiencies are seasonal in nature, such as scurvy which occurs in Somali camps in Kenya generally between September and December, or pellagra in Mozambique in the October–December period. In cases such as these, prevention seems relatively straightforward yet particularly in the case of the Kenyan camps, the operational agencies still appear to react to the occurrence of the deficiency rather than prevent it in the first place.

In other cases, micronutrient deficiencies seem to appear after a prolonged stay in a refugee camp, most likely indicating that sub–clinical deficiencies may have been present for a period of time and that food diversity has gradually diminished. This has been seen in Ethiopia and in some camps in Tanzania. These populations were dependent on food aid with little opportunity for cultivation and/or trading. Food aid rations were inadequate in micronutrients. Their diets were therefore consistently unvaried and lacking in micronutrients and gradually deteriorated due to a variety of economic and political factors.

A more perplexing situation has arisen in the camps for Bhutanese refugees in Nepal. This is a stable population. with a varied ration which includes fresh fruits and vegetables, along with a fortified blended food. Despite this, cases of scurvy, beri–beri and vitamin B2 deficiency (seen as angular stomatitis) continue to be reported. Possible explanations for this are discussed in the section on Asia.

Summary statistics

The following analysis is based on information about refugees and displaced people available to the ACC/SCN from September 1993 to July 1997. This information is provided by a number of NGOs and UN agencies involved in humanitarian relief and, while this database, which covers largely anthropometry, mortality and other indicators on the well–being of refugees and internally displaced people, provides an extensive body of information, it should not be considered as exhaustive. The following analysis may therefore not be extrapolated to all emergency situations and programmes.

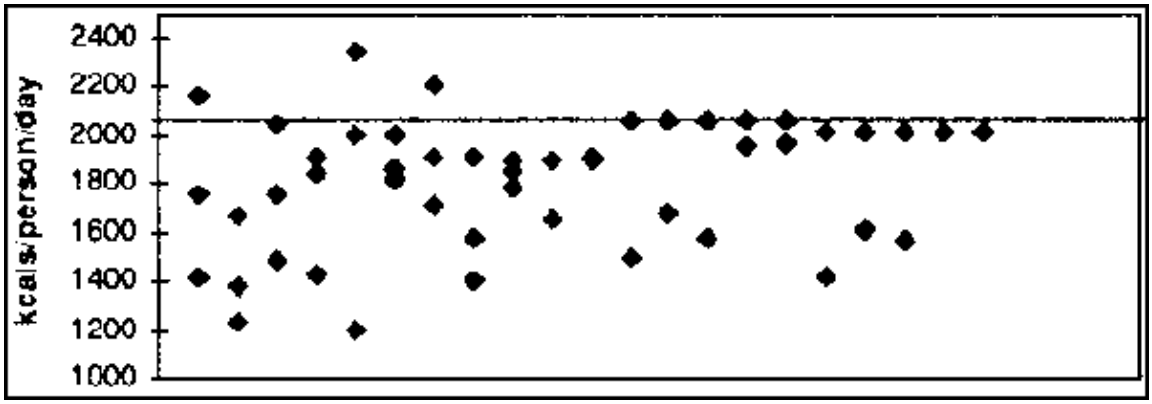


Figure 19.: Reports of Kcals/person/day Received in Tanzania

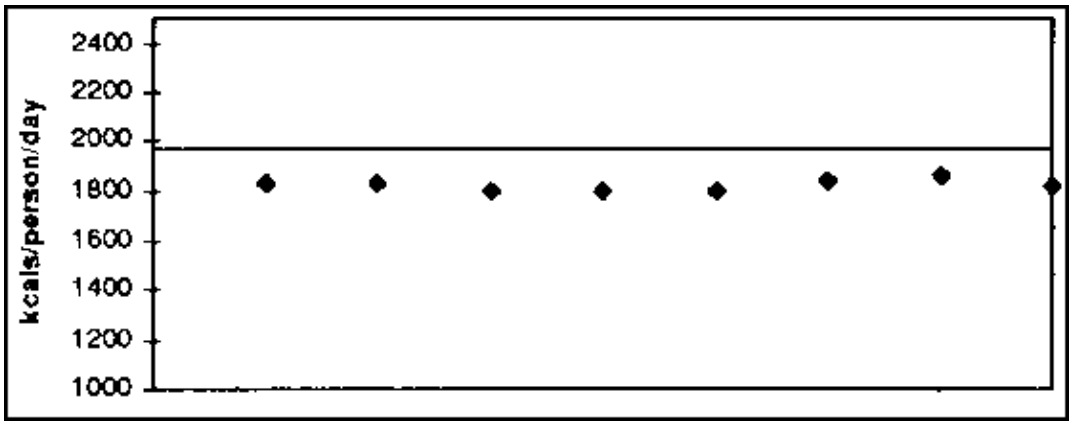


Figure 20.: Reports of Kcals/person/day Received in Kenya

Each point represents a report on kcals distributed; the line represents assessed needs.

When looking at information on food aid provision, it is important to bear in mind that approximately 2100 kcals/person/day is the minimum recommended for populations totally dependent on food aid; however, needs assessments often estimate the requirement above or below that level, depending on circumstances. It is important, then, to look at food aid provision along with assessed needs. For example, the planned ration in Tanzania for 1995–96 was 2080 kcals/person/day. In Figures 19 and 20, each point represents the ration distributed to refugees at a point in time. A horizontal line is placed at the planned level. In the Dadaab camps for Somali refugees in Kenya, the planned ration for 1995–96 was 1980 kcals/person/ day. The graph, based on food basket monitoring, shows that on average kcals distributed were slightly below the recommended level. In Tanzania, rations distributed were more variable, in some cases even exceeding the planned level.

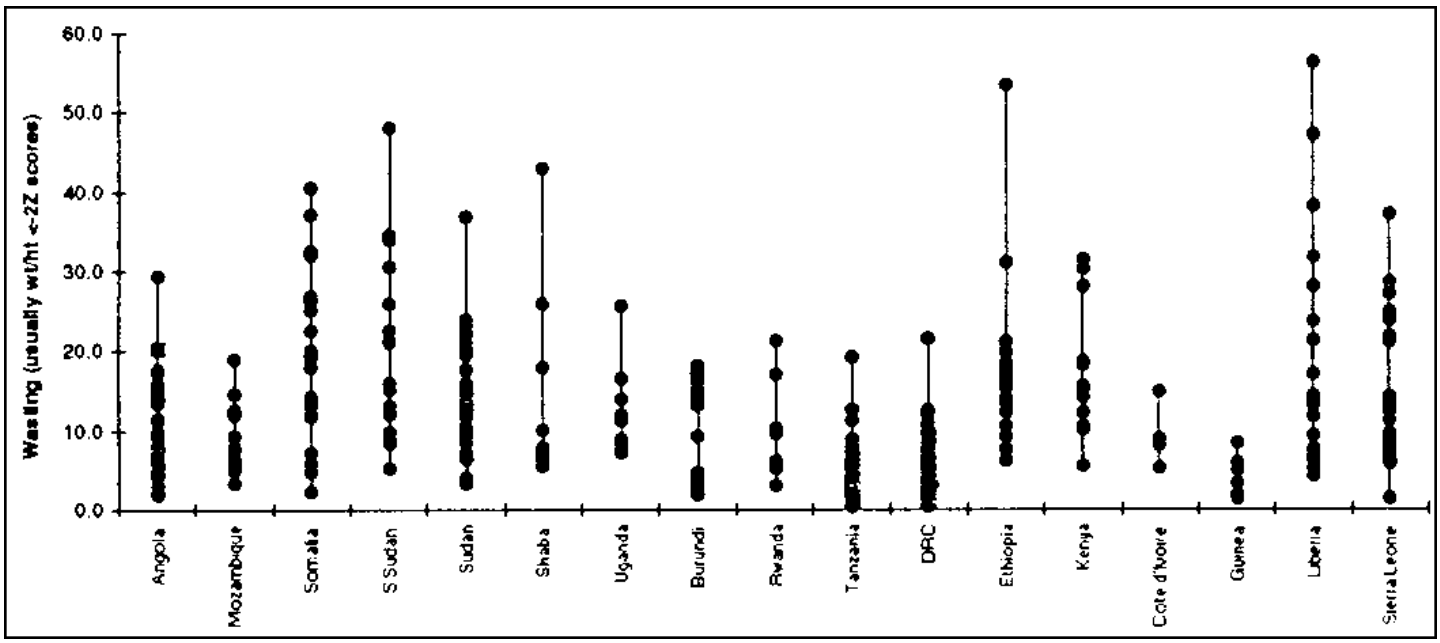


Figure 21.: Levels of Wasting (usually in children 6–59 months) Based on Anthropometric Survey Data Available to the ACC/SCN, Jan 1995–Jun 1997

There are other factors to consider in relation to food distributions. One is the timing of commodity distribution; it can happen that only one or two commodities are distributed over a certain time period and, while this might meet the caloric needs of a population, it is unlikely to meet their nutritional needs. There are, in turn, many possible reasons for this such as logistical and security problems that impede food deliveries. In addition, a lack of food aid pledges by government or delays in shipments are sometimes causes of reduced ration receipts. There is growing awareness that how food aid is delivered (i.e. the distribution system) has an impact on what is actually consumed by target beneficiaries, and that distribution within the family also plays a key role in target group distribution.

Levels of wasting, usually in children 6 months to 5 years old and generally expressed as weight/height <–2 Z scores below the median, are widely reported. In general, levels of wasting in a population under five that exceed 20% are considered to be very high and indicate a serious situation (see Box 4, p. 54).

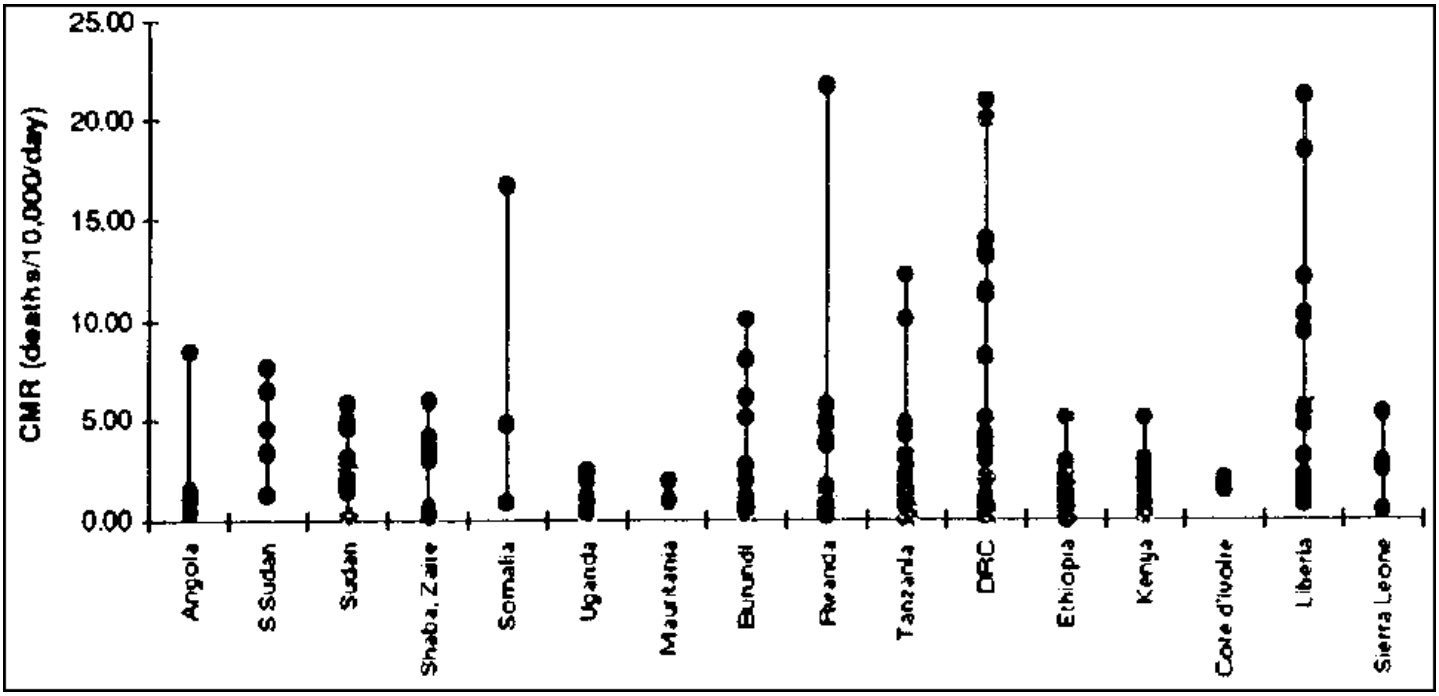


Figure 22.: Crude Mortality Rates (CMR)

In Figure 21, each point represents the results of an anthropometric survey. Half of the reports available to the Refugee Nutrition Information System (RNIS) indicate levels of wasting that are over 10%. One in five of the reports indicates a serious situation demanding immediate intervention.

Worldwide, the crude mortality rate (CMR) is 0.25/10,000/day. A CMR of 1/10,000/day is considered to be alarming, and over 2/10,000/day a serious crisis.

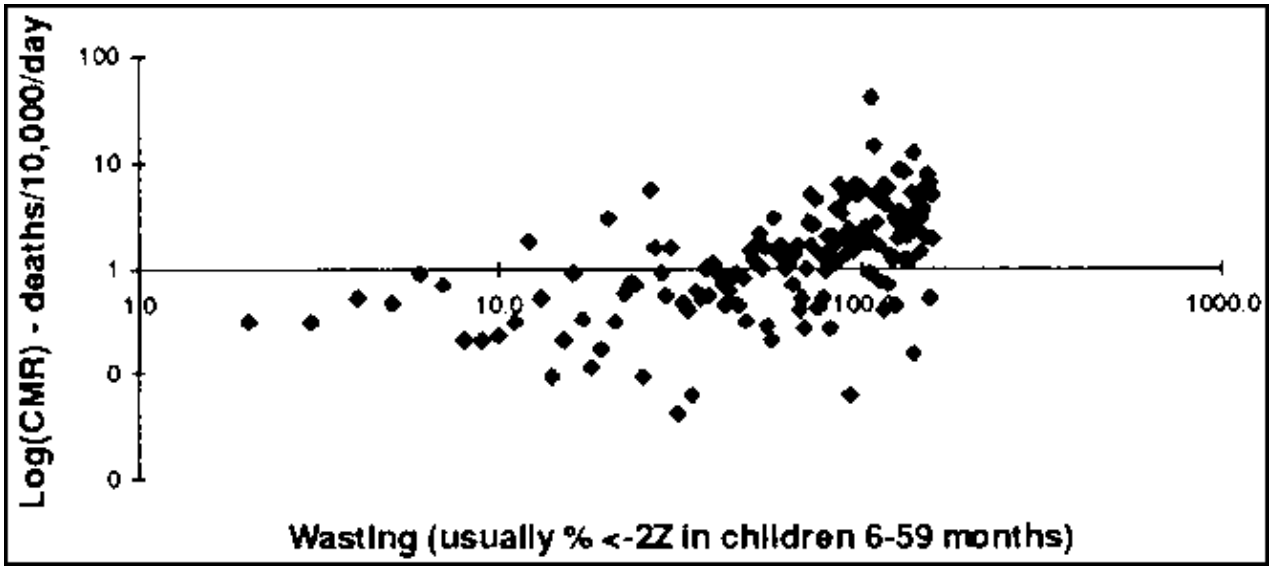


Figure 23.: Wasting and Crude Mortality Rates (CMR) (log scale)

CMR

	<1	>1	Total
<10%	43	14	57
>10%	15	83	98
Total	58	97	155

sen=0.74
total=1.6
spec=0.85

CMR

	<1	>1	Total
<15%	50	31	81
>15%	8	66	74
Total	58	97	155

sen=.62
total=1.51
spec=.89

CMR

	<1	>1	Total
<20%	52	48	100
>20%	6	49	55
Total	58	97	155

sens=.52
total=1.41
spec=.89

Figure 22 illustrates the CMRs from Sub−Saharan Africa (excluding three points in Goma, Democratic Republic of Congo, of 51,40,34/10,000/day in August 1994 during a cholera epidemic). Over 30% of the records show a CMR of over 2/10,000/day, a level which is considered to indicate an emergency out of

control.

Figure 23 plots, on a log scale, wasting and CMRs, again for information available on Sub–Saharan Africa. This figure shows the close association between wasting and mortality, which was also demonstrated in the earlier analysis on this dataset (ACC/SCN, 1994). The expected association is observed, and if we use the cut–off of CMR>1/10,000/day as indicative of a crisis, the best predictor of elevated mortality, based on this information, is 10% wasting (highest total sensitivity + specificity, and highest sensitivity i.e. true positives identified). This is shown in the calculations below Figure 23.

Some reports include information on measles immunization coverage. Refugees and IDPs are considered to be at very high risk of measles outbreaks. All of the main risk factors (crowding, overcrowded sleeping quarters, possible undernutrition and particularly vitamin A deficiency, and possible low immunization coverage) are likely to occur. Information on immunization coverage available to the ACC/SCN shows tremendous variations, indicating that ensuring adequate immunization coverage during emergencies continues to be problematic[6]. Due to the highly contagious nature of measles, immunization must remain as one of the highest priorities in refugee situations.

[6] *Relevant guidelines on the topic include: Conduite à tenir en cas d'épidémie de rougeole'. MSF 1996, and WHO Guidelines for epidemic preparedness and response to measles'.*

Conclusions

Lessons Learned

The overall nutritional situation in most areas covered in this chapter has improved over the period under review with some exceptions – e.g., Ethiopia and Kenya. The information presented illustrates the increasingly complex environment in which humanitarian agencies must work. Access to those in need is often not possible at all or is only possible sporadically, as in Burundi, Liberia and Southern Sudan. Agencies are therefore constrained to work only when security permits, resulting in less than optimal services being provided to beneficiaries. Frequently, humanitarian aid agency personnel and those they are trying to help are placed at great risk during programme implementation. In some instances, beneficiaries may prefer one type of lower priority service provision, e.g., selective feeding, over another programme, e.g., general rations, as it places them at less risk while participating in the programme.

When continual access to populations is possible, levels of wasting and mortality are generally brought under control rapidly. However, it should be pointed out that extremely high rates of malnutrition (i.e. over 40%) are being seen, even in 'stable' situations such as in Ethiopia, Kenya, Liberia, Somalia and Sudan.

The analysis at the end of this chapter bears out what was shown in the *Update on the Nutrition Situation, 1994* (ACC/SCN, 1994). High levels of wasting are a good predictor of elevated mortality (i.e. CMR above 1/10,000/day). Based on the data presented in this chapter, levels of wasting above 10% indicate elevated mortality. Ensuring adequate immunization coverage during emergencies continues to be problematic. While security constraints are often a primary cause of inadequate coverage, a variety of institutional and technical factors may also play a role and should be reviewed in order to determine whether improvements can be effected for future emergency immunization programmes.

There have been undoubted improvements in general ration planning and modalities which help to prevent micronutrient malnutrition; however, cases are still being seen. There are still many research and operational issues which need to be explored in order to ensure more effective preventive strategies. One such initiative is a study being undertaken to determine the use and acceptability of fortified blended foods at the household level. Other initiatives are looking into the feasibility of fortifying cereals for distribution in the general ration.

Issues for Further Consideration

There are several other management and operational issues which have emerged over the past two years in the context of the emergency programmes described in this chapter, some of which are beginning to be addressed while others require further consideration.

One pressing issue is the need for humanitarian agencies to acquire better information about the food security of the beneficiary populations which they are assisting. The need for this was shown clearly in the Great

Lakes region during 1995 and in Liberia and southern Sudan over the past few years. In the case of the Zairian refugee camps, the unplanned reduction in rations which occurred at the start of 1995 was met with outcries by the international aid community which feared widespread starvation and mortality if the general ration was not improved. No such improvements occurred yet the nutritional status of the refugee population remained stable and adequate. Subsequent food security assessments showed that this occurred because refugees had evolved coping strategies which permitted considerable supplementation of the general ration. These strategies only began to be threatened as the government imposed increasing restrictions on refugees' economic activities.

In Liberia, policies of phasing out general ration provision in order to promote self−reliance and avoid dependency were applied too generally and should have been better targeted on the basis of differential ability to adopt coping strategies. Once again, improved assessment of socio−economic circumstances would have led to better informed decisions. The need to rapidly acquire better information on the food economy and coping mechanisms of refugees is being partly addressed by the use of an assessment methodology developed by Save the Children Fund (UK). This methodology is being increasingly used after the initial, acute phase of an emergency and is becoming a regular precursor to assessment missions to set ration levels.

Issues also arise over the role and context for emergency selective feeding programmes. For example, while emergency selective feeding programmes were felt to be highly appropriate at the start of the Liberia emergency, when levels of wasting were extremely high in many parts of the country, the effectiveness of these programmes began to be questioned as time went on. General ration deliveries were frequently inadequate so that many children were re−admitted and default rates were high. It may well have been that resources devoted to 'curative' selective feeding programmes could have been better allocated to supporting the preventive general ration programme.

Another issue that emerged during the 1995−96 period was the utility of adopting a flexible approach to establishing food distribution systems. The experiences in the Great Lakes region during 1994, when commune−headed distribution systems were established in refugee and IDP camps in the former Zaire, Tanzania and Rwanda, showed how such systems could lead to highly inequitable general ration allocations with alarming effects on the nutritional status of camp populations. However, towards the end of 1994 and throughout 1995, agency distribution mechanisms were adapted and evolved into "fairer" systems which proved far more acceptable to beneficiaries. The lessons learned in establishing these systems need to be disseminated and institutionalized in order that agencies can adopt best practice in future emergencies.

In addition to the above issues, a set of ethical considerations also emerges from the experiences of the past two years. These ethical issues need to be examined and thought through ahead of future emergency programmes which may pose similar dilemmas. For example, reluctance shown by some governments to support the largely Hutu population in Eastern DRC manifested itself in a gradual reduction in food aid pledges and raises issues of human rights as well as challenging concepts of 'voluntary repatriation'. It is unclear to what extent moral judgements, regarding the acceptability of supporting a population with known involvement in the 1994 genocide, or foreign policies of 'encouraging' repatriation to Rwanda, were behind such behaviour. Government rationales appeared to be implicit in actions rather than explicitly stated as foreign policy aims or objectives.

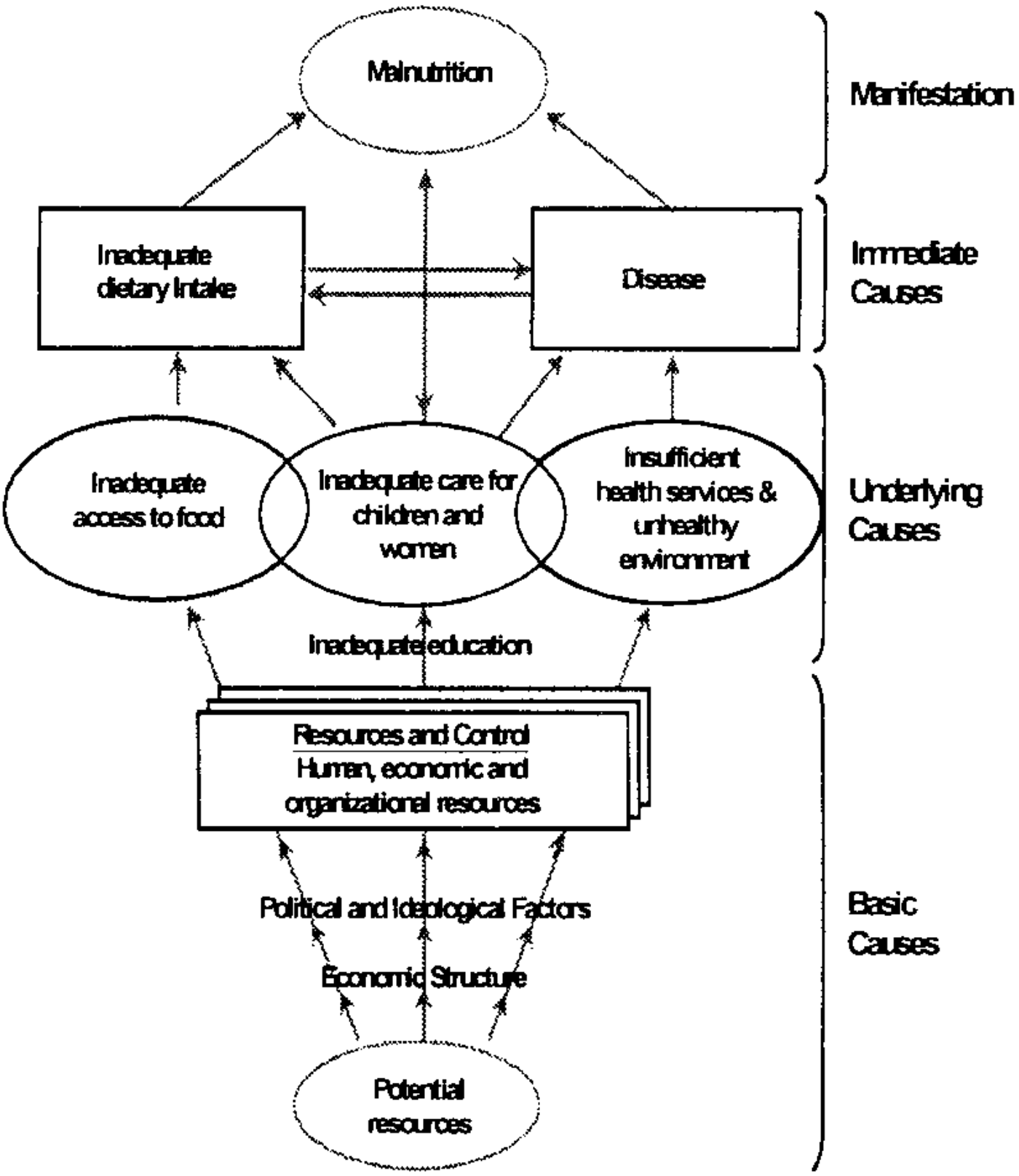


Figure 24.: UNICEF Conceptual Framework of the Causes of Malnutrition

The concept of voluntary repatriation was challenged in Tanzania when the Rwandan refugees went home. The decision that the refugees should return was taken by the Government of Tanzania, and it was reinforced by a military presence as the deadline for repatriation approached. Similarly, there are questions around the voluntary nature of the repatriation of refugees from Bangladesh back to Rakhine State, Myanmar.

Another ethical issue arises with regard to international humanitarian agency support for incumbent governments such as the Taliban in Afghanistan, where such governments openly discriminate against, or

exclude, sections of the population (women) who require assistance from external agencies.

A further emerging issue concerns the tendency of the humanitarian aid community during long−term emergency programmes to move away from provision of emergency aid towards more 'development−oriented' emergency aid support. This targeted support (i.e. seasonal rations, food−for−work) is instituted in the name of discouraging dependency and encouraging self−sufficiency. However, a possible offshoot of this policy has been a potential lowering of acceptable standards of nutrition in an effort to accommodate development thinking, with the effect that levels of malnutrition that would have triggered emergency interventions at the start of a crisis are now seen as somehow normal or acceptable. This phenomenon has been identified in Southern Sudan.

A final issue that needs to be addressed is the extent to which it is valid to compare the nutritional status of refugee and internally displaced populations with that of host populations in order to assess the efficacy of an emergency intervention. For example, while it is often true that a host population has some endemic form of micronutrient deficiency disease this does not necessarily mean that a certain prevalence is acceptable within the refugee or IDP population. Indeed, the increased risk run by the refugees due to factors such as crowded conditions and inadequate sanitary facilities, often associated with camp conditions, means that a compromised nutritional status would have more profound and far−reaching effects. This type of comparison is often implicitly or explicitly made in assessments of emergency−affected populations.

If we accept the concept that refugees have a right to the best possible nutrition, this comparison is not useful. It is more relevant to look at the underlying causes of malnutrition (i.e. food security, caring practices and adequate health care, as set out by the UNICEF model, reproduced as Figure 24) so that the causes may be addressed both among the refugee and host populations.

One way to move forward on this issue may be for the international aid community to define a minimum standard of humanitarian aid provision for emergency−affected populations, as is being undertaken by a project spear−headed by the Steering Committee on Humanitarian Response. In the food and nutrition sector this might entail, for example, promoting best practice in infant feeding or nutrition education for the use of blended foods, a commodity with which many refugees are unfamiliar.

It is apparent that policies need to be formulated on many of these issues. Clarification and wide acceptance of such policies can help us to move another step towards improving emergency response performance and the overall well−being of refugee and internally displaced populations.

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Chapter 4: Towards Nutrition Security Policy Implications for the Twenty−First Century

INTRODUCTION

Great strides have been made since the 1950s in dealing with problems of poverty, hunger and malnutrition. Globally, food production has increased, the rates of preschool malnutrition have fallen and infant and child mortality have decreased in most parts of the world. Despite these impressive gains, poverty, hunger and malnutrition continue to be problems of staggering proportions.

Chapter 1 in this *Report* elucidated the importance of stunting as a good biomarker for the overall quality of life in a given country. Data in this *Report* indicate that the number of stunted preschoolers worldwide has increased during the period 1980 to 1995; more alarming is that fact that the numbers in Sub−Saharan Africa have increased by 62% during this time period. This chapter analyzes the underlying causes of malnutrition and identifies effective strategies for improving nutrition as the world enters the twenty−first century.

Effective policies and programmes

There continues to be tension among policy−makers, on the one hand, in the use of broad−based economic policies as a means of eliminating malnutrition, and on the other, the use of more targeted interventions. Malnutrition is complex; the reality is that typically a combination of different types of policies and programmes are needed to effectively alleviate poverty and malnutrition. Sustaining strategies for reducing and preventing malnutrition almost always involves a combination of macro−economic policies and more targeted interventions. Even in many industrialized countries where average income is adequate, pockets of the population − mainly the poor − are at risk of food insecurity and poor nutritional status. Chapter 1 identified the proximal causes of malnutrition at the individual level as related to food, health and care. While hunger and malnutrition manifest themselves at the level of the individual, the causes generally involve a combination of individual, household, community, national and international factors. It is important to understand these linkages as a way to identify the most effective strategies for reducing malnutrition in a given socio−cultural environment.

National and household food security

Food intake and nutritional status are inextricably linked. The impressive gains in global and national food supplies over the past 30 years were achieved because of effective investments in agricultural research. However, although food security has improved globally, progress has been uneven. Significant proportions of the population are still food insecure in parts of Sub–Saharan Africa and South Asia. The larger numbers of stunted children in these two regions discussed in Chapter 1 reflect, in part, the related problem of hunger and food insecurity in a broad spectrum of the population. In 12 of the 25 African countries reviewed in Chapter 1, stunting has increased. One clear policy implication is that continued investments in agricultural research with, particular emphasis on South Asia and Sub–Saharan Africa is needed.

National food security clearly does not resolve the problem of household level food security, let alone of health, care or poverty more generally. It is access to food – or the household's ability to obtain food – that is critical to ensuring household food security. Policies that increase the access of vulnerable households to food – either through increased income or decreased food prices – will enhance household level food security. Strategies that increase the income of the poor are the most sustainable means of improving household food security. However, it may take quite large increases in income to bridge the food security gap for low–income households. In the short–to–medium term, interventions targeted at low–income households may be needed to buffer vulnerable households against hunger and malnutrition. Parallel action in health is vital, as well as more general actions to deal with poverty, ranging from strategies to support pro–poor growth to education and measures to encourage gender equity.

An increase in household food intake is often assumed to improve the food intake of each of the individual members. However, the effect of increases in household food supplies on an individual's food consumption can be modified by a variety of factors. These include control of income, education of household members, and characteristics of the individual such as gender, age and birth order. In most settings, though, the amount of additional food needed to prevent growth faltering in a preschooler is small in relation to the family's needs. The critical needs are primary health care services such as immunization and the quality of care, including breastfeeding.

Also important are actions to deal with problems of 'hidden hunger' – inadequacies in micronutrient intake. Policies must focus not simply on closing the energy gap but doing so in a way that increases variety and nutrient density of the diet. Diversification of food production must be encouraged both at the national and household level in tandem with increased yields. In many countries this may be a longer–term goal; in the interim, programmes focused on specific target nutrients may need to complement the production–oriented, diet diversification policies. The dramatic expansion of such targeted programmes in recent years provides many examples to build on.

Refugees and displaced people

As shown in Chapter 3 of this *Report,* refugees and displaced populations are the groups most vulnerable to acute food deficits and malnutrition. Civil war and political upheaval have replaced natural disasters as the most common causes of new populations of refugee and displaced person.

A recent report from the Committee on International Nutrition (IOM, 1995) recommended a minimum ration allocation of 2,100 kilocalories per day in order to provide sufficient food energy for reasonable physical activity. WFP and UNHCR have adopted this recommendation as the initial reference value for designing food aid rations in emergencies. However, it is recognized that this initial value should be adjusted as soon as further assessment is possible. This newly defined ration level is well above the caloric level generally available to refugees and displaced people, and it remains to be seen how donors will respond to resulting increased requests.

Much attention is now being focused on the quality of the ration provided to refugees populations, particularly with respect to micronutrient content. A recent step was taken to provide a micronutrient–fortified blended food to all populations totally dependant on food aid. At the same time, questions are being raised on the reliability of the diagnosis of micronutrient malnutrition. Work has begun on developing diagnostic tests which can be used in the field.

All recent projections of food aid needs into the twenty–first century assume that emergencies will continue. Thus far, history has borne out this assumption. There are indications that food aid resources are declining

(Shapouri and Missiaen, 1995), and humanitarian agencies are developing targeting methods to more efficiently use the aid available.

Unfortunately, food aid issues and nutrition have been highly visible only in times of famine and natural disasters. Once the acute food shortages have subsided, concern about chronic malnutrition receives less attention. Indeed, it is in many of the long−standing refugee/displaced situations (e.g., Southern Sudan) where the highest rates of wasting are continually seen.

Food insecurity and malnutrition will continue to be chronic problems that affect large proportions of populations in developing countries. The UN agencies can collectively be an effective vehicle for keeping the food insecurity issue for refugees and displaced persons on the policy agenda.

Nutrition−health links

Malnutrition is caused not only by inadequate food availability but also by inadequate access to health services and a poor environment. Nutrition policy must be an integral part of health policy, co−ordinated at both the national and grass−roots level.

Macro−economic policies that result in increased national income are presumed to lead to increased allocation of this income to investments in primary health care and other social services that will improve nutritional status. However, basic services such as access to safe water and investment in health infrastructure do not show a close relationship to national per capita income levels (von Braun, 1991). Thus, we cannot assume that growth in national income will automatically result in improvements in the health and sanitation environment, at least in the short to medium term. Deliberate policies aimed at reducing malnutrition and improving nutritional status need to be implemented, in tandem with policies for increasing national and household income.

There is now a long rich history of investment in nutrition interventions in developing countries. Much has been learned about approaches that are effective in addressing malnutrition. Major improvements will accrue from preventive approaches targeted to subsets of the population. For ease of presentation these will be discussed from a life cycle perspective.

Adolescents/pre−pregnancy

Some of the biggest gains in improving nutritional status will come from gains in improving neonatal outcomes. Birth weight is the single biggest predictor of growth in the early years of life. Interventions that target females as young girls or during the early teenage years prior to first conception have a potentially high payoff for the nutritional status of the newborn. This is of particular importance since early nutrition determines the growth potential of the uterus and hence the capacity for normal uterine hypertrophy when pregnancy occurs. The capacity of uterine/placental vasulature to increase blood supply to the foetus during pregnancy is modulated by the female's early diet.

Interventions that target a woman once she is pregnant often come too late. Preventive strategies will be most effective in improving birth outcomes. While nutrition interventions directed to high−risk pregnant women have been successful in decreasing the rates of low birth weight and prematurity, the optimal time for addressing nutrition concerns is preconception. This is true in terms of glucose control of diabetic women, weight gain in malnourished women, control of chronic disease (including obesity) and of nutritional deficits. Micronutrient deficiencies cause nutritional insult before most women know they are pregnant. Poor folic acid nutrition and neural tube defects are cases in point. Adequate nutrition is critical to foetal organo−genesis in the early stages of pregnancy.

The adolescent female is a stakeholder that has not been a typical target of nutrition intervention. Thus we have fewer models of how to deliver preventive nutrition services to teenage girls. There is a critical need to identify and test interventions that effectively reach female adolescents, including the appropriate role of nutrient−dense dietary supplements.

There are some interventions that fall under the classification of non−nutritional that can potentially be very effective. Education of girls has been shown to have a profound effect on age at marriage and age of first

conception. Clearly, innovative ways to extend the education of girls into the teenage years need to be pursued. This would also provide the opportunity to integrate a nutrition communications component into a school–based system.

The caring skills of parents and mothers in particular are known to be an essential component of child development. Parenting and child–rearing skills, including the special needs of infants, need to be taught to females prior to the birth of the first child. Again, if female education is extended routinely into the teenage years, parenting skills can be taught as part of a school–based curriculum. This also provides the opportunity for psychosocial support and discussions of issues such as avoidance of substance abuse.

In areas of the world where formal female education is not the norm, other intervention alternatives need to be tested. The use of female community workers offers the potential to reach young women in a socially acceptable way.

Policies aimed at improving growth and development of infants

Breastfeeding is the optimal form of infant feeding. Health procedures need to provide an environment that actively encourages breastfeeding. Baby–friendly policies such as rooming in and early, continued contact between mother and newborn need to be actively pursued. This active promotion of breastfeeding needs to continue once the mother returns home. Breastfeeding support systems are a critical element for the successful continuation of breastfeeding. Where this support is not provided by the extended family, women recruited and trained from within the community can fill this void. An increasing problem in many countries is the entry of women into the formal wage–earning sector as a result of urbanization. While there are clear benefits for women from income–generation, continued breastfeeding becomes more of a challenge. Specific policies at the work site can facilitate the ability of women to breastfeed – breastfeeding rooms, flexible work schedules. These are not policies that typically have been high priority for many employers. Governments and the public health community need to collectively advocate for changes in the work environment that encourage breastfeeding.

A second major issue for early child growth and development is the appropriate introduction of complementary foods. Here again, the hospital or health centre can serve as one point of contact with the mother to discuss infant feeding practices. Given the increasing prevalence of childhood obesity in developing countries, a discussion of overfeeding as well as underfeeding needs to be included.

There is a series of non–nutritional interventions which deserve to be highlighted. The health system needs to evaluate the overall obstetrical practices for their effects on neonatal adaptation and mother/infant bonding. Issues such as the use of birth rooms with family participation, active involvement of the father in the birthing process, and the avoidance or minimization of the use of depressants, anaesthetics and other medications which could interfere with successful neonatal adaptation all need to be directly addressed by health officials. There should be a consistent, articulated policy which optimizes mother/child interaction in the early days. Procedures also need to be specifically identified to screen for preventable causes of impaired mental development, as well as ways to identify infants at developmental risk based on perinatal or social risks. Having carried out the infant screening, interventions aimed at providing adequate social and medical support for families with children at risk for developmental problems need to be implemented. Often this level of support is needed in health systems that do not have the financial nor human resources to provide it, so creative community solutions may need to fill this void.

Policies and programmes directed at young children

Particular emphasis must be placed on ensuring adequate growth and development for young children. This includes effective interventions to prevent stunting and improve mental development. The overall effect of collective efforts will be to promote healthy lifestyles, including diet. This is easier said than done.

Most of the nutrition interventions that have traditionally been used by developing countries have targeted children. However, those interventions have done less well in reaching preschoolers under three years of age. Some promising approaches have emerged. Community–sponsored child care programmes that simultaneously address a mother's time constraint while providing a mix of health/nutrition services offer one model for reaching the younger child. Nutrition screening and monitoring services can be part of the package

included.

Micronutrient malnutrition

Data in this report indicate that tremendous progress has been made in eliminating micronutrient deficiencies. Despite this progress, deficiencies of vitamin A, iron and iodine are still highly prevalent in the world; estimates in this Report indicate that almost one–third of the population worldwide have a deficiency in one or more micronutrient. Because of a substantial commitment by donors, a number of effective interventions to deal with micronutrient malnutrition have been implemented. Some of the more common approaches include supplementation, food fortification, dietary diversification and control of parasitic and other infections. The challenge in the future will be a better identification of the most appropriate intervention or mix of approaches in a given country or local context Not each intervention will work equally well in a given socio–cultural environment. More attention needs to be given to operational research which will identify the key elements of a successful micronutrient intervention. Equally important is to determine how the results of the operational research will be used to guide future investment in micronutrient interventions.

The following issues are critical to specific nutrients:

- Universal iodization is a clear success story in reducing iodine deficiency disorders. Routine monitoring for compliance will be a key factor for sustaining this success.

- Clinical signs of Vitamin A deficiency have decreased dramatically worldwide, in part due to successful mass dose supplementation interventions. Diet diversity strategies offer the potential for decreasing sub–clinical vitamin A deficiency in the general population. Food fortification is also important; more than one food vehicle is available for vitamin A in most settings.

- Recently implemented wide–scale iron fortification programs hold promise for reaching at risk populations.

- More research is needed on the extent of zinc deficiency and a fuller understanding of the links to pervasive stunting and maternal mortality.

We have missed opportunities to address two or more micronutrient deficiencies simultaneously. Past interventions, by and large, have focused on a single micronutrient. Future efforts would benefit from identifying strategies that leverage intervention funds so that we can develop a collective approach for alleviating micronutrient malnutrition.

Earlier discussions indicated that a mix of approaches to addressing malnutrition is typically needed, and the same is true for hidden hunger. A judicious mix of diet diversification, supplementation, fortification and public health measures is almost always needed. The key will be how to identify ways of co–ordinating the menu of interventions so as to maximize the impact in reducing micronutrient malnutrition.

Summary

The *Third Report on the World Nutrition Situation* highlights the progress that has been made in improving nutritional status. There is also an unambiguous message that food insecurity and malnutrition will continue to pose problems for large segments of the world's population as we enter the twenty–first century. There are clear policy implications that need to be addressed if governments and the international community are to be effective in improving nutrition worldwide.

No one solution, by itself, will be effective in eliminating hunger and malnutrition. A collective set of policies and related programme activities will be needed. There now needs to be a more serious and aggressive dialogue on how these pieces best fit in a given country environment.

The relatively positive long–term projections for global food supplies and the obvious link to nutrition are based on the essential role of increased agricultural productivity. These productivity increases will occur only if there is continued public and private sector investment in agricultural research. There is clearly a role for both

national and international institutions to play. Sustaining the gains in agricultural productivity and extending agricultural technologies into untouched areas will depend on continued support for agricultural research. This need occurs at a time when investment in agricultural research is plateauing or declining.

Much more attention needs to be focused on the links between agricultural research globally and on ways of translating such research into public policy at the national and grass–roots level. This has been a major impediment to the adoption of potentially successful approaches for improving household food security.

A second essential element for improved household food security is income growth. Countries must continue to pursue policies that increase the incomes of the poor. However, even where national macro–economic policies have been successful in the short– to–medium–term, there is often the need for a social safety net to protect the nutritional status of vulnerable groups. Programmes that offer the greatest promise for preventing malnutrition involve early intervention. Unfortunately, the cadre of classical nutrition interventions have focused most often on cure and not prevention. This new paradigm of a preventive nutrition focus, with particular emphasis on young girls and teenage females, needs to be implemented in a number of settings. Operational research to identify elements of successful preventive interventions is essential.

Deliberate efforts aimed at reducing and preventing malnutrition are needed, in tandem with policies aimed at increasing national and household income.

The overall outlook for food security and nutrition for the twenty–first century appears relatively good. But this overall positive picture masks dramatic disparities in certain regions of the world in particular among refugee populations. For regions and countries most adversely affected, short–term assistance is likely to continue to be needed.

The dramatic gains in reducing hunger and malnutrition must be continued; one of the biggest mistakes at this juncture would be for policy–makers and donors to assume that the war to end hunger and malnutrition is over. National and international collaborative efforts need to continue if we are to enhance the gains that have been made. The ACC/SCN at its 24th Session in Katmandu convened a *Commission in the Nutrition Challenges of the 21st Century.* We look forward to discussing their proposals for innovative policies for the 21st century.

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Annexes

Annex 1: Prevalences of stunting

Table 22.: National Prevalence of Stunting for Sixty–One Countries with more than One Survey

Country	Year of Survey	Prelevance rates
Sub–Saharan Africa		
Burkina Faso	1992–1993	33.3
	1996	29.4
Cameroon	1977–1978	35.6
	1991	26.0
Cape Verde	1983	15.3
	1985	25.8
Central Africa Republic	1994–1995	33.6
	1995	28.4
Comoros	1991–1992	33.0
	1995	33.8
Côte d'Ivoire	1986	17.2
	1994	24.4
Ethiopia (rural)	1983	59.8
	1992	64.2
Ghana	1987–1988	30.5
	1988	29.4
	1993–1994	25.9
Kenya	1978–1979	35.4
	1993	33.3
	1994	33.6
Kenya (rural)	1982	38.2
	1987	32.2
Lesotho	1976	41.4
	1992	33.0
	1994	32.9
Madagascar	1983–1984	33.8
	1992	54.1
	1993–1994	48.6
	1995	49.8
Malawi	1981	56.4
	1992	49.2
	1995	48.3
Mall	1987	23.8

	1995–1996	30.1
Mauritania	1988	34.0
	1990–1991	56.9
	1995–1996	44.0
Mauritius	1985	21.5
	1995	9.7
Nigeria	1990	42.7
	1993	39
Rwanda	1976	36.6
	1992	48.7
Sao Tome and Principe	1986	25.9
	1996	26
Senegal	1986	23.0
	1991–1992	29.1
	1992–1993	24.7
Sierra Leone	1974–1975	34.1
	1977–1978	42.8
	1989	35.2
	1990	34.7
Tanzania	1991–1992	43.2
	1996	43.4
Togo	1976–1977	33.7
	1988	33.6
Uganda	1988–1989	44.4
	1995	38.3
Zambia	1992	39.8
	1996–1997	42.4
Zimbabwe	1988	29.0
	1994	21.4
Near East /North Africa		
Algeria	1987	12.4
	1992	18.1
	1995	18.3
Egypt	1978	37.7
	1988	30.9
	1990	30.0

	1992–1993	26.0
	1994–1995	21.6
	1995–1996	29.8
Morocco	1987	24.9
	1992	24.2
Oman	1991	20.7
	1994–1995	15.7
Tunisia	1973–1975	39.5
	1988	17.9
	1994–1995	22.5
Turkey	1993	16
	1995	20.5
Yemen	1991–1992	44.1
	1996	39
South Asia		
Bangladesh	1982–1983	67.7
	1985–1986	67.5
	1989–1990	64.6
	1992	64.2
	1996–1997	54.6
India (rural)	1974–1979	72.3
	1988–1990	62.1
	1991–1992	61.2
Maldives	1994	30.1
	1995	29.6
Nepal	1975	69.4
	1995	63.5
	1996	48.8
Pakistan	1977	67.0
	1985–1987	57.9
	1990–1991	49.6
Sri Lanka	1975–1976	49.9
	1977–1978	44.6
	1980–1982	36.2
	1987	27.2
	1993	23.8

South East Asia		
Laos	1993	48.0
	1994	47.3
Myanmar	1980–1981	48.0
	1983–1985	49.7
	1991	40.0
	1994	44.6
Philippines	1971–1975	55.3
	1982	42.8
	1987	36.6
	1989–1990	37.2
	1992	34.7
	1993	32.7
Solomon Islands	1970	25.7
	1989	27.3
Viet Nam	1983–1984	59.7
	1987–1969	56.5
	1994	46.9
Middle America/Caribbean		
Costa Rica (1st grade)	1979	20.4
	1981	15.4
	1983	12.7
	1985	11.3
	1989	9.2
Dominican Republic	1986	20.6
	1991	16.5
El Salvador	1986	29.9
	1993	23.1
Guatemala	1987	57.7
	1995	49.7
Haiti	1976	39.6
	1990	33.9
	1994–1995	31.9
Honduras	1987	37.2
	1991–1992	36.3
	1993–1994	39.6

Jamaica	1976	12.1
	1989	8.7
	1991	6.2
	1992	10.6
	1993	9.6
Mexico (rural)	1974	42.6
	1979	26.7
	1986	36.4
	1989	35.1
Nicaragua	1980–1982	21.7
	1993	23.7
Panama	1980	22.0
	1992	9.9
South America		
Bolivia	1981	42.7
	1989	37.7
	1993–1994	26.6
Brazil	1975	32.0
	1969	15.4
	1996	10.5
Chile	1984	9.9
	1985	9.5
	1986	9.6
	1993	6.6
	1994	2.6
	1995	2.4
Colombia	1965–1966	31.9
	1977–1960	22.4
	1986	25.3
	1989	16.6
	1995	15.0
Guyana	1971	23.7
	1981	20.7
Peru	1975	39.7
	1984	37.8
	1991–1992	31.8

	1996	25.8
Uruguay	1987	15.9
	1992–1993	9.5
Venezuela	1981–1982	6.4
	1987	4.6
	1990	13.8
	1991	13.5
	1992	13.6
	1993	12.8
	1994	13.2

Source: *WHO Global Database on Child Growth and Malnutrition (1997)*

Table 23.: National Prevalence of Stunting for Countries with One Survey

	R NAME	C NAME	YEAR	STUNTING
1	Sub–Saharan	Benin	1996	25.00
2	Sub–Saharan	Burundi	1987	47.40
3	Sub–Saharan	Congo	1995	45.20
4	Sub–Saharan	Congo (rural)	1987	27.50
5	Sub–Saharan	Eritrea	1995	38.40
6	Sub–Saharan	Mozambique	1995	55.00
7	Sub–Saharan	Namibia	1992	28.50
8	Sub–Saharan	Niger	1992	39.50
9	Sub–Saharan	Seychelles	1988	5.10
10	Sub–Saharan	South Africa	1995	22.80
11	Sub–Saharan	Sudan	1993	34.30
12	Sub–Saharan	Swaziland	1984	30.30
13	Near East	Bahrain	1989	9.90
14	Near East	Djibouti	1989	22.20
15	Near East	Iran	1995	18.90
16	Near East	Iraq	1991	21.80
17	Near East	Jordan	1990	15.80
18	Near East	Kuwait	1984	12.20
19	Near East	Lebanon	1996	12.20
20	Near East	Libyan Arab Jamahiriya	1995	15.10
21	Near East	Qatar	1995	8.10
22	Near East	Syrian Arab Rep.	1993	26.60

23	S. Asia	Bhutan	1987	56.10
24	S. Asia	India	1993	52.00
25	SE Asia	Fiji	1993	2.70
26	SE Asia	Indonesia	1995	42.20
27	SE Asia	Kiribati	1985	28.30
28	SE Asia	Paper New Guinea (rural)	1983	43.20
29	SE Asia	Thailand	1987	21.50
30	SE Asia	Vanuatu	1995	19.10
31	Mid−America	Costa Rica	1994	6.10
32	Mid−America	Mexico	1988	22.80
33	Mid−America	Trinidad and Tobago	1987	4.80
34	S. America	Argentina	1994	4.70
35	S. America	Barbados	1981	7.00
36	S. America	Ecuador	1986	34.00
37	S. America	Paraguay	1990	13.90

Source: *WHO Global Database on Child Growth and Malnutrition (1997)*

Annex 2: Description of methods used to estimate regional trends and prevalences reported in Chapter 1

The data used to assess progress in child stunting were taken from the WHO Global Database on Child Growth and Malnutrition. For 61 countries, data were available from at least two surveys for the estimation of trends in stunting. For 95 countries, data were available from at least one survey for the estimation of prevalence of stunting. A data set was constructed with the following variables: region, country, year of survey, prevalence of stunting, sample size of survey, minimum age surveyed, maximum age surveyed, and country population for that year. The data set had 223 observations; this means that countries had, on average, 2.4 surveys.

The countries comprising each region were the same as for previous reports in this series, particularly *Update on the Nutrition Situation, 1996.* The year of survey was coded in fractional units if appropriate; for example, a survey taken in 1993−94 was coded as 1993.5. Minimum age surveyed was coded as 0 if the minimum age was 0 months, and 1 if otherwise.

The statistical analysis used multilevel modeling. Multilevel modeling refers to a generalization of standard regression that employs multiple levels or units. In the data set, there were three levels: region, country and survey year. Each of these levels was a source of variability in the prevalence of stunting. Multilevel modeling was implemented in "SAS proc mixed", a procedure that accommodates both categorical and continuous co−variates, and an incomplete series of time measurements, and allows for the added variability introduced by the multiple levels of analysis.

Analyses were done separately for each of the six regions. This was useful, firstly because the trend in the prevalence of stunting may have differed substantially from one region to another. Secondly, a separate analysis for each region required that two rather than three levels be modeled, substantially reducing model complexity.

Ideally, the analytical approach would have been to fit curves relating the prevalence of stunting to the survey year for each country, using random coefficient modeling.

This modeling would have allowed each country to have its own intercept and regression coefficient(s) for the relationship. However, the number of countries with more than two survey years was too few to fit this model. Therefore, a simplified version of a random coefficient model with only random intercepts was used. Each country had its own intercept, but countries shared common regression coefficient(s) for the relationship of prevalence of stunting to survey year. This model is a generalization of a standard repeated measures analysis that allows both categorical and continuous co−variates. This simplified random intercept model gave the same estimates of the overall trends and prevalence as the more complex model would have given.

An assumption of the analyses was that the extent of available data for countries was not related to the prevalence of stunting. In other words, it was assumed that the trend of the prevalence over time for a region could be estimated in an unbiased manner from the data available. Under this assumption, the model accommodated the variable patterns of available surveys for the countries. Countries with just one survey only contributed information to the estimation of the overall intercept, whereas countries with more than one survey also contributed to the estimation of the regression coefficient(s) relating the trend to the survey year.

To estimate the trends in the prevalence of stunting by region, a multilevel model was devised that was appropriate for each of the six regions. The models were run both with the country population included as sample weights, and without the population weights. The population weights were calculated by taking the average of the population for each country over the years 1980,1985, 1990 and 1995, and dividing by the average of the population for that region over the same years. With the population weights, the relative contribution of each country in the region to the estimation was according the size of the country, so that larger countries had more influence on the estimates. These weighted models were appropriate for estimating trends and prevalence at the regional level. The unweighted models gave equal emphasis to each country, and were important for understanding how well the models fit the data from the countries. In a few instances, a country had two series of surveys that were not directly comparable such as one series of rural surveys and one series of whole−country surveys. These two series were treated in the analysis as distinct for the purposes of estimating trends.

The initial models specified a linear (i.e., straight−line) relationship between prevalence of stunting and survey year. Thus, these models assumed that the rate of change in the prevalence of stunting was constant. To determine if any of the regional trends were speeding up or slowing down, possible nonlinear relationships were examined by including quadratic and cubic polynomial terms. The estimated nonlinear regression equations were compared with plots of the prevalence of stunting against survey year to examine the fit of the models to the data. The only region for which there was evidence of a nonlinear relationship was Near East/North Africa.

To determine if the regions were progressing differently, linear contrasts among the regression coefficients were constructed from the estimated values of the coefficients and their standard errors. The linear contrasts were evaluated against the standard normal distribution to obtain p−values.

Although most surveys measured children from zero to 59 months, there was some variation in the minimum and maximum ages measured. Any possible influence of this variability in age was evaluated by repeating models including co−variates for the minimum and maximum age. The maximum age was found to be unrelated to the prevalence of stunting. However, the minimum age was related both to survey year and to the prevalence of stunting. Surveys with minimum age greater than zero months were collected earlier, on average, than were surveys with minimum age equal to zero. Furthermore, surveys with minimum age greater than zero months had lower prevalence of stunting, on average, than did surveys with minimum age equal to zero.

Consequently, it is possible that the variability in the minimum age confounded the estimates of the trend in stunting. An attempt was made to evaluate the possible effects of this age variability within each region, but there were insufficient data to do this. Instead, the possible effects of this age variability were evaluated for all countries in all six regions combined. The analysis was inconclusive, again because of insufficient data, but there was some indication that the effect of the age variability would have been to underestimate somewhat the trends in the prevalence of stunting. This means that the regions that were estimated to have a decrease in the prevalence of stunting did, in fact, decrease, but that Sub−Saharan Africa may have actually had less of an increase than was estimated.

There was considerable variability in the sample size for each of the surveys included in the analysis. The minimum sample size was 449. The sampling variability of the prevalence of stunting from a survey with a sample size of 449 is about 2% (i.e., the standard error). This sampling variability for the smallest survey was much less than the variability in the prevalence of stunting among countries. Therefore, the possible influence

of the sampling variability on the results was small and could be ignored.

Notes on Data Sources used for Chapter 1

All stunting prevalence rates were taken from the WHO'S recently published Global *Database on Child Growth and Malnutrition,* compiled by Mercedes de Onis and Monica Blössner. This appears as WHO (1997) in the list of references.

National prevalence rates of low birth weight used for the figure on page 10 were taken from UNICEF's *State of the World's Children 1998,* page 98 to 101 published by UNICEF in December 1997.

Population figures were taken from the United Nations Statistics Off ice, 1996.

Social and economic development indicators used throughout the chapter are from the UNDP's *Human Development Report* 1997 and UNICEF's *State of the World's Children. 1998* and the World Bank's *World* De*velopment Indicators,* 1997.

Annex 3: Trends in stunting: is age an issue?

BACKGROUND

Stunting is a cumulative process. In general, if infants in developing countries are born with adequate length (comparable to the 50th percentile of the WHO/NCHS growth reference (WHO, 1979)), they start to deviate from the reference line during their first few months of life, continue to deteriorate markedly during the first year, reach their lowest height–for–age Z–score sometime during their second year (usually around 18–24 months of age) and plateau at this low level, without any major improvement thereafter. The rate of deterioration is greatest during the first 6–9 months of age, and in some countries, it starts as early as during the first three months of life (Rivera and Ruel, 1997 (Guatemala); Sommerfelt and Stewart, 1994 (DHS data)). Although the precise timing of the deterioration as well as the magnitude of the overall deficit in height differ between regions (Victora 1992), and between countries within regions (Sommerfelt and Stewart, 1994), the patterns of deterioration are amazingly consistent worldwide. In terms of rates of stunting, this translates into generally low prevalences of stunting during the early postnatal period, followed by a gradual increase during the first year to reach a maximum and to stabilize at highest levels at around 24–36 months of age.

The pattern described above highlights the fact that the group of *under–five* children is not a homogenous group. It also emphasizes the fact that estimates of the prevalence of stunting will be largely affected by the age range included in the estimation. For instance, prevalence estimates will be higher if children between 36 and 60 months are included in the estimation because this group of children, which constitutes 2/5th of the sample, almost always has much higher prevalences of stunting than younger age groups. Therefore, including this group will bring the prevalence estimates up and will lower the median height–for–age z–score estimates. It is also important to be consistent about the 0–3 months age group[1]. Because this group has lower prevalences of stunting, including them in the estimation will tend to lower the prevalence, and excluding them will have the opposite effect. This group, however, constitutes a much smaller proportion of the total sample of children than the 36– to 60–months–old group, therefore including or excluding them should have a smaller impact on the overall prevalence estimates. Thus, the main point to be emphasized is the need for consistency in the presentation and reporting of stunting data for comparisons between countries as well as for reporting changes over time.

> [1] *The Demographic Health Surveys are often not consistent (even within a country) with the inclusion of this age group, which makes comparisons over time difficult to interpret.*

WHICH AGE GROUP should we FOCUS on for TREND ANALYSIS?

The decision about which age group to focus on for international comparisons and trend analyses should be based on three considerations: the age groups being targeted, the nature of the interventions, and short–term versus long–term trends.

a) Which age group are current programmes and policies targeting?

The last decade has seen a shift from targeting nutrition and health programmes and interventions to *under−five* children to a greater emphasis on children under three years of age. This came about largely as a response to the claims made by the research community that children under three are more vulnerable and at risk of developing malnutrition, and that they tend to respond more to interventions than older children. Thus the main issues motivating the change in focus were: prevention of malnutrition rather than cure; and achieving cost−effectiveness, i.e. that funding should be allocated to the group of children likely to show the greatest response to interventions.

In his review of targeting for supplementary feeding, Beaton provides convincing evidence that "the effective target range for substantive impacts on linear growth seems to be six months to two or perhaps three years" (Beaton, 1993 p. 47). He clarifies that the implications are not that no benefit at all can be expected beyond this age, but that the magnitude of benefits may not justify the additional cost of providing food supplements to children after three years of age. These conclusions were based on three main points:

- that the age of "active" growth faltering is between six and 24 months of age;
- that evidence from positive secular changes shows increasing improvements in height−for−age Z−scores from about six to 24 months of age, with smaller improvements thereafter;
- that response to supplementation is greater among children under 24 months of age.

This latter point was documented with studies from India (Gopalan et al. 1973) and Colombia (Lutter et al. 1990). Additional information now available from Guatemala (Schroeder et al. 1995) further substantiates that greater benefits from energy−protein supplementation are obtained before 24 months of age, and that the younger the children (after six months of age), the greater the benefits.

These convincing results, although widely recognized among the academic community, have made their way to the operational and programmatic institutions only slowly and inconsistently. Many programmes still target all under−fives, although some NGOs have now started to change the focus of their programmes to younger age groups.

b) What is the nature of the intervention(s)?

Another issue that needs to be considered is what is the nature of the intervention(s) or changes we are monitoring when reporting trends in the prevalence of stunting. When looking at global trends, the hypothesis is that overall growth and improvements (or deteriorations) in economic conditions will bring about improvements (or deteriorations) in the nutritional status of children. The mechanisms by which nutrition will improve as a result of economic growth are indirect, and therefore may require a number of years before a change is observed. A series of intermediary steps are needed, such as increased income and education, improved infrastructure and environmental sanitation, and a greater access to food, health and appropriate caregiving practices. Thus, the time frame for reporting trends must be adapted to the nature of the changes we are monitoring.

c) Are we looking at short−term or long−term trends?

The most appropriate age group to use for the assessment of trend might also depend on whether we are looking at short−term or long−term trends. In the following analysis, empirical data are used to examine both.

SHORT−TERM TRENDS

Because of their high rates of growth, children during their first two years tend to respond more quickly to short term insults (or improvements), compared to older children who are relatively insensitive to short term changes. This can be seen by looking at the effects of seasonality on linear growth, using an example from Ghana[2].

[2] *The data are from the Ghana Vitamin A Supplementation Trials Child Health Study (Principal investigators: Kirkwood BR, Ross DA and Arthur P. The data were collected by the London School of Hygiene and Tropical Medicine and the Ministry of Health of Ghana. The sample size for this analysis was 1,054 children.)*

Figure 25 shows differences in children's median height−for−age between survey rounds, by three−month intervals between birth and 60 months of age. Round 1 is the reference period and each of the subsequent rounds (2, 3 and 4) is compared to round 1. Round 2 corresponds to the worst season of the year when both food insecurity and malaria incidence were at their highest. There is a clear age−pattern in the response to the severe season, whereby infants in their first year showed a huge deterioration in height−for−age Z−scores. This was also seen among children in their second year, but was completely absent among children 24 months and older.

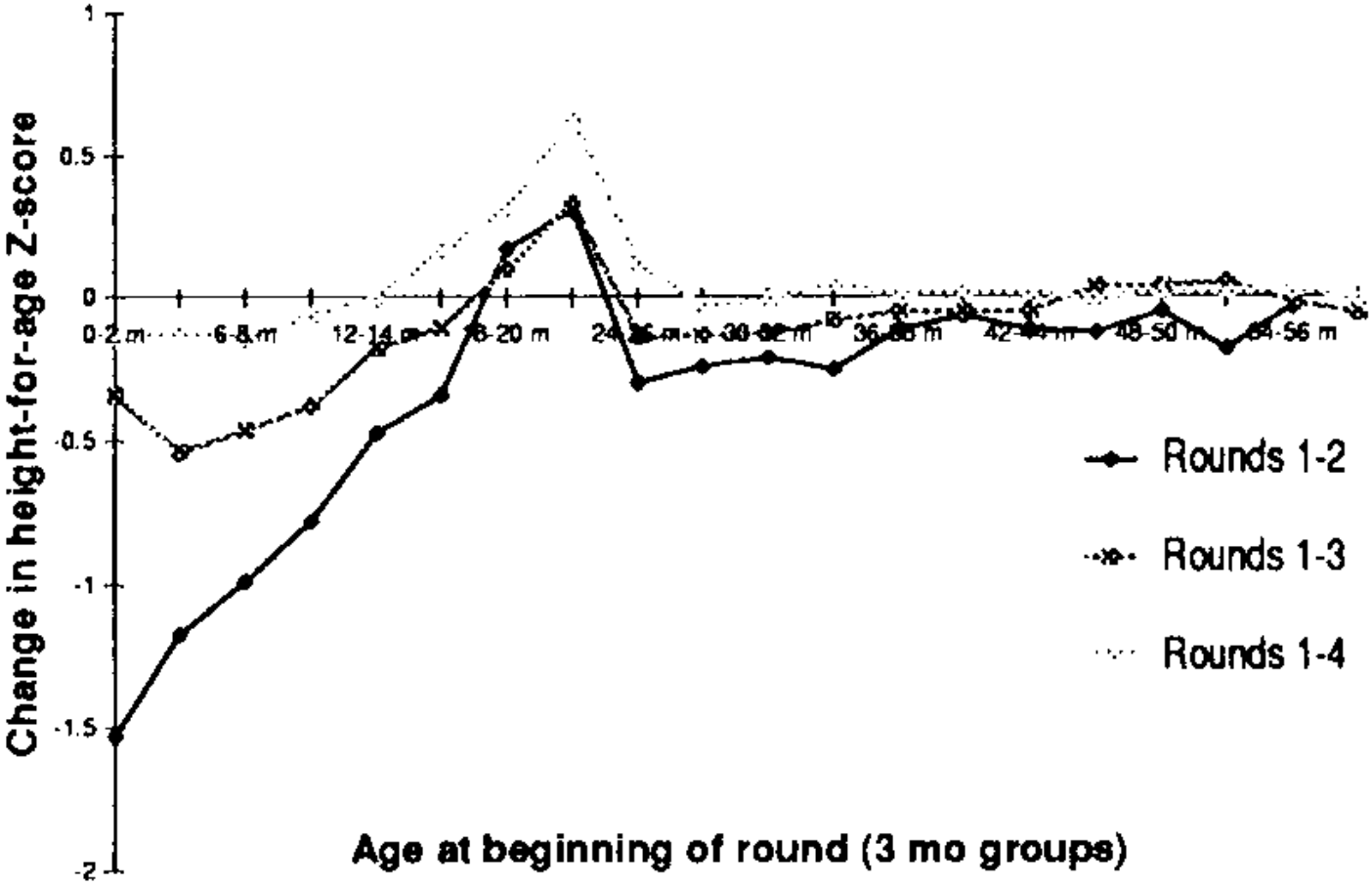

Figure 25.: Change in Stunting in Children Shows a Pronounced Age Pattern in Ghana

Similar, but less striking results were found in two other IFPRI data sets (from the Philippines and Bangladesh) that were also analysed for seasonal patterns. These findings underscore the need to report stunting data by age groups that are sensitive to the true patterns of change during childhood, such as three− or six−month intervals for children under 24 months of age and possibly yearly thereafter.

LONGER−TERM TRENDS

For analysis of long−term trends, data from the Demographic Health Surveys (DHS) were used. There were eight countries for which anthropometric data were available at two points in time and for which the data sets were available on the Internet.

A summary of the main results for each country is presented in the following table. Median height−for−age Z−scores and prevalences of stunting by age group and year of survey for each country are also presented below.

Table 24.: Summary of Analysis of Trends using DHS Data

Country and years of surveys	Changes In stunting prevalence

Colombia (1986 & 1995)	Improvements were consistent throughout the age range, but much larger improvements were found among children 24 months and older. Among this group, the prevalence of stunting fell from approximately 30% to 10–11%.
Dominican Republic (1986 & 1991)	The data indicate a deterioration among children 18 months or younger and a reversed trend (improvement) among children 24 months and older. These were found for both the median Z–scores and for the prevalences of stunting.
Guatemala (1987 & 1995)	Very slight improvements in median Z–scores occurred: this was consistent throughout the whole age range. The prevalence of stunting was slightly reduced at all ages (except for the 27–29 and the 33–36 mo age groups). Reductions in prevalences of stunting were between 2% and 11%.
Ghana (1988 & 1993)	Not much change was observed; small changes were inconsistent throughout the age range. Children 24 months and older showed slight improvements in median Z–scores in 1995 and some reduction in the prevalence of stunting was also observed.
Mali (1987 & 1995/6)	Median Z–scores deteriorated among children 15 months and older. The magnitude of the deterioration was quite large and is also seen in large increases in the prevalence of stunting for children 15 months and older. Prevalences of stunting among this age group went from about 30% in 1987 to close to 50% in 1996. Among children 33–36 months old the prevalence of stunting doubled.
Senegal (1986 & 1992/3)	Changes in median Z–scores between 1986 and 1992 were inconsistent throughout the age range. There seemed to be an improvement in Z–scores before the age of 12 months, but the 12–24 months old group seemed to have deteriorated over this period.
Uganda (1988/9 & 1995)	Median Z–scores were somewhat better in 1995, but differences were not large. The pattern, however, was relatively consistent over the age range. The prevalence of stunting generally decreased for almost all age groups.
Zimbabwe (19889 & 1994)	Median Z–scores were consistently greater in 1994 for all age groups, and differences between years were larger among children less than 12 months of age than among older children.

The first overall observation is that there is no clear pattern of age differentials observed across countries. Some countries show larger responses among children aged under two years, others show the opposite, and yet others show a similar magnitude of change for all age groups. This lack of consistency probably reflects the fact that both the timing and the nature of the interventions varied among countries, as discussed above. For instance, countries that show a consistent improvement throughout the age range, such as Zimbabwe, may have experienced positive changes over a sufficiently long period of time (at least five years) to allow those effects to be observed throughout the whole age range. Children who are now four years of age, for example, might have been young enough when improvements occurred to have responded then and to have maintained the gained benefits over the long term.

On the other hand, findings from the Dominican Republic, which show an improvement among children 24 months and older, but a marked deterioration among children less than 18 months, indicate that two different processes may be happening at the same time. Had only overall trends been examined, results might have shown little change over time because the two opposite patterns of change would cancel each other out. The data stratified by age clearly suggest that a strong factor is negatively affecting the growth of young infants in the Dominican Republic, possibly related to changes in breastfeeding practices.

Another interesting aspect shown in Figures 26 to 34 is that improvements in median height–for–age Z–scores among younger age groups will tend to have much smaller effects on overall stunting prevalence rates than similar improvements at older ages. This is because the median height–for–age Z–score of older children is much closer to the –2 Z–score cut–off point which separates stunted from not–stunted children. Zimbabwe provides a good example of this phenomenon. If one looks at differences in median height–for–age Z–scores between 1988 and 1994, the magnitude of improvement for six– to eight–month– old children is approximately 0.5 Z–score, which is reflected in a reduction of the prevalence of stunting for this age group from 16% in 1988 to 8% in 1994. A much smaller difference in Z–scores (approximately 0.25) among the 33– to 35–month old group results in a greater reduction in the prevalence of stunting (from 31% to 21%). A similar phenomenon is observed in Mali. A drop of 0.5 median Z–score among the 33– to 35–month olds resulted in a two–fold increase in the prevalence of stunting among this age group (from 25% to 51%). On the

other hand, a slightly larger drop in median Z−score at 18−20 months of age resulted in a 1.6−fold increase in stunting prevalence at that age.

CONCLUSION

In conclusion, the use of one estimate of stunting prevalence for a whole cohort of children between 0 and 60 months of age should be avoided when looking at trends over time because it may mask important differences between age groups. When possible, at least two estimates should be provided: one for children under 24 months of age and one for older children (either 24 to 36 months or 24 to 60 months old).

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Colombia

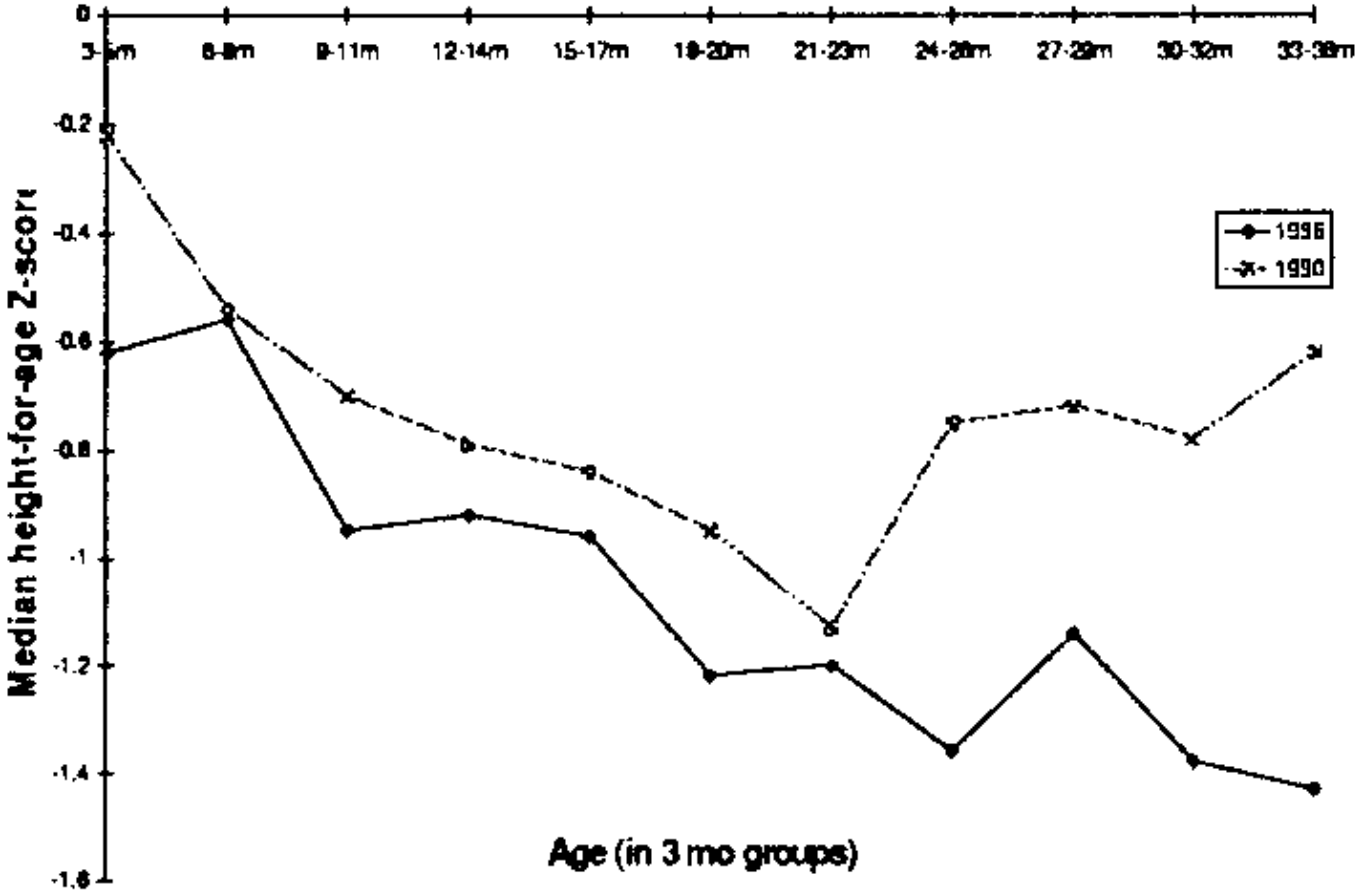

Figure 26: Median height–for–age Z–score of Colombian children (DHS 1986 and 1995)

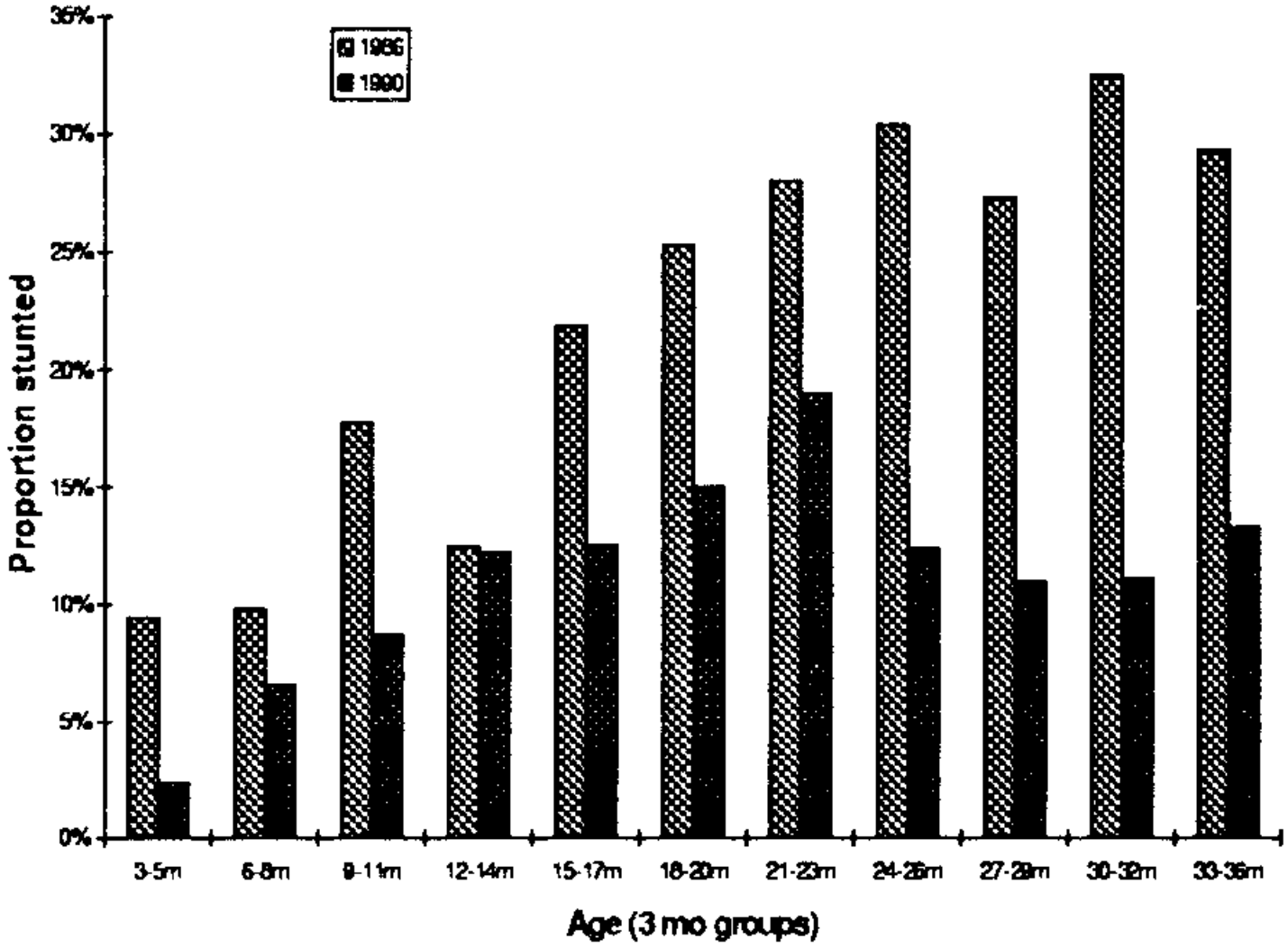

Figure 27: Prevalence of stunting by age, Colombia (DHS 1986 and 1995)

Dominican Republic

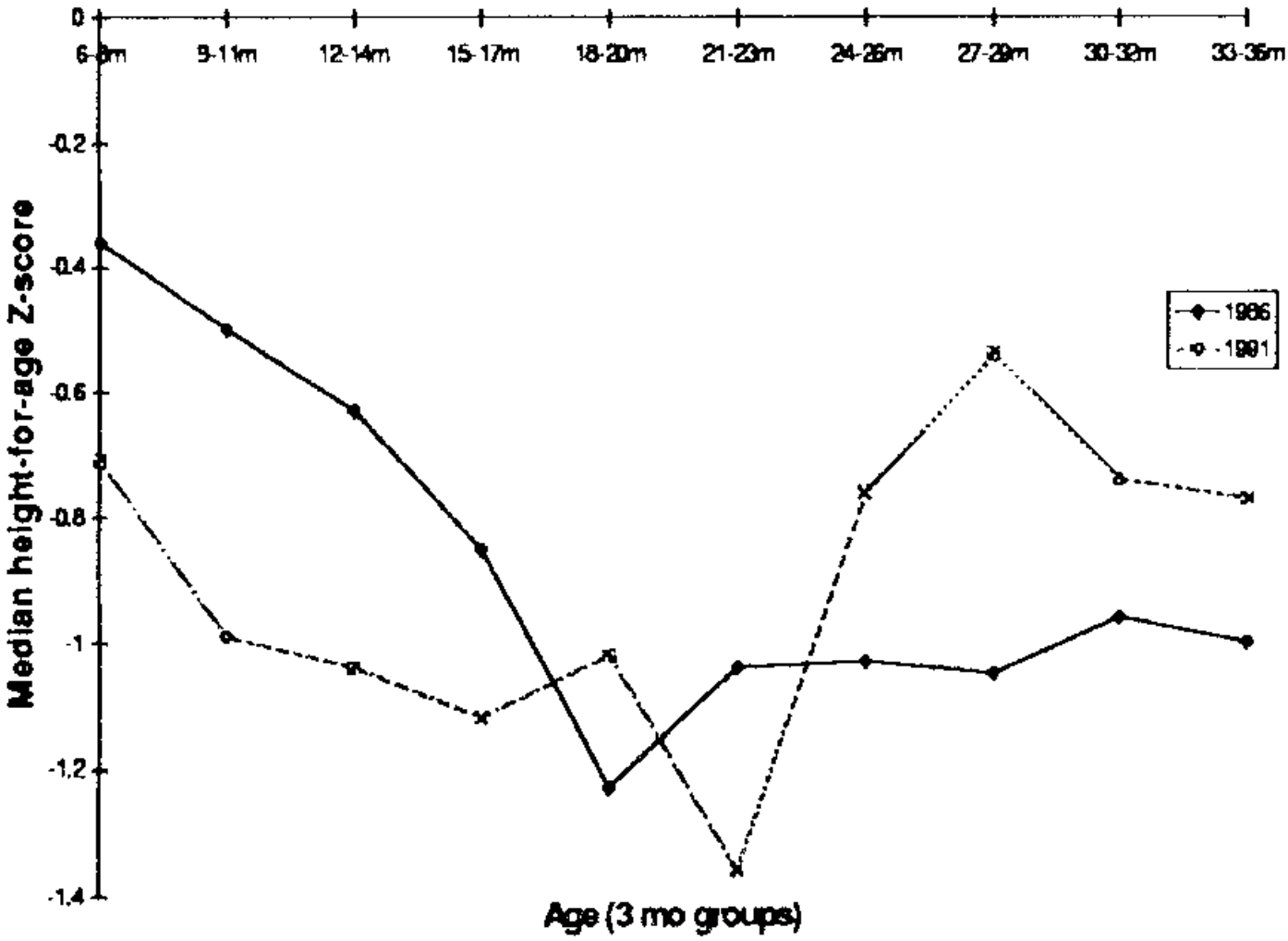

Figure 28: Median height–for–age Z–score of children from the Dominican Republic (DHS 1986 and 1991)

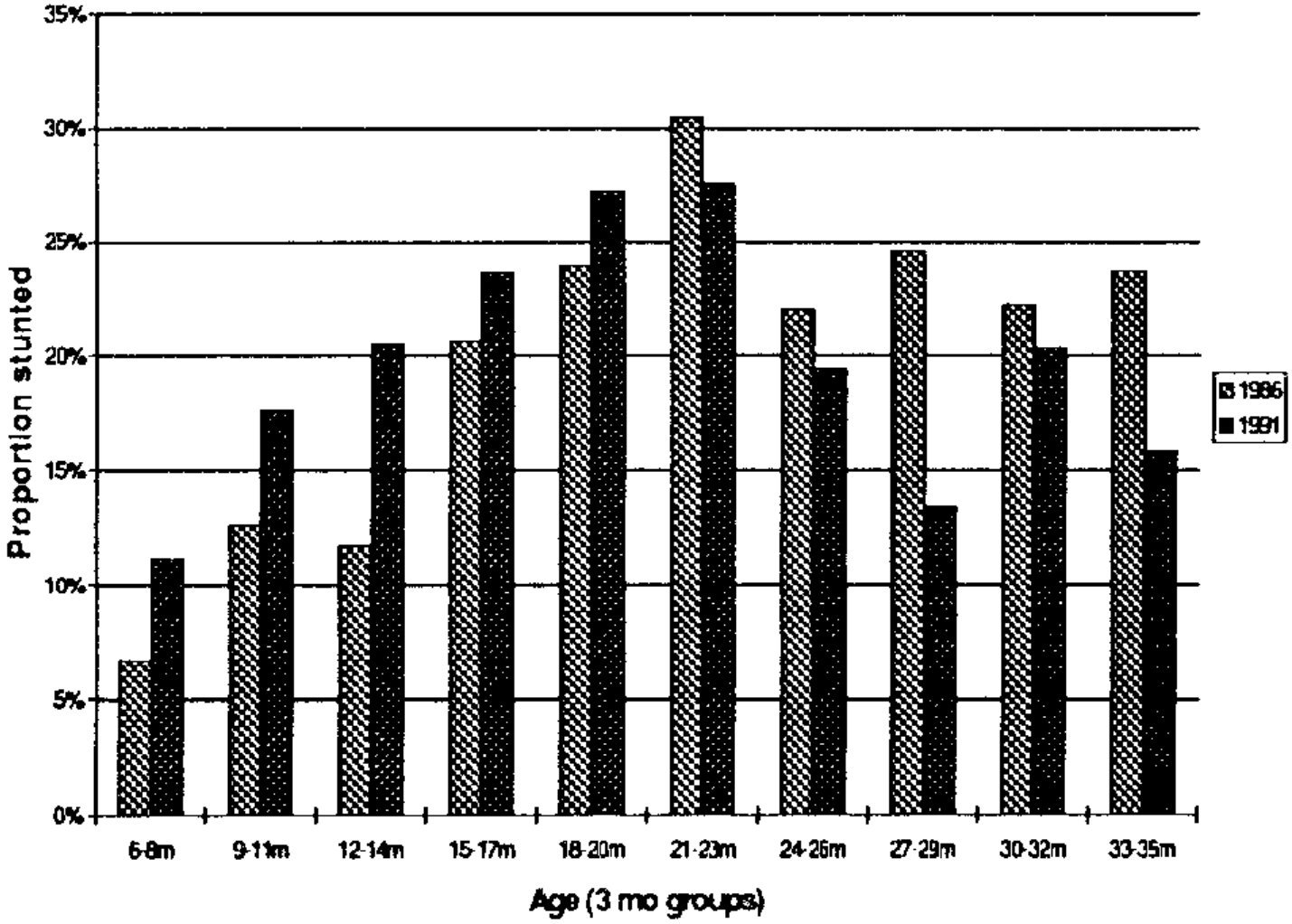

Figure 29: Prevalence of stunting by age, Dominican Republic (DHS 1986 and 1991)

Guatemala

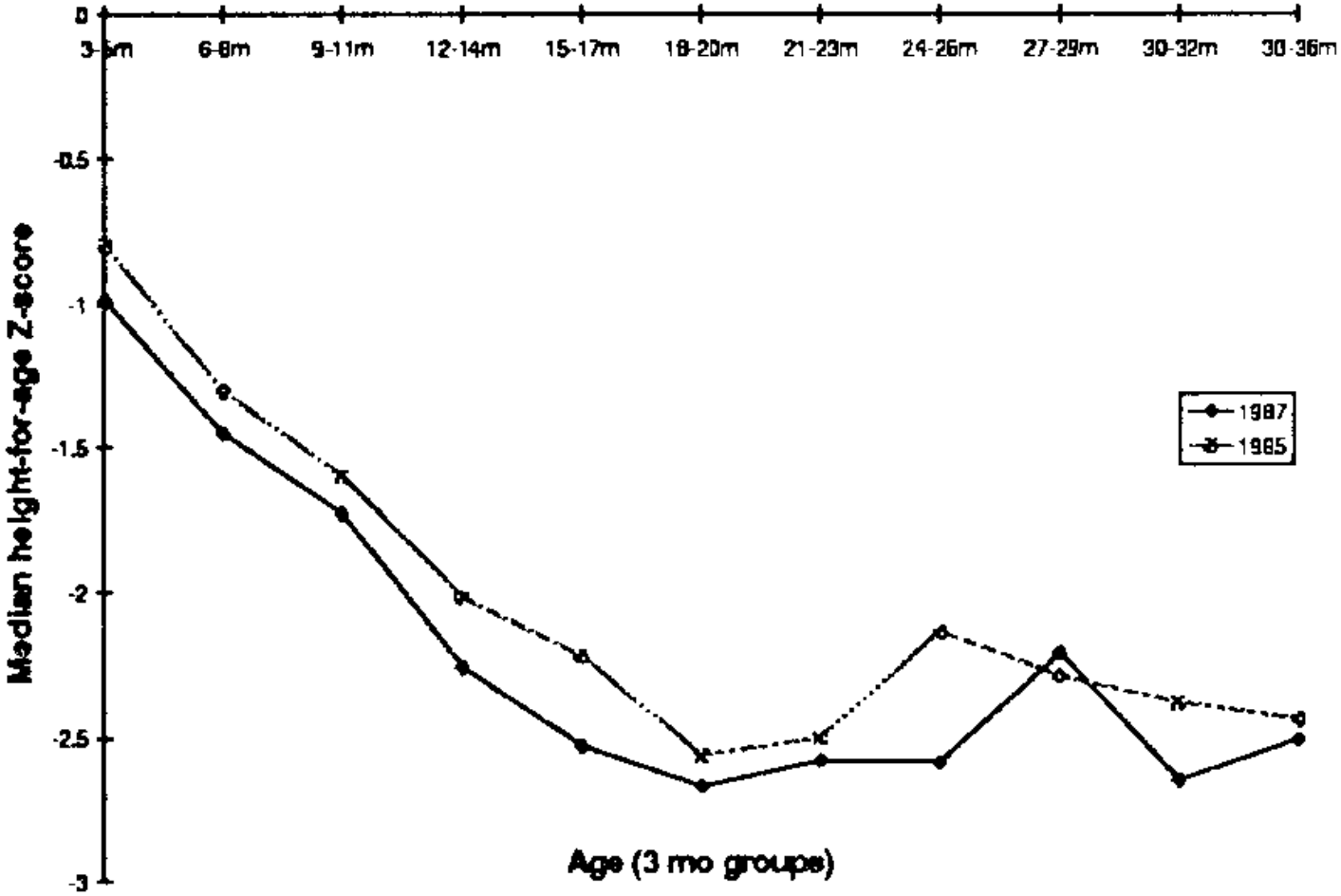

Figure 30: Median height–for–age Z–score of Guatemalan children (DHS 1987 and 1995)

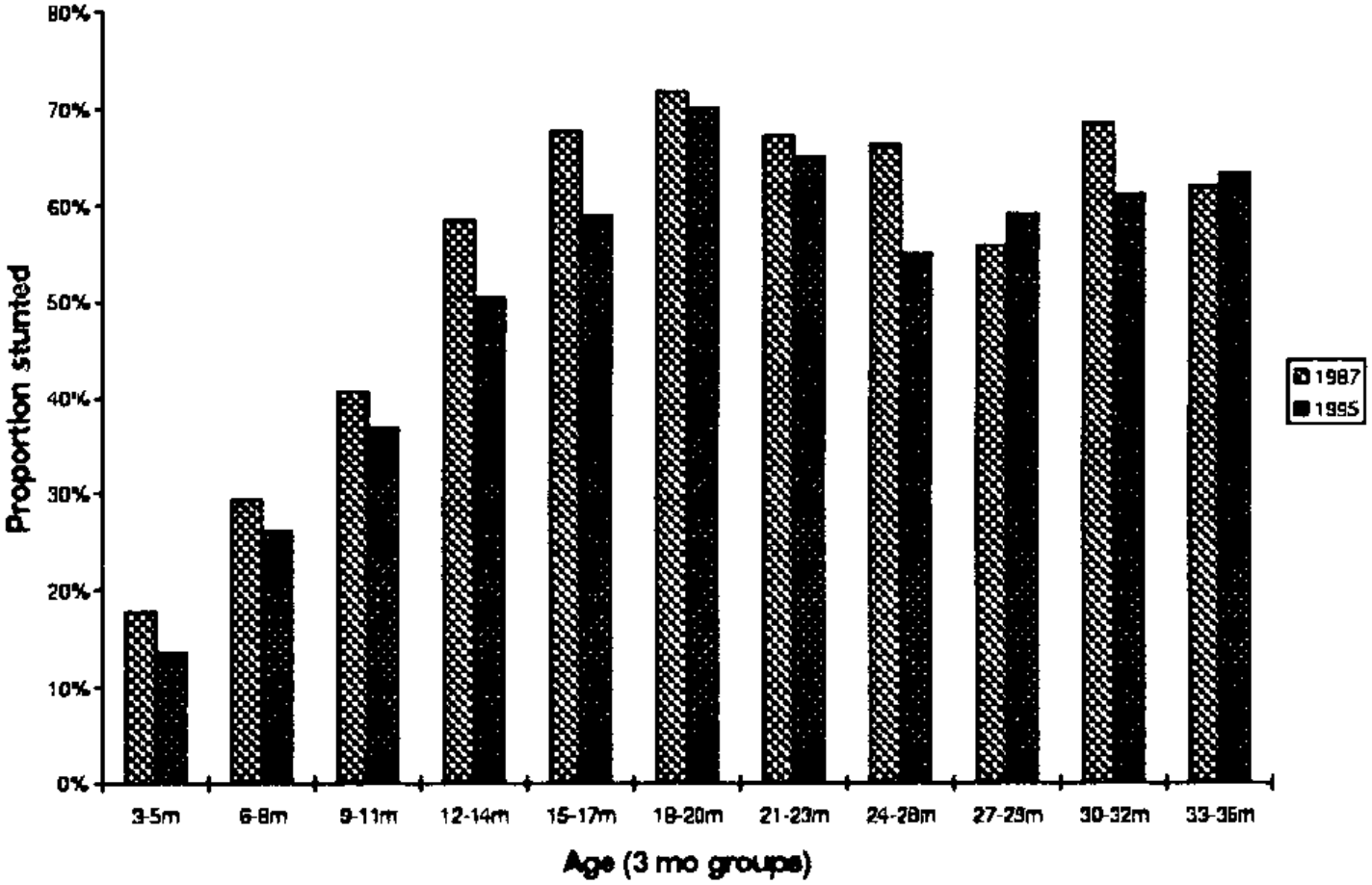

Figure 31: Prevalence of stunting by age, Guatemala (DHS 1987 and 1995)

Ghana

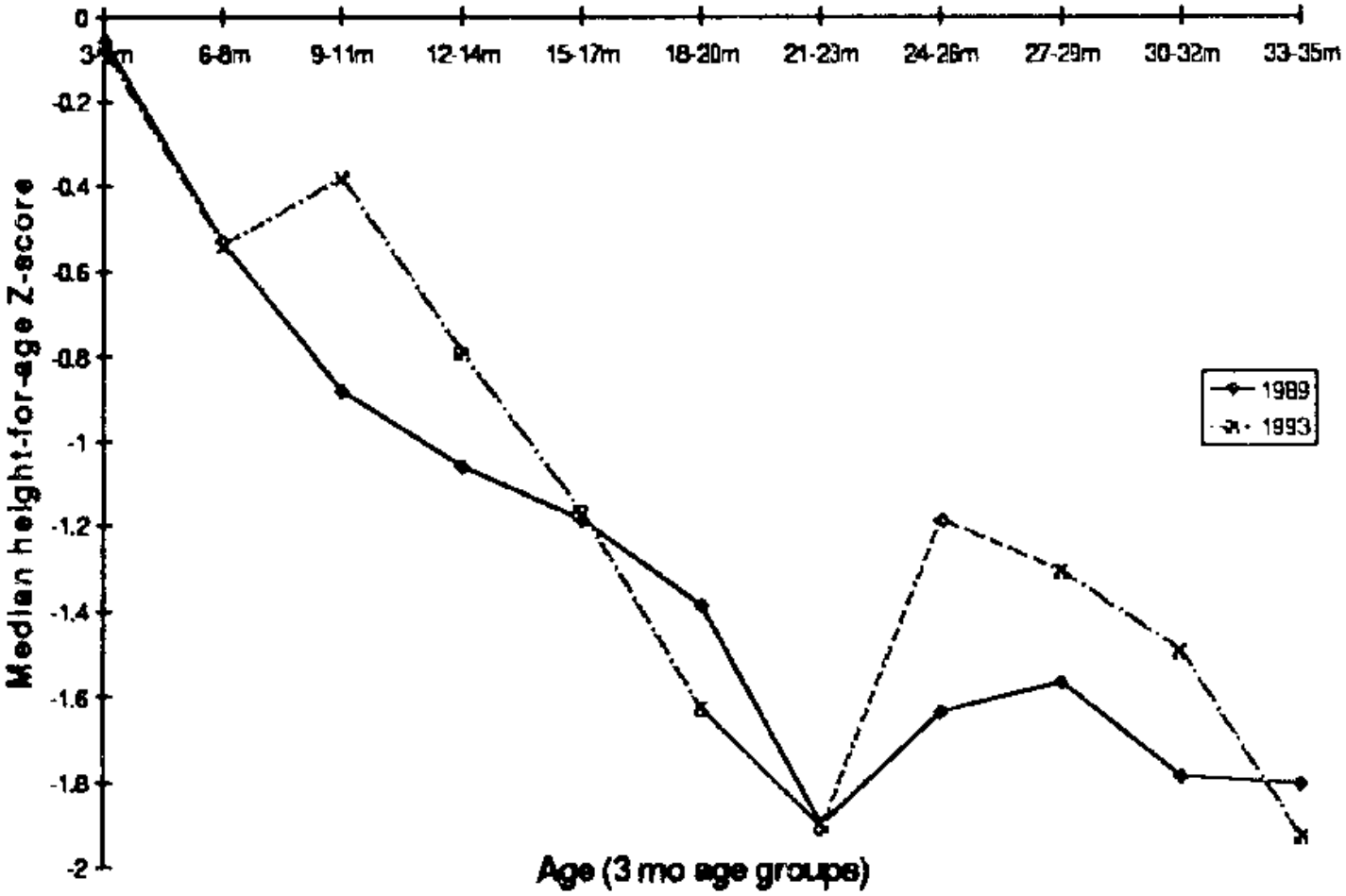

Figure 32: Median height–for–age Z–score of Ghanaian children (DHS 1988 and 1993)

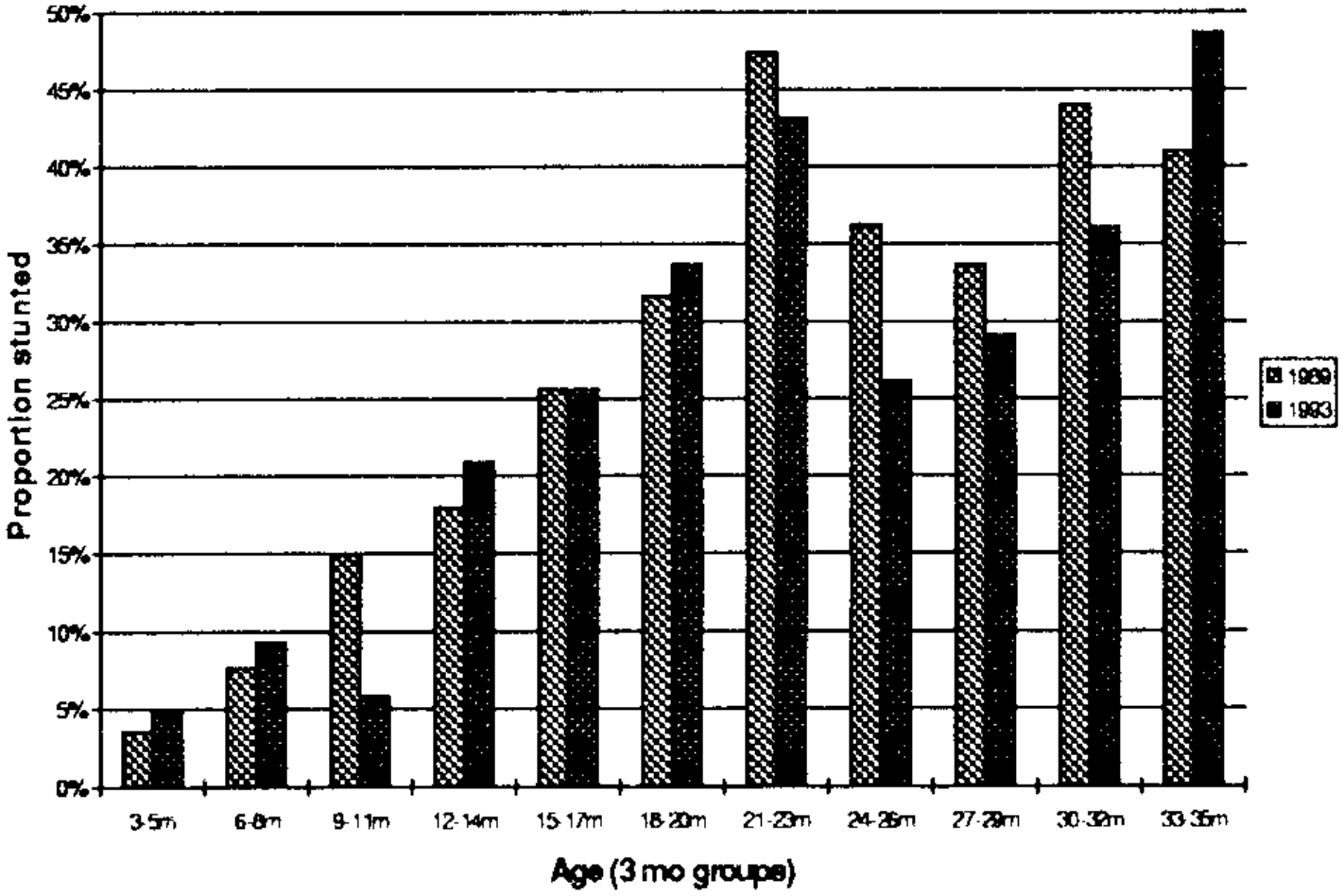

Figure 33: Prevalence of stunting by age, Ghana (DHS 1988 and 1993)

Mali

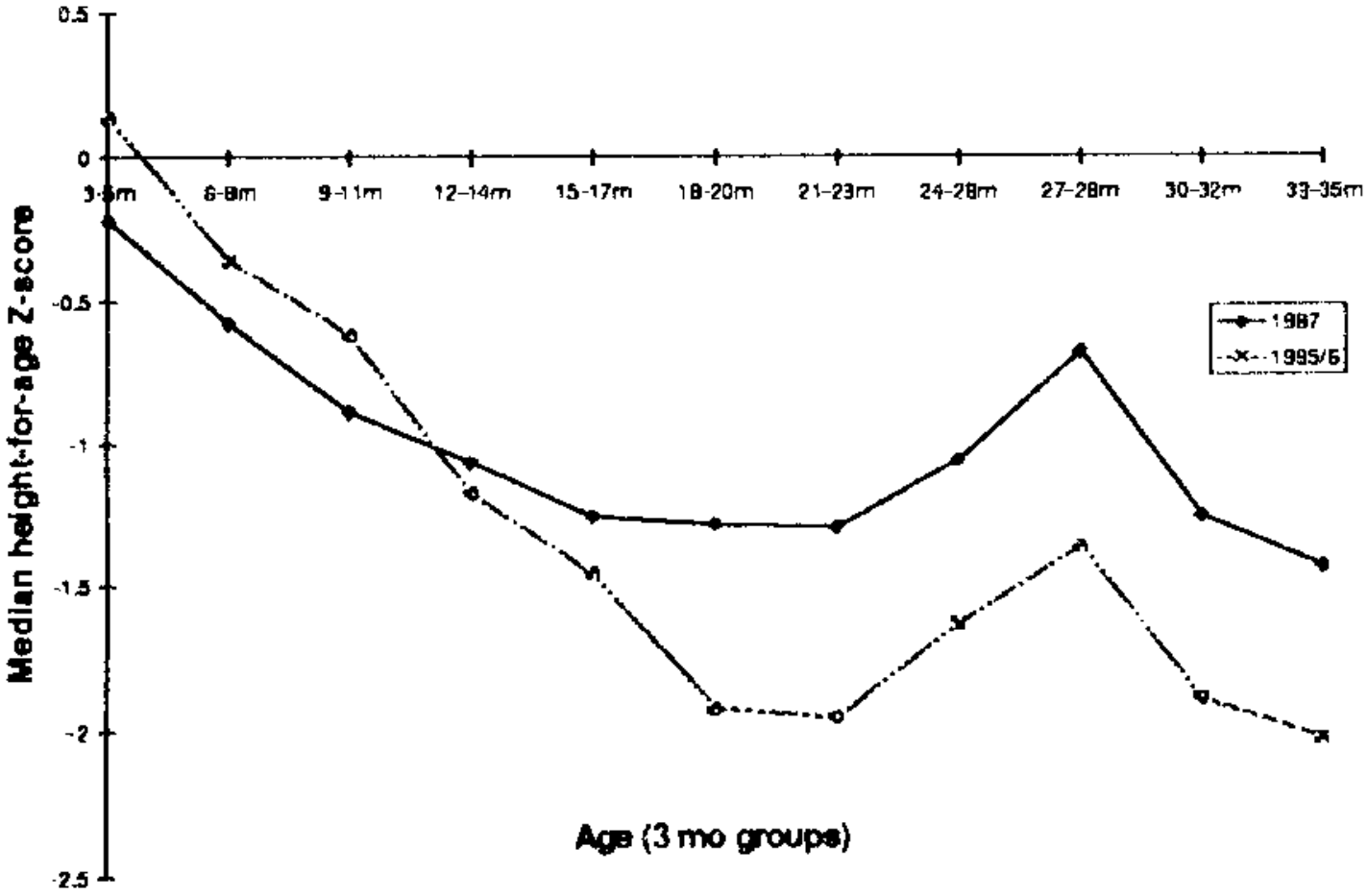

Figure 34: Median height–for–age Z–score of Malian children (DHS 1987 and 1995/6)

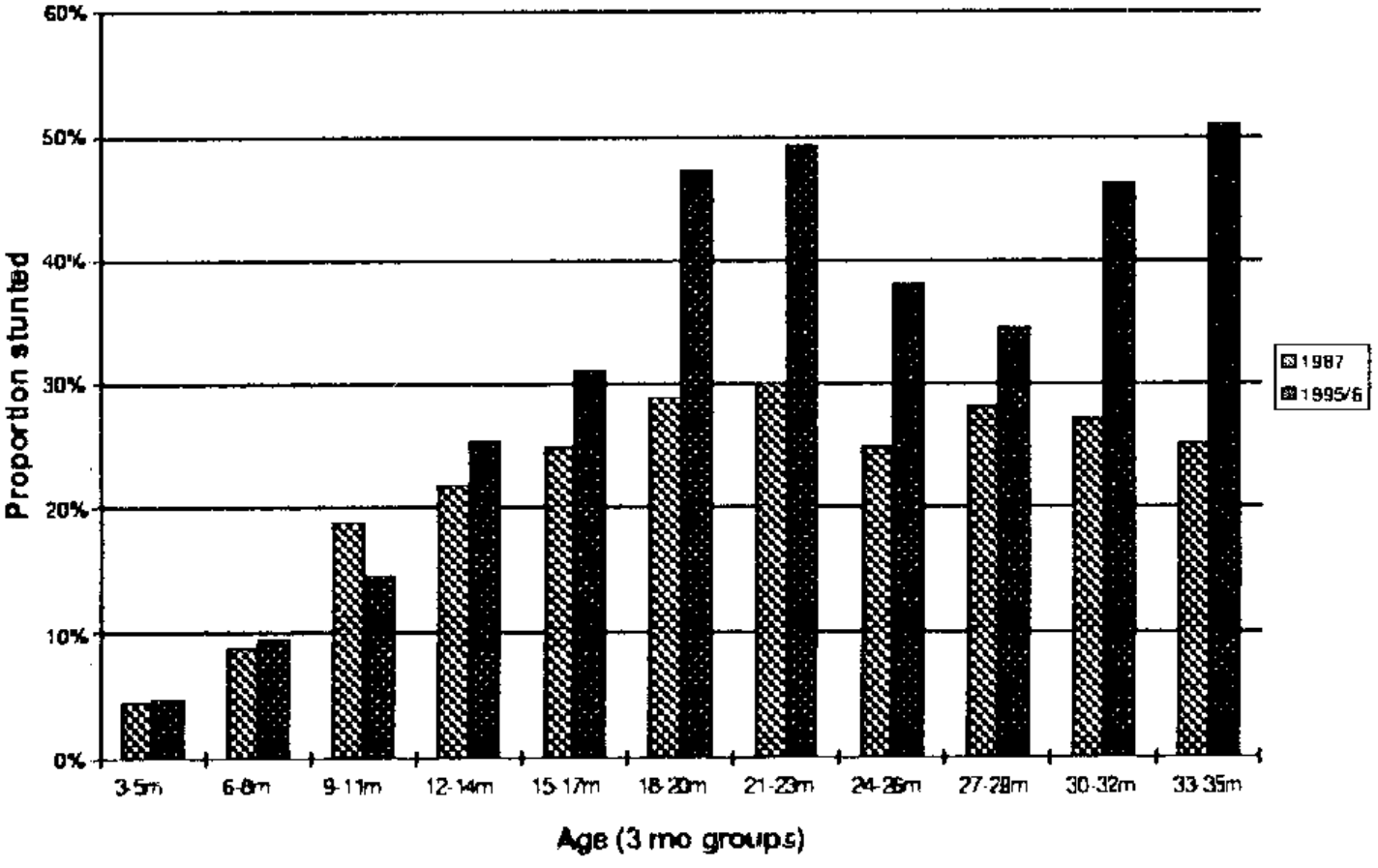

Figure 35: Prevalence of stunting by age, Mali (DHS 1987 and 1995/6)

Senegal

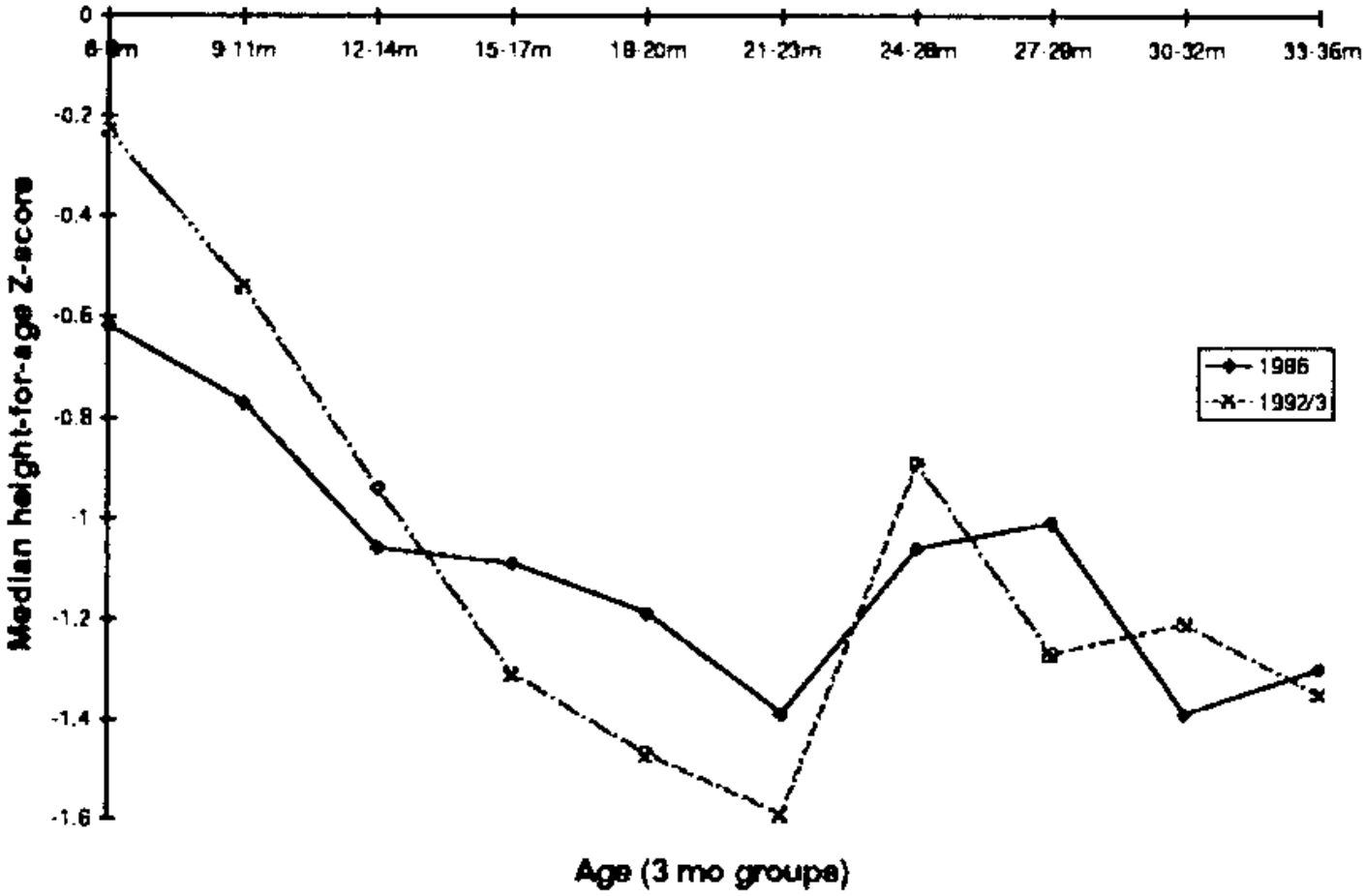

Figure 36: Median height–for–age Z–score of Sanegalese children (DHS 1986 and 1992/3)

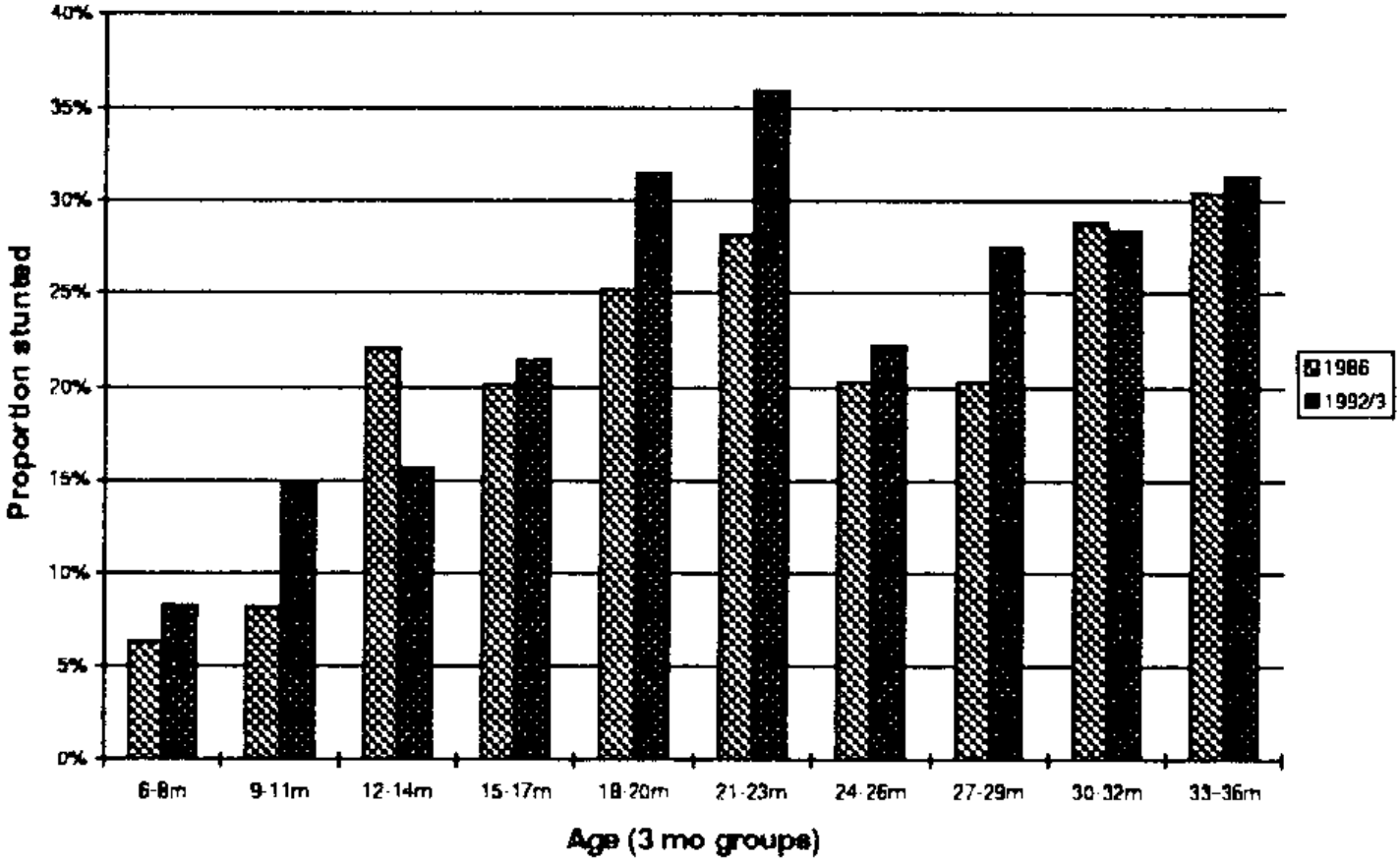

Figure 37.: Prevalence of stunting by age, Senegal (DHS 1986 and 1992/3)

Uganda

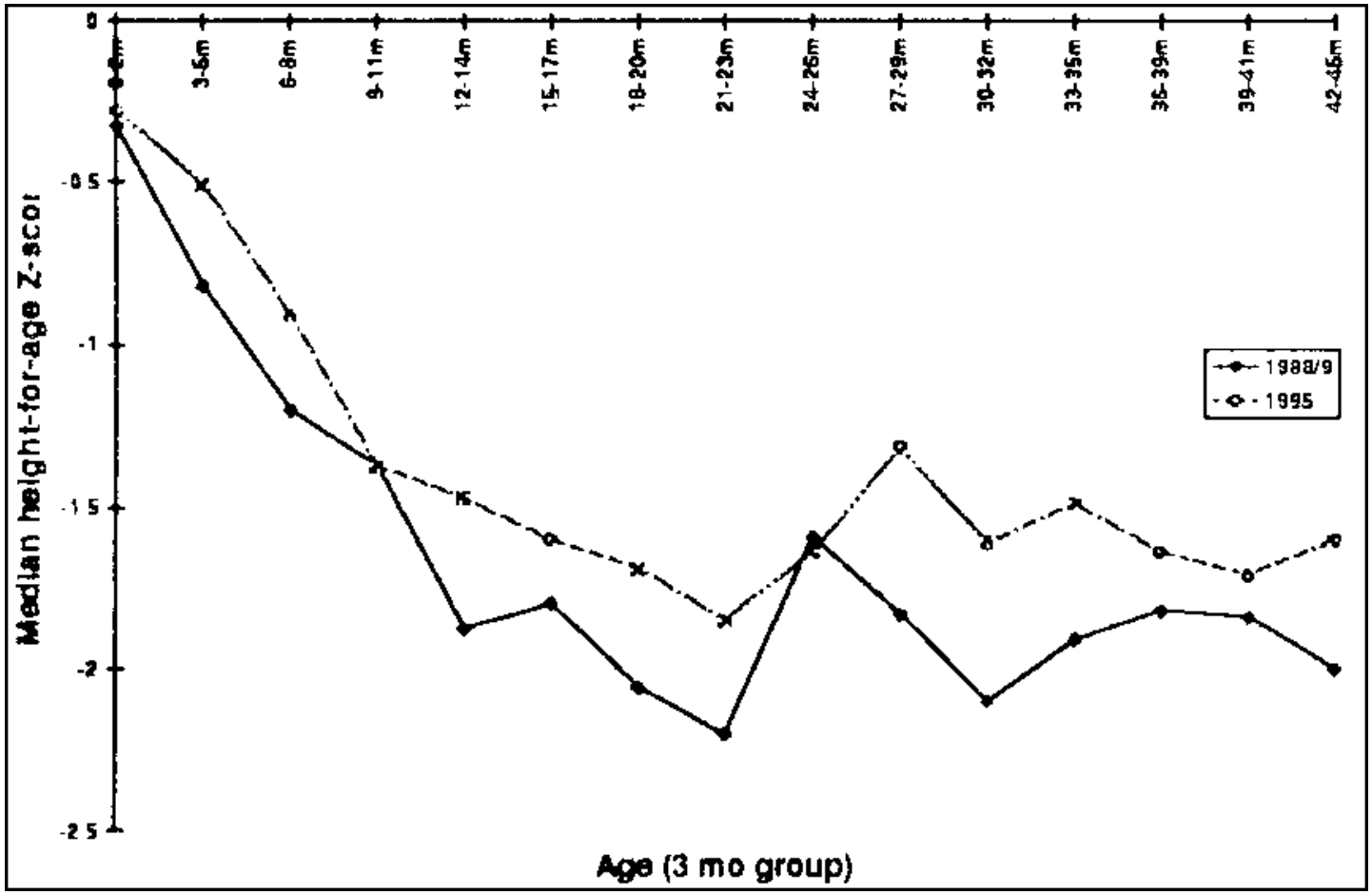

Figure 38.: Median height–for–age Z–score of Ugandan children (DHS 1988/9 and 1995)

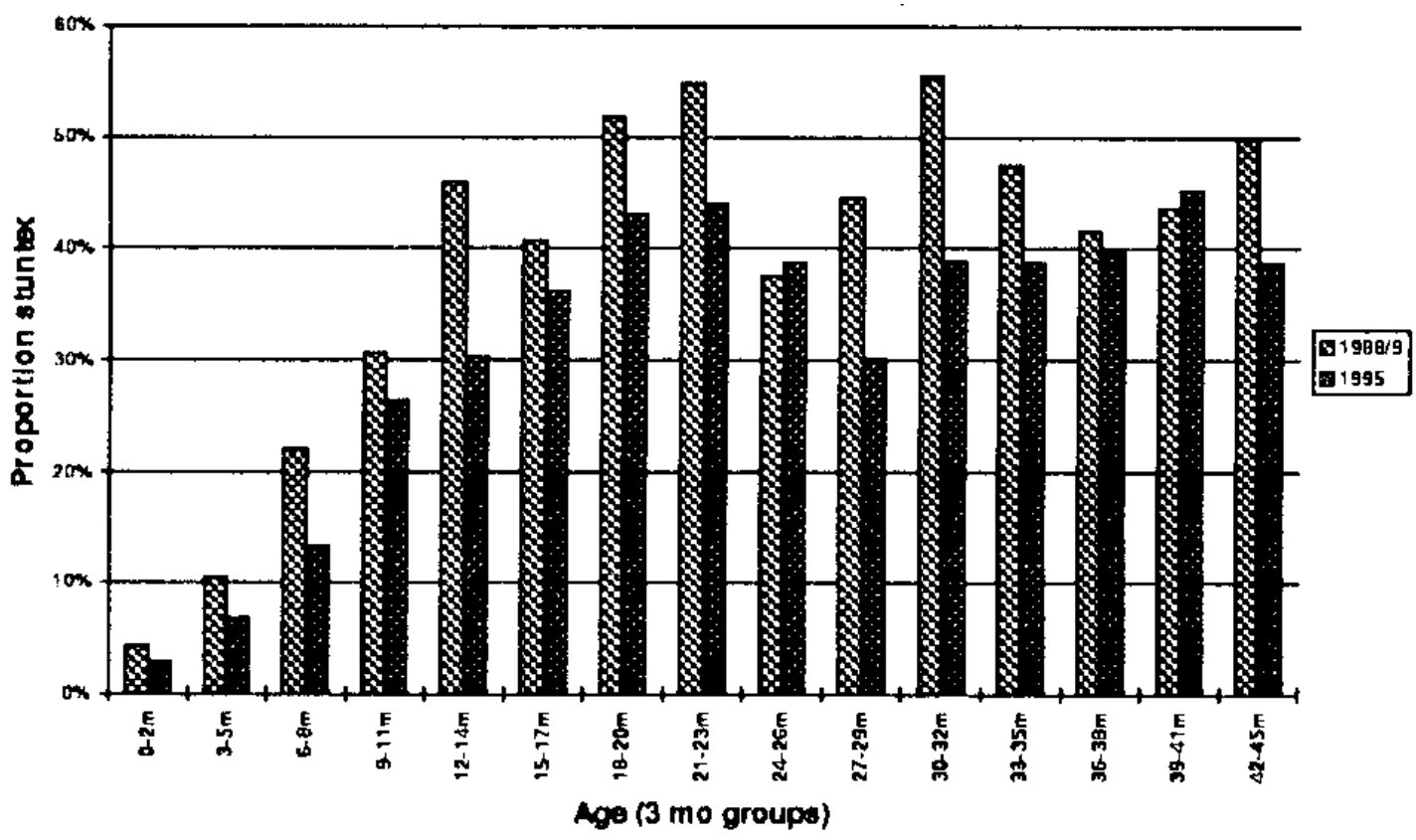

Figure 38.: Prevalence of stunting by age, Uganda (DHS 1988/9 and 1995)

Zimbabwe

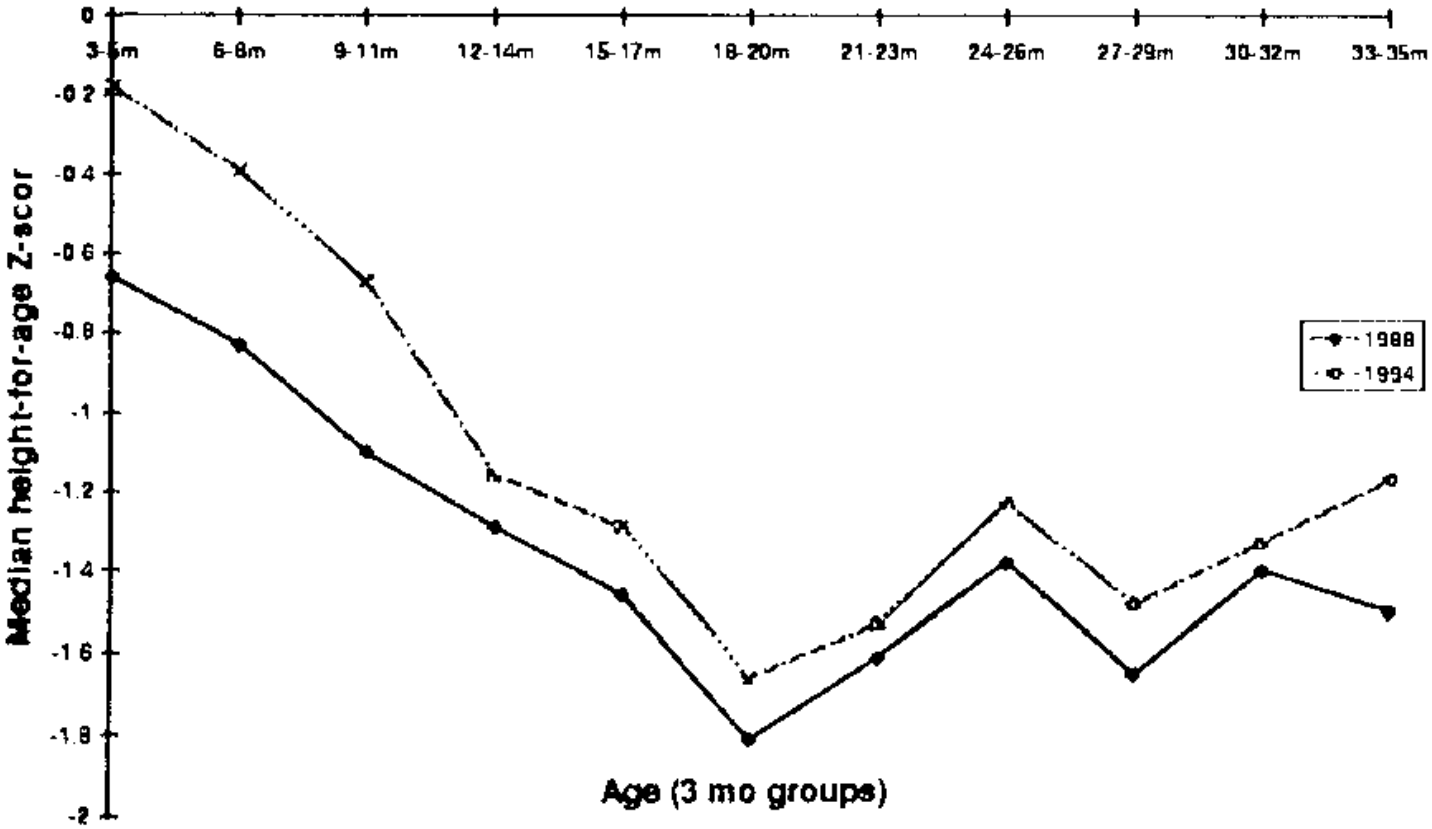

Figure 40.: Median height–for–age Z–score of Zimbabwean children (DHS 1988/89 and 1994)

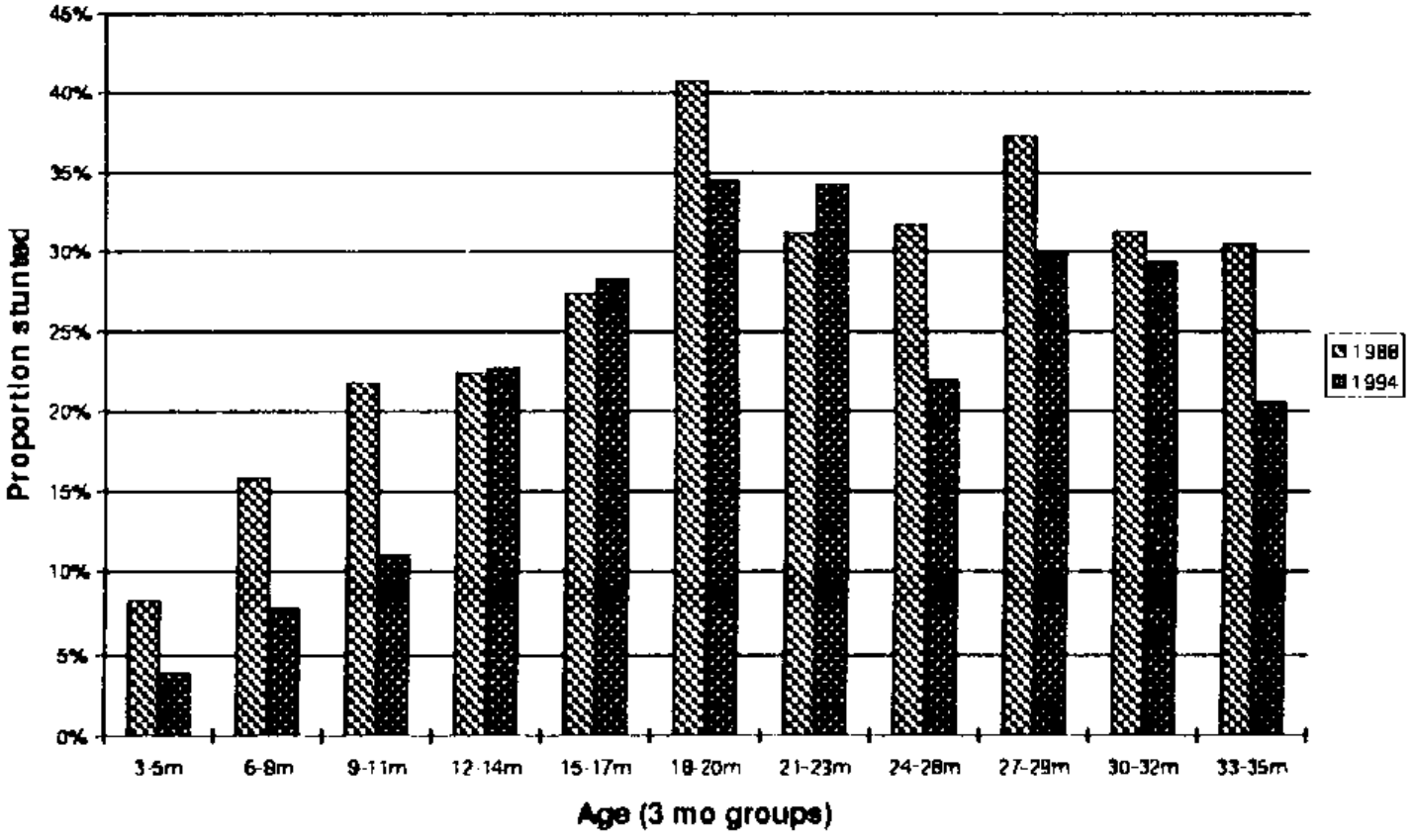

Figure 41.: Prevalence of stunting by age, Zimbabwe (DHS 1988/89 and 1994)

Annex 4: Prevalences of clinical vitamin A deficiency

Table 25.: Prevalences of Clinical Signs of VAD from Survey Data

These data were selected as most likely to give a one–time estimate of national prevalences. They were then used to interpolate for standard years (1985–95) to estimate prevalences for those countries with no survey *data. In six cases (Burkina Faso, Ethiopia, Kenya, Myanmar, Nepal, and Niger) more recen*t *survey data became available during the course of the study and are included here.*

Country	Survey Type[1]	Year	Age Group (Months)	Sample Size	Prevalence of Clinical Signs of VAD	Multiplication Factor	Implied National Prevalence
Bangladesh	N	1983	4–72	22,335	4.6	0.75	3.45
Burkina Faso	SN	1986	0–71	1,103	2.5	0.60	1.50
Burkina Faso	N	1989	30	1,103	3.9	0.60	2.34
Cameroon	SN	1992	0–60	5,352	0.5	0.40	0.20
Chad	SN	1986	0–60	1,044	3.6	0.75	2.70
Egypt[3]	N	1995	6–72	1,577	0.2	1.00	0.20
Ethiopia	N	1980	6–71	6,636	4.6[2]	0.75	3.45
Ethiopia	N	1996	6–60	15,087	1.5	0.75	1.13
Ghana	SN	1990	0–48	16,568	1.1	0.40	0.44
India	N	1988	0–60		1.4	0.75	1.05
Indonesia	N	1992	6–72	18,435	0.3	0.60	0.18
Iraq	SN	1994	0–60	7,000	2.4	0.25	0.40
Kenya	N	1994	6–72	6,348	2.0	0.40	0.80
Malawi	SN	1986	0–71	5,436	2.0	0.60	1.20
Mauritania	SN	1983	<60		2.6	0.60	1.56
Myanmar	SN	1987	24–60	1,284	2.0[2]	0.60	1.20
Myanmar	N	1994	6–60	14,059	0.8	0.60	0.48
Nepal	SN	1993	6–60	8,798	3.0[2]	0.75	2.25
Nepal	N	1996	6–35	3,386	1.5	0.75	1.13
Niger	N	1988	0–72	1,504	3.0	0.75	1.50
Niger	N	1992	24–59	3,193	3.7	0.75	2.78
Nigeria	N	1994	0–72	2,836	1.0	0.75	0.75
Philippines	N	1993	6–60	5,049	0.4	0.40	0.16
PNG	SN	1993	6–60	1,027	0.6	0.60	0.36
Rwanda	SN	1987	0–72	5,687	2.6	0.60	1.56
Senegal	N	1994	24–120	12,338	0.6	0.60	0.36
Somalia[3]		1993			1.5	1.00	1.50
South Africa	N	1994	6–71	11,430	1.6	0.25	0.40

Sri Lanka	N	1987	0–48	32,643	0.5	0.40	0.20
Sudan	SN	1986	0–60		2.4	0.75	1.20
Tanzania	SN	1984	0–120	7,431	1.5	0.60	0.90
Uganda	SN	1991	0–72	5,074	3.5	0.40	1.40
Viet Nam	N	1988	0–60	23,782	0.6	0.60	0.36
Zambia	SN	1988	0–60	423	1.4	0.60	0.84
Zimbabwe	SN	1991		6,944	0.6	0.40	0.24

[1] N = National; SN = Sub–National
[2] These were not adjusted
[3] A multiplication was not derived for Egypt by WHO, so it was set to 1.00. *Similarly for Somalia, prevalence was an estimate, so a factor of 1 was applied.*

Source: WHO (1995) and UNICEF et al., (1997b)

Annex 5: Method used to estimate prevalence of clinical vitamin A deficiency

A total of 35 countries were included in an analysis to estimate trends in clinical prevalence of vitamin A deficiency for all developing countries for the period 1985 to 1995. Results of 25 surveys were taken from the WHO database (WHO, 1995). Subsequently, data from ten more surveys became available through UNICEF country reports (UNICEF et al., 1997b). All prevalence data were from national or nationally–representative surveys. The most recent estimates of prevalence were used in most cases. These data are listed in Annex 4.

Most of the prevalence data were a combination of night blindness (XN) and eye changes (X1A, X1B, X2, X3A, X3B, XS), predominantly Bitot's spots (X1B). WHO (1995) derived a total xerophthalmia' prevalence by aggregating various clinical signs, depending on how they were reported, e.g. A = XN – X3B; B = XN – X3B without X1A, and so on.

Table 26.: Classification of Xerophthalmia and Minimum Prevalence Criteria

		Minimum prevalence for a public health problem, %
XN	Night blindness	1.0
X1A	Conjunctival xerosis	not used for assessment
X1B	Bitot's spot	0.5
X2	Corneal xerosis	0.1
X3A	Corneal ulceration/keratomalacia<1/3 corneal surface	0.1
X3B	Corneal ulceration/ keratomalacia and corneal surface	0.1
XS	Corneal scar	0.5
XF	Xerophthalmic fundus	not used for assessment

Source: *WHO (1996,p.23)*

By inspection of the data, XN and X1B appeared the most common, with X1B usually in the range of one–third to occasionally a little higher than XN. The sum XN plus X1B appeared to be the most feasible

standard indicator to approximate total xerophthalmia'. However, it was unclear how much double counting was involved because many children with X1B may also be night blind. In view of this, when it was necessary to estimate (XN plus X1B) from either XN or X1B alone, a conservative estimate was made, erring on the low side. X1B prevalences were doubled, and XN was multiplied by 1.5. (If for example, on average X1B is two−thirds of XN and there is some overlap, this gives reasonable estimates).

In most country cases, total xerophthalmia prevalence was taken as reported in the summary tables in WHO (1995), which approximated to (XN+X1B). However, in three cases − Ethiopia (1980), Myanmar (1987) and Nepal (1993) − XN data were not available, X1B prevalences were already high, and these were not adjusted further upwards. Two cases were excluded from the model later as outliers, Cambodia (1993) with XN=6.3%, and Mongolia (1992) with X1B=0.8%, for which not all independent variables were available. Adjustments were made to include XN for Kenya (1996), India, Rwanda, Sudan, Myanmar (1994) and South Africa. Similarly, adjustments were made to include X1B for Niger (1988 and 1992), Iraq, Nepal (1996), Senegal and Ethiopia (1996).

To estimate the number affected in each population, WHO (1995, p. 16) derived a multiplication factor to reflect prevalence in each population and estimate the number at risk. The rationale for the multiplication factor was given by WHO as follows:

'A multiplication factor was derived for countries where representative national surveys of vitamin A deficiency were unavailable. Where sub−national surveys were available, extrapolations were made to the proportion of the total country likely to be affected, considering similar ecological conditions. From this a multiplication factor was generated.'

National samples were given a factor of 0.75; samples representing 60−75% of a population were given a factor of 0.60; samples representing 30−60% of a population were given a factor of 0.40; samples representing 20−30% of a population were given a factor of 0.25. These same multiplication factors (given by WHO) were applied to the data in the present analysis to derive adjusted prevalences.

An interpolation model was used to estimate trends in prevalence of clinical signs of VAD. Several independent variables were tried in the interpolation model. The variables included vitamin A supply (Retinol Equivalents per capita per day), GNP (Atlas) per capita, log GNP per capita, estimated underweight prevalence and infant mortality rate (IMR), and percentage reported measles immunization coverage in children less than one year of age. The interaction terms for vitamin A supply with GNP, log GNP, IMR and underweight prevalence were all tested in the model. A dummy variable for vitamin A supply (for values greater than 600) was tested as well. Vitamin A supply, reported measles immunization coverage, GNP and their interaction terms were all found to be poor predictors of clinical prevalence.

The final model included only underweight prevalence and IMR, because these variables were found to be the strongest predictors of clinical prevalence of vitamin A deficiency. The adjusted R^2 was 0.82.

The final equation used in the model was:

$$\text{Ln}\ (1/p-1) = a + b\ (\text{underweight prevalence}) + c\ (\text{IMR})$$

where p is the adjusted clinical prevalence.

The association between the observed adjusted clinical prevalence and the prevalence predicted by the model is depicted graphically elsewhere (UNICEF et al., 1997. p 40 and 41). The sensitivity of this model in predicting prevalence of clinical signs as greater than or less than one percent is 94.4%. The specificity is 94.1%. The model, therefore, predicts prevalences of greater than one percent when observed prevalence is truly high. Similarly, the high specificity indicates that where prevalences are below one percent the predicted prevalence is tow as well.

Model to Estimate Clinical Prevalence of Vitamin A Deficiency In Preschool Children

Intercept	7.23 (34.62)
IMR	−0.0216 (−10.63)
Underweight Prevalence	−0.0131 (−2.60)

Number of Observations	35
R^2, Adjusted	0.824
F−Statistic	80.71

Note: t−statistics *are given in parentheses*
Significance at p< 0.05

Annex 6: Prevalences of sub−clinical vitamin A deficiency

Table 27.: Prevalences of Sub−Clinical VAD from Survey Data

Country	Survey Type[1]	Year	Age Group	Sample Size	<0.35µmol	<0.7µmol
Bolivia	N	1991	12−60	891	0.1	11.3
Botswana	N	1994	6−71	222	2.9	32.5
Brazil	SN	1989	0−72	563	15.3	54.7
Burkina Faso	SN	1986	0−72	273	17.6	70.5
Cameroon	SN	1992	4−60		1.3	19.7
China	N	1982	0−24			18.5
Colombia	N	1977	0−60		0.0	24.1
Colombia	N	1995	12−59	2.233	1.3	13.0
Congo	SN	1988	6−60			26.0
Costa Rica	N	1996	12−72	573	0.0	8.7
Côte d'Ivoire	SN	1994	6−60	342	12.3	46.6
Dominican Rep	SN	1991	12−60	505	4.2	19.6
Ecuador	N	1993	12−60	2,521		16.3
Egypt	N	1995	6−72	1,577	0.6	11.3
El Salvador	N	1988	0−48	259		36.0
El Salvador	N	1976	12−72			33.3
Ethiopia	N	1980	6−60	739		51.0
Ethiopia	N	1996	640	15,087	23.7	38.9
Ghana	SN	1990	0−72	607	14.0	54.9
Guatemala	N	1988	12−48			26.0
Honduras	N	1987	0−48			20.0
Honduras	N	1996	040			42.0
Indonesia	SN	1991	0−72	688		57.5
Kenya	N	1994	6−72	6,348	7.7	33.0
Malaysia	SN	1984	0−48	25		12.0

Mall	SN	1986				73.0
Mauritania	SN	1983				41.6
Mauritius	N	1995	36–72	161	0.0	9.3
Mexico	SN	1990	24–84			32.0
Mexico	SN	1990	24–84			32.0
Myanmar	SN	1987	24–72	642		32.4
Namibia	SN	1992	24–72	290	3.1	20.4
Nicaragua	SN	1993	1240			31.3
Pakistan	N	1988	6–60	578		50.0
Peru	N	1992	0–72	300		22.0
Peru	N	1996	12–71			13.0
Philippines	N	1993	6–60	3,773	25.8	10.1
PNG	SN	1993	6–72	74	50.0	91.0
South Africa	SN	1991	36–72		5.0	49.0
South Africa	N	1994	6–71	11,430	3.3	30.0
Tanzania	SN	1984		64	1.5	45.3
Thailand	SN	1990	24–72	499		20.0
Zambia	SN	1988	0–72			16.5

[1]*N= National; SN = Sub–National*

Source: *WHO(1995) and UNICEF et at., (1997b. p. 19)*

Annex 7: Prevalences of wasting quoted in Chapter 3

Table 28: Summary of Levels of Wasting Quoted In Chapter 3
Italicized entries provide details for ranges in levels of wasting quoted in the text.

	Date	% Wasting	Unit of Measure (wt/ht unless noted)	Confidence Interval	Source
Kabul, Afghanistan	Nov 95	6.2	<–2Z scores or oedema	4.2–9.1	AICF
Kabul, Afghanistan	May 96	6.7	<–2Z scores	4.6–9.5	AICF
Kabul, Afghanistan	Dec 96	5.1	<–2Z scores	3.3–7.8	ACF
New Hadda Camp, Afghanistan	Dec 94	6.2	<–2z/oedema	3.8–9.9	MSF–H
New Hadda Camp, Afghanistan	Mar 95	6.7	<–2z/oedema	4.7–9.5	MSF–H
New Hadda Camp, Afghanistan	Sep 95	11.0	<–2sd	not specified	MSF–H

New Hadda Camp, Afghanistan	Dec 95	4.0	<–2z scores or oedema	0.6–7,4	MSF–H
Bangladesh	Aug 95	9.5	<–2z scores	6.9–12.5	MSF–H/HCR
Bangladesh	Dec 96	15.0	<–2z scores or oedema	13.2–17.9	MSF–H
Bhutanese Refugees in Nepal	Jul 95	5.7	<80%	not specified	SCF
Bhutanese Refugees In Nepal	Oct 96	2.4	<80%	not specified	SCF
Cafunfu, Lunda None, Angola	May 95	29.0	>–2z scores or oedema	25.0–33.8	AICF
Cafunfu, Lunda Norte, Angola	Jul 95	2.8	<–2SD	1.3–5.5	AICF
Moxico Province, Angola	Apr 95	20.0	not specified	not specified	WFP
Moxico Province, Angola	Dec 95	6.0	not specified	not specified	UNHAA
Goma, Zaire	1996	1.6–3.5			
Lac Vert, Goma	*Jun 96*	*3.2*	*<–2z scores*	*1.8–5.5*	*UNHCR*
M'Gunga, Goma	*Jun 96*	*1.6*	*<–2z scores*	*0.4–4.7*	*UNHCR*
Katale, Goma	*May 96*	*3.5*	*<–2z scores*	*1.5–7.2*	*UNHCR*
Kahindo, Goma	*Jul 96*	*2.5*	*<–2z scores*	*0.9–6.0*	*UNHCR*
Kibumba, Goma	*Jul 96*	*3.5*	*<–2z scores*	*1.8–6.4*	*UNHCR*
Uvira, Zaire	Mar 96	2.3–11.0			
Runingo, Uvira	*Mar 96*	*8.3*	*<–2z scores*	*3.3–10*	*UNHCR*
Kajembo, Uvira	*Mar 96*	*5.9*	*<–2z scores*	*6.9–17.1*	*UNHCR*
Kagunga, Uvira	*Mar 96*	*11*	*<–2z scores*	*not specified*	*UNHCR*
Kibogoye, Uvira	*Mar 96*	*9.7*	*<–2z scores*	*not specified*	*UNHCR*
Luvungi, Uvira	*Mar 96*	*5.6*	*<–2z scores*	*3.1–9.6*	*UNHCR*
Biriba, Uvira	*Mar 96*	*4.8*	*<–2z scores*	*2.0–10.0*	*UNHCR*
Kanganiro, Uvira	*Mar 96*	*2.6*	*<–2z scores*	*1.0–5.9*	*UNHCR*
Rwenena, Uvira	*Mar 96*	*4.2*	*<–2z scores*	*2.0–8.2*	*UNHCR*
Luberizi, Uvira	*Mar 96*	*2.3*	*<–2z scores*	*0.8–5.6*	*UNHCR*
Bukavu, Zaire	*May 96*	*0.9–7.0*			
Inera, Bukavu	*May 96*	*7.2*	*<–2SD or oedema*	*5.3–9.7*	*UNHCR*
Kashusha, Bukavu	*May 96*	*1.7*	*<–2SD or oedema*	*0.7–3.4*	*UNHCR*
Nyangezi I, Bukavu	*May 96*	*0.9*	*<–2SD or oedema*	*0.1–3.6*	*UNHCR*
Nyamirangwe, Bukavu	*May 96*	*3.2*	*<–2SD or oedema*	*1.5–6.2*	*UNHCR*
Chimaga, Bukavu	*May 96*	*2.7*	*<–2SD or oedema*	*1.4–4.8*	*UNHCR*
Kabira, Bukavu	*May 96*	*2.0*	*<–2SD or oedema*	*1.1–3.6*	*UNHCR*

Kigali, Rwanda	Sep 95	5.3	<–2z scores	4.0–7.1	AICF
Rwanda (3 communes)	May 95	2.9	<–2z scores	not specified	UNICEF
Umbano Camp, Rwanda	Apr 96	17	<80% or oedema	11.8–22.2	MERLIN
Umbano Camp, Rwanda	Aug 96	11.5	<–2SD or oedema	8.2–15.7	MSF–B
Burundi (displaced camps)	end 95	15–18			
Muhanga Camp, Burundi	*Dec 95*	*16.1*	*<–2z scores or oedema*	*all included*	*MSF–H*
Gasenyi Camp, Burundi	*Dec 95*	*15.0*	*<–2z scores or oedema*	*alt included*	*MSF–H*
Buraniro Camp, Burundi	*Dec 95*	*17.2*	*<–2z scores or oedema*	*all included*	*MSF–H*
Gahambo Camp, Burundi	*Dec 95*	*18.2*	*<–2z scores or oedema*	*all included*	*MSF–H*
Gatumba Transit Camp, Burundi	Nov 96	17.6	MUAC<110mm	all included	UNHCR
Regroupment Camp, Burundi	Feb 97	18.7	<–2z scores or oedema	14.8–23.3	MSF–B
Tanzania	Apr 97	1.8–7.2	<–2z scores or oedema		UNHCR
Metandle, Tanzania	Apr 97	3.3	<–2z scores	1.9–4.7	UNHCR
Kanembwa, Tanzania	Apr 97	3.0	<–2z scores	1.9–4.7	UNHCR
Nuduta, Tanzania	Apr 97	72	<–2z scores	5.6–9.1	UNHCR
Mukgwa, Tanzania	Apr 97	1.8	<–2z scores	0.4–5.5	UNHCR
Lukole, Tanzania	May 97	3.9	<–2z scores	2.2–4.7	UNHCR
Somali Refugees, Ethiopia	Mar 95	12–17.3			
Harlisheik A, Ethiopia	*Mar 95*	*13.7*	*<80%*	*not specified*	*SCF*
Hartisheik B, Ethiopia	*Mar 95*	*12.0*	*<80%*	*not specified*	*SCF*
Kebre Beyah, Ethiopia	*Mar 95*	*17.3*	*<80%*	*not specified*	*SCF*
Derwonaji, Ethiopia	*Mar 95*	*16.4*	*<80%*	*not specified*	*SCF*
Teferi Ber, Ethiopia	*Mar 95*	*12.0*	*<80%*	*not specified*	*SCF*
Somali Refugees, Ethiopia	Jul 95	7.5–13.3			
Rabasso, Ethiopia (Som)	*Jul 95*	*7.5*	*<80%*	*not specified*	*ARRA*
Daror, Ethiopia (Som)	*Jul 95*	*10.3*	*<80%*	*not specified*	*ARRA*
Cam abokor, Ethiopia (Som)	*Jul 95*	*9.8*	*<80%*	*not specified*	*ARRA*
H/Sheik A&B, Ethiopia (Som)	*Oct 95*	*11.4*	*<80%*	*not specified*	*ARRA*
	Oct 95	*16.5*	*<80%*	*not specified*	*ARRA*

Kebri Beyah, Ethiopia (Som)					
Derwaonaji, Ethiopia (Som)	*Oct 95*	*15.0*	*<80%*	*not specified*	*ARRA*
Teferiber, Ethiopia (Som)	*Oct 95*	*12.5*	*<80%*	*not specified*	*ARRA*
Aisha, Ethiopia (Som)	*Jul 95*	*13.3*	*<80%*	*not specified*	*ARRA*
Somali Refugees, Ethiopia	May 96	15.2–21.1			
Rabasso, Ethiopia (Som)	*May 96*	*15.2*	*<80%*	*not specified*	*ARRA*
Daror, Ethiopia (Som)	*May 96*	*16.0*	*<80%*	*not specified*	*ARRA*
Cam Abokor, Ethiopia (Som)	*May 96*	*17.5*	*<80%*	*not specified*	*ARRA*
H/Sheik A&B, Ethiopia (Som)	*May 96*	*19.8*	*<80%*	*not specified*	*ARRA*
Kebri Beyah, Ethiopia (Som)	*May 96*	*20.5*	*<80%*	*not specified*	*ARRA*
Derwonaji, Ethiopia (Som)	*May 96*	*21.1*	*<80%*	*not specified*	*ARRA*
Teferiber, Ethiopia (Som)	*May 96*	*17.2*	*<80%*	*not specified*	*ARRA*
Aisha, Ethiopia (Som)	*May 96*	*18.4*	*<80%*	*not specified*	*ARRA*
Sudanese Refugees. Ethiopia	Jun 95	6.0–17.6			
Dimma, Ethiopia	*Jun 95*	*6.0*	*<80%*	*not specified*	*SCF*
Bonga, Ethiopia	*Jun 95*	*6.1*	*<80%*	*not specified*	*SCF*
Fugnido, Ethiopia	*Jun 95*	*17.6*	*<80%*	*not specified*	*SCF*
Sudanese Refugees. Ethiopia	*Jul 96*	*6–8*	*<80%*	*not specified*	*WFP/UNHCR*
Dadaab Camps, Kenya	Nov 94	5.3–8.9	<80%		
Hagedera, Kenya	Nov 94	5.3	<80%	not specified	
Ifo Camp, Dadaab, Kenya	Mar 95	15.3	<–2z scores or oedema	11.6–20.1	MSF–F
Dadaab Camps, Kenya	Aug 95	9.8–12.1			
Hagedera, Kenya	*Aug 95*	*12.1*	*<–2z scores or oedema*	*9.1–15.9*	*MSF–B*
Ifo, Kenya	*Aug 95*	*12.1*	*<–2z scores or oedema*	*9.1–16.0*	*MSF–B*
Dagahaley, Kenya	*Aug 95*	*9.8*	*<–2z scores or oedema*	*7.0–13.4*	*MSF–B*
Dadaab Camps, Kenya	*Aug 96*	*15.1–18.6*			
Hagedera, Kenya	*Aug 96*	*18.2*	*<–2z scores or oedema*	*14.7–22.2*	*MSF–B*
Ifo, Kenya	*Aug 96*	*18.6*		*15.1–22.7*	*MSF–B*

			<–2z scores or oedema		
Dagahaley, Kenya	*Aug 96*	*15.1*	*<–2z scores or oedema*	*12.0–18.9*	*MSF–B*
Dadaab Camps. Kenya	Jan 97	28.0–31.4	<–2z scores or oedema		
Hagedera, Kenya	*Jan 97*	*28.0*	*<–2z scores or oedema*	*24.0–32.2*	*MSFB*
Ifo, Kenya	*Jan 97*	*30.3*	*<–2z scores or oedema*	*26.2–34.7*	*MSFB*
Dagahaley, Kenya	*Jan 97*	*31.4*	*<–2z scores or oedema*	*27.3–35.9*	*MSFB*
Lower Bong. Upper Margibi, Liberia	Jul 95	56.2	<–2z scores or oedema	51.2–61.2	SCF(kwash=37.1)
Lower Bong. Upper Margibi, Liberia	Oct 95	6.4	<–2z scores or oedema	4.2–9.2	MSF–H
Tubmanburg, Liberia	Oct 96	38	MUAC<125 or oedema	not specified	EPICENTRE
Buchanan, Liberia	Jul 95	9.2	<–2z scores or oedema	6.8–12.4	MSF–F
Harbel Unification town, Liberia	Apr 95	7.4	<–2sd/kwash	8.6–10.2	MSF–H
Guinea (longer–term residents)	1995	4	Anecdotal		
Macenta, Guinea	Jul 96	4.8	<–2z scores	3.1–7.4	ACF
Likasi, Zaire	Dec 95	5.5	<–2z scores or oedema	3.3–8.1	MSF–B
Luputa, Zaire	Oct 95	11.5	<–2z scores or oedema	8.9–14.6	MSF–B
Mwene Ditu, Zaire	Oct 95	29.4	>–2z scores or oedema	26.2–32.9	MSF–B
Mwene Ditu, Zaire (Residents)	Oct 95	18.0	>–2z scores or oedema	not specified	MSF–B
Mwene Ditu, Zaire (Displaced)	Oct 95	43	>–2z scores or oedema	not specified	MSF–B
Mozambique	Jul–Aug 95	1.9–5.0	<–2z scores		
Nampa, Nampula, Mozambique	Jul 95	4.0	<–2z scores	2.2.7.0	MSF–CIS(WV)
Nampa, Nampula, Mozambique	Jul 95	4.3	<–2z scores	2.0–7.0	MSF–CIS(WV)
Nampa, Nampula, Mozambique	Aug 95	1.9	<–2z scores	0.7–4.6	MSF–CIS(WV)
Mozambique	1996	11–13.2			
Kismayo, Somalia	Jul 95	17.8		15.0–21.1	UNICEF

			<2z scores or oedema		
Mogadishu, Somalia (residents)	Jun 95	25.1	<–2z scores or oedema	21.1–29.4	AICF
Mogadishu, Somalia (displaced)	Jun 95	26.3	<–2z scores or oedema	22.3–30.8	AICF
Mogadishu, Somalia	1995	2.1–7.0		not specified	DHA rpt
Bull Huwain, Somalia	Oct 96	37	<80%	not specified	Trocraire
Attar, S Sudan	Mar 96	25	<80%	not specified	MEDAIR
Mangalatore, S Sudan	Mar 96	15.0	MUAC<125 or oedema	10–20	MSF–H
Sinkat, Sudan (displaced)	Oct 96	47.8	<80%	not specified	OXFAM
Sinkat, Sudan (resident)	Oct 96	30.4	<80%	not specified	OXFAM

Annex 8: Micronutrient malnutrition

Details for interpreting Table 21 (see Annex 5, p. 102 for information on vitamin A deficiency).

Table 29: Provisional criteria for severity of public problem of Thiamin, Niacin and Vitamin C Deficiencies

	Mild	Severity of public health problem Moderate	Severe
Clinical signs:	>1 clinical case;	1–4% of population in age group concerned	>5% of population in age group concerned
	<1%o(population in age group concerned		

WHO (in press) Management of Nutrition in Major Emergencies (taken from *Tables A.8.4, a.92, a. 10.2)*

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Second Report on the World Nutrition, Volume I, Global an regional Results, October 1992

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Update on the Nutrition Situation 1996, November 1996

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Inquiries should be addressed to:

ACC/SCN Secretariat
c/o World Health Organization
20 Avenue Appia
CH 1211 Geneva 27
Switzerland
Email: accscn@who.ch
Fax: +41–22–798 89 91
Telephone: +41–22–791 04 56