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In brief

• The prevalence of acute malnutrition is one of the most widely used indicators of the severity of humanitarian crises, and is endorsed by a wide array of UN organisations, donors, national governments and international agencies. Yet there is very little simple and straightforward guidance on how to conduct nutrition surveys, and how to understand and use their results.

• This Network Paper aims to fill this gap by helping decision-makers obtain and apply nutritional information and analysis. In non-technical language, it describes some of the basic concepts used in nutrition, sets out the purposes to which nutrition information is typically put, and explains how nutrition surveys are constructed and interpreted.

• The paper shows that malnutrition data can be used as an objective indicator of crisis. With better guidance on interpretation, acute malnutrition data can help in identifying the severity and nature of crisis, and thereby help identify appropriate responses to address malnutrition and its underlying causes.

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The meaning and measurement of acute malnutrition in emergencies

A primer for decision-makers

Commissioned and published by the Humanitarian Practice Network at ODI

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Chapter 1
Introduction: why is this paper needed?

International agencies have been using malnutrition prevalences to confirm humanitarian emergencies for more than four decades, with early examples including the international response to the Nigerian civil war in Biafra in the 1960s and the famine across the Sahel in the 1970s. These early surveys were powerful tools for some of the first major media campaigns in the West publicising the severity and scale of a nutritional crisis, and were used to reinforce shocking images of hunger, starvation and death. The prevalence of acute malnutrition is now one of the most widely used indicators of the severity of humanitarian crises throughout the world, and is endorsed by a wide array of UN organisations, donors, national governments and international agencies.

Despite this, the use of malnutrition to diagnose a humanitarian crisis and prescribe an appropriate response is not without problems. Often, rates of malnutrition do not match the wider international analysis of the situation. For example, in southern Africa in 2002 two years of drought and widespread harvest failure caused acute food insecurity and a regional food crisis followed, but there was apparently no widespread malnutrition and mortality.[1]

A further problem is that rates of malnutrition on their own do not mean very much, unless the underlying causes of malnutrition are understood: i.e. whether the cause is related to food, health or social and behavioural factors, or a combination of all three. Nutrition survey reports frequently lack this type of analysis, which has led to disputes between food agencies and health agencies, for example in Darfur where WFP and UNICEF could not agree on why rates of malnutrition remained persistently high in some camps. This obviously has implications for subsequent response strategies.

Despite the widespread use of malnutrition data to indicate crises, there remains a dearth of publications which explain and present in simple terms the ins and outs of nutrition surveys for decision-makers. Most programme officers who have to make decisions about the merits and importance of multiple nutrition surveys rarely have access to technical support, and therefore must make up their own minds whether the findings can be trusted, and what the implications are in terms of threats to lives and well-being, and in terms of practical response options. This type of understanding is now expected of all humanitarian professionals, whether they are trained nutritionists or not.

> *The broad aim of the paper is therefore to help decision-makers understand, use and interpret nutritional information and analysis, by reviewing in non-technical language how nutrition data is collected, analysed and interpreted.*

The importance of nutrition surveys and the data they generate in emergencies cannot be underestimated. There has always been a steady interest in, and donor support for, emergency nutrition surveys, but donors do not always respond according to need.

The recent humanitarian reform agenda, which aims to make the humanitarian system more accountable, has led to a surge in interest in acute malnutrition as an indicator of humanitarian crisis. WHO and UNICEF, as UN cluster leads in health and nutrition, have put forward a proposal for a 'Humanitarian Health and Nutrition Tracking Service' to help track humanitarian outcomes and performance on request from the Inter-Agency Standing Committee. This is not only a technical challenge, but also an institutional one, as it is often institutional constraints that hamper the implementation of, and response to, nutrition surveys. Thus, a further objective of this paper is to link the technical issues with a more pragmatic understanding of the institutional constraints to collecting and using information.

The paper's target audience comprises principally the users of nutritional data, who include the wide array of decision-makers in stakeholder institutions. These decision-makers include programme and project managers, humanitarian officers or managers, technical programme or policy advisers and consultants, and early warning and other information analysts, including experts in evaluation and monitoring. Many epidemiologists and nutritionists lack humanitarian experience or training, and this paper will be relevant to them too. Increasingly, academic institutions are including humanitarian studies within their curricula, and this paper will also hopefully provide a primer for the humanitarian professionals of tomorrow.

Chapter 2
Basic concepts

Why has acute malnutrition remained so important in humanitarian contexts, and why is so much attention being paid to expanding and improving its assessment and analysis? There are several reasons:

1. The prevalence of acute malnutrition among children under five years is a sensitive and objective crisis indicator, reflecting the wider situation of emergency-affected populations, including their food security, livelihoods, public health and social environment.
2. Acute malnutrition is associated with an increased risk of morbidity and mortality,* although because malnutrition precedes death there is still the opportunity to save lives. Strong evidence indicates that a child with severe acute malnutrition has a greatly increased risk of dying, and in some instances this extends to the moderately malnourished as well.
3. Acute malnutrition is a fairly robust indicator, in that even in the very difficult circumstances of a humanitarian crisis it is possible to statistically estimate the prevalence of acute malnutrition among an emergency-affected population with known degrees of precision. This allows for statistical comparisons of nutritional trends over time (i.e. how the situation is changing, which is important for evaluating the impact of interventions). It also allows for an objective comparison between emergency populations internationally, which is critical in relation to impartial humanitarian response.

The international community probably has more data on the prevalence of acute malnutrition in emergencies than any other single indicator, although coverage of emergencies remains incomplete, with many humanitarian crises lacking adequate capacity to assess and monitor nutrition.

Despite its importance, acute malnutrition among children is not universally a problem in a complex emergency; for example, it was not evident following the Kosovo crisis in 1999, nor in Bosnia-Herzegovina in the early 1990s. In Sarajevo, however, nutritional surveillance did reveal that under-nutrition was a problem among older people.[2]

What do we mean by acute malnutrition, and how is it measured?

There are many technical terms and concepts used in any discussion of malnutrition in emergencies. It is important to understand what these mean and to use the terms correctly, as they are part of the common language of response to humanitarian crises.

* Here we are talking about the association between malnutrition and mortality at the level of the individual. Later, we discuss associations between population level estimates of malnutrition and mortality.

Malnutrition is a general term that includes many conditions, including under-nutrition, over-nutrition and micronutrient deficiency diseases (like vitamin A deficiency, iron deficiency anemia, iodine deficiency disorders and scurvy). This paper focuses on *acute malnutrition*, particularly among infants and young children from six months to less five years of age. Table 1 defines key terms, and is intended as a quick reference for the non-technical reader.

While our focus is acute malnutrition, micronutrient malnutrition may also be a serious public health problem in an emergency, even where levels of acute malnutrition are low. This was the case in northern Afghanistan in 2001, where the prevalence of acute malnutrition was 7.0% whilst the prevalence of scurvy was 6.5%. Even though the levels of acute malnutrition were not remarkable, the levels of scurvy indicated a serious humanitarian crisis.[3]

Using body measurements to calculate nutritional status and identify the malnourished

Height and weight are the most common body (or anthropometric) measurements used to measure nutritional status in emergencies. Mid Upper Arm Circumference measurement (MUAC) is sometimes used, and this is explained in more detail below. Weight-for-height (WFH) is the nutritional index of choice in emergencies (see Table 1).

A child's weight obviously varies with their height and sex, so any raw measurements must be standardised. For each child, their actual weight measurement is compared with a reference value drawn from international growth standards. These are assumed to reflect normal child growth under optimal environmental conditions, and can be applied to children everywhere, regardless of ethnicity, socio-economic status and type of feeding. In the reference population, where food, health and care are assured, the anthropometric measurements are normally distributed around the mean or median, as illustrated in Figure 1.

The child's nutritional status is expressed either as a percentage of the reference median, or alternatively as a Z-score. The calculation of the percentage of the median is relatively easy (see Figure 1).

Z-scores are the equivalent of standard deviations in a normal bell-shaped distribution curve. The normal range for growth is assumed to lie between –2 and +2 standard deviations, which includes 95% of the reference population. This means that, even within the reference population, 5% of children lie outside of the normal range. Z-scores are expressed in multiples of the standard deviation, so that a Z-score of 0 is equivalent to the median

Table 1: Measurement of malnutrition: a glossary of technical terms

Marasmus	Marasmus is the most frequent form of protein energy malnutrition found in humanitarian crisis. It results from prolonged starvation, and may also be caused by chronic or recurring infections with marginal food intake. The main sign is a severe wasting away of fat and muscle, which makes the child appear very thin.
Kwashiorkor	Kwashiorkor is the second form of acute protein energy malnutrition. The main sign is oedema, which usually starts in the lower limbs and spreads in more severe cases to the face and hands. Marasmic kwashiorkor is a mixed form of Protein Energy Malnutrition.
Growth failure	The failure to grow in stature or weight. There are two types of growth failure associated with malnutrition, stunting (or shortness) and wasting (or thinness).
Wasting and acute malnutrition	Wasting is the main characteristic of acute malnutrition. Wasting occurs as a result of recent rapid weight loss, or a failure to gain weight within a relatively short period of time. Wasting occurs more commonly in infants and younger children, often during the stage when complementary foods are being introduced and children are more susceptible to infectious diseases. Recovery from wasting is relatively quick once optimal feeding, health and care are restored. Wasting occurs as a result of deficiencies in both macronutrients (fat, carbohydrate and protein) and some micronutrients (vitamins and minerals).
Stunting and chronic malnutrition	Stunting is a failure to grow in stature, and occurs as a result of inadequate nutrition over a longer time period, which is why it is also referred to as chronic malnutrition. It is a slow, cumulative process, the effects of which are not usually apparent until the age of two years, although to prevent stunting action is needed before a child reaches the age of two. Stunting is not a good indicator of growth failure in emergencies as it does not reflect recent changes and requires a long-term response. The effects of stunting are not completely reversible, and children who suffer from chronic malnutrition and become stunted will grow up to become small adults.
Nutritional (bilateral) oedema	Bilateral oedema is an essential indicator for determining the presence of Severe Acute Malnutrition or kwashiorkor. It presents first in feet, then in ankles and lower limbs. Oedema results from the excessive accumulation of extracellular fluid as a result of severe nutritional deficiencies, and is a serious cause for concern. All children with nutritional oedema are automatically classified as severely malnourished. Oedema may be detected by the production of a definite pit as a result of moderate pressure for three seconds with the thumb just above the ankle.
Weight-for-height (WFH)	WFH is a widely used nutritional or anthropometric index, and is the best indicator of wasting. WFH is recommended for assessments of recent nutrition, and is especially important for assessments of nutrition-related humanitarian emergencies.
Height-for-age (HFA)	The nutritional index HFA reflects skeletal growth (stature), and is the best indicator of stunting. The longer time-scale over which height-for-age is affected makes it more useful for long-term planning and policy development, rather than emergencies.
Weight-for-age (WFA)	WFA is a composite index, which reflects either wasting or stunting or a combination of the two. Children with low WFA are described as *underweight*. Rapidly changing weight-for-age can be assumed to be the result of changing weight-for-height. Growth charts based on weight-for-age reference curves are used for growth monitoring in Mother and Child Health programmes. WFA is less useful in emergencies.
Body Mass Index (BMI)	BMI = (weight in kilos)/(height in metres)^2. It is used for assessing the nutritional status of adults.
Anthropometric cut-offs	For each anthropometric index there are 'cut-off' points used to grade malnutrition among children aged six to 60 months. These are statistically determined based on the distribution curve of the reference population. There are no agreed anthropometric cut-offs for malnutrition in infants under six months.

(100% percentage WFH), while a Z-score of –2 lies two standard deviations below the median.

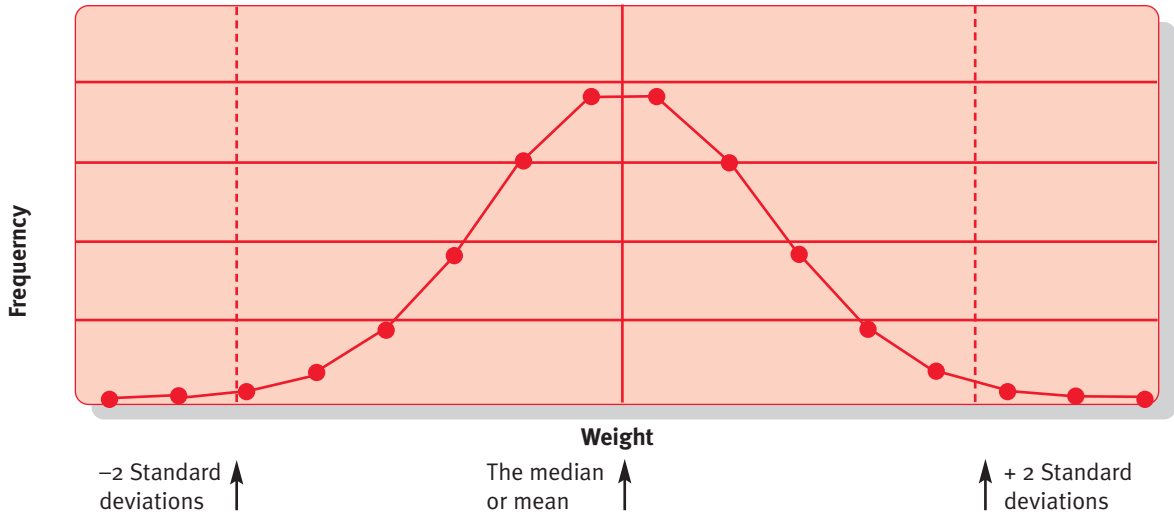
Cut-off points are used to grade acute malnutrition as severe or moderate, and to identify children for referral for treatment or further action, such as nutritional screening or supplementary or therapeutic feeding. If the child is observed to have nutritional oedema, they are automatically graded as severely malnourished (see Table 2).

As shown in Table 2, the cut-off point of –2 Z-scores is equivalent to ‹80% of the median. However, in practice this relationship is not consistent, and the two curves (–2 Z-score and 80% of the reference median) are not always equivalent, which means that results will vary depending on whether they are expressed as Z-scores or percentage of the median.

As part of a nutritional survey, cut-off points are used to count the number of children who are malnourished, and

Figure 1

The reference growth curve: a normal distribution and associated median, mean and standard deviation



Example of calculating Percentage of the Median: Length of child = 82 cm; reference weight for child of this length= 11.2 kg; observed weight of child= 9.4 kg. (9.4 kg / 11 kg) x 100 = 85% Percentage of the Median

Table 2: Classification of acute malnutrition among children aged 6–59 months

	Severe Acute Malnutrition (SAM)	Moderate Acute Malnutrition	Total Malnutrition**
Children 6.0 to 59.9 months	< –3 Z-score WFH *or* < 70% median WFH; bilateral oedema 'oedematous malnutrition'; *or* MUAC < 110 mm in children aged 1 to 5 years	–3 to < –2 Z-scores WFH *or* 70% to < 80% median WFH	< –2 Z-scores WFH *or* 80% median WFH and bilateral oedema

** Total Malnutrition is sometimes known as Global Acute Malnutrition (GAM).

then to estimate the prevalence of acute malnutrition in a population. It is widely agreed that Z-scores are the scale of choice for use in nutrition surveys.[4] Z-scores are statistically more uniform, but they are a little more complicated to calculate, and for this reason this task is usually computerised.

The prevalence of malnutrition using the Z-score cut-off tends to be higher than if percentage of the reference median is used (in other words, more children are identified as malnourished using Z-scores as compared with percentage of the median). This has an impact on programme planning and estimating food needs. In Angola, Concern International calculated that, on average over a period of about 18 months, the use of the –2 Z-score selected a malnourished group which was 1.6 times larger than the group selected using the < 80% of the reference median cut-off.[5]

Mid Upper Arm Circumference of children aged one to five years

The measurement Mid Upper Arm Circumference (MUAC) changes little between one and five years of age,* which means that the actual measurement can be used rather than standardising the measurements using growth reference. MUAC is useful for the nutritional screening of children aged between one and five years for possible eligibility for feeding programmes, as it requires little equipment and training and screening teams can cover a large number of children quickly.

Many guidelines recommend the collection of MUAC data along with WFH data during surveys or for rapid assessments. There has been debate about changing the cut-off for MUAC, as the recommended cut-off points of 12.5cm and 13.5cm greatly exaggerate acute malnutrition prevalence rates as compared to the WFH cut-off points of < 70% and < 80%.[6] WHO has recommended that MUAC should be related to reference values for height (or length)

* WHO points out that MUAC increases normally by up to 2cm between 1 and 5 years, which means that using a fixed cut-off point will naturally select more younger children with smaller arm circumference measurements. M. de Onis, R. Yip et al., 'The Development of MUAC-for-Age Reference Data Recommended by a WHO Expert Committee', *Bulletin of the World Health Organization*, 75(1), 1997: 11–18.

Box 1

Can we use one international growth reference for all populations?

Since the late 1970s, the World Health Organisation (WHO) has endorsed the use of an international growth reference, the NCHS/CDC reference values, which are universally applied in humanitarian emergencies. The NCHS/CDC growth references are based on two samples of American children: one nationally representative sample of individuals aged from two to 18 years from the National Center for Health Statistics (NCHS), and the second drawn from a local sample of children under 36 months of age in Ohio who were mostly artificially fed.[7] Breastfed babies grow at a different rate, which means that malnutrition will tend to be overestimated in this age group.

Studies have shown that, up to the age of five years, growth in children of different populations can be very similar. The difference in growth becomes evident at the onset of adolescence. A recent Multi Centre Growth Reference Study (MGRS) by WHO presents the strongest evidence yet that a single international child growth standard is valid by showing that children of different ethnic groups from six participating countries all grew in the same way.[8]

WHO has recently released new growth standards for children.[9] These standards differ from existing growth references in that they are based on international datasets and describe the growth of breastfed rather than artificially fed children. They prescribe how children *should* grow, rather than just providing a common basis for comparison. They are intended for use as 'growth standards' in both developing and developed countries, although so far they have not been applied in emergency contexts. There are important differences between the new growth standards and the existing growth references, which become evident if both sets of growth curves are plotted together. These will affect the measured prevalence of malnutrition and the numbers of children eligible for admission to programmes.[10] Currently, there are no guidelines on how these operational challenges should be addressed. Until these guidelines are available the standards should not be applied in emergency contexts. It is expected that there will be a transition period when the NCHS/CDC reference values and the new WHO growth standards are both used to report prevalence data.

or age,[11] although in practice this is uncommon. Table 3 describes the classification of malnutrition according to MUAC as used by Action Against Hunger, which is similar to that used by Médecins Sans Frontières (MUAC ‹ 11cm: severely malnourished, and MUAC › 11 cm and ‹ 12.5 cm: moderately malnourished).[12]

Table 3: Classification of acute malnutrition according to MUAC (developed by Action Against Hunger)

MUAC	Diagnosis
‹ 110 mm	Severe malnutrition
› 110 and ‹ 120 mm	Moderate malnutrition
› 120 and ‹ 125 mm	Serious risk of malnutrition
› 125 and ‹ 135 mm	Moderate risk of malnutrition
› 135 mm	Satisfactory malnutrition

C. Prudhon, *Assessment and Treatment of Malnutrition in Emergency Situations. Manual of Therapeutic Care and Planning for a Nutritional Programme* (Paris, London, Madrid, New York: Action contre la Faim, 2002).

MUAC has a stronger association with risk of mortality than WFH among children between one and five years of age.[13] For this reason, MUAC (cut-off ‹ 110mm) has been used as the admission criterion for therapeutic feeding programmes.[14] In the past few years there has been growing pressure for MUAC to be used as an independent indicator for admission into outpatient therapeutic programmes[15] and this recommendation has been endorsed by an informal WHO committee.[16] For this reason, MUAC will often appear in nutrition surveys in order to allow calculations of the number of severely malnourished children potentially eligible for therapeutic feeding, rather than as an estimate of prevalence of Severe Acute Malnutrition.[17]

Direct comparisons of prevalence data based on WFH and MUAC are not recommended, as they tend to differ (see Table 4), and despite considerable overlap MUAC and WFH identify different children as malnourished.[18]

The key point here is that such differences are expected and that, when comparing nutritional data, like must *always* be compared with like, and different indices or different scales of expression should not be confused. Lastly, when assessing the nutritional status of a population MUAC should be used in addition to, and not in place of, WFH when assessing the nutritional status of a population.

Nutritional status of adults, adolescents and the elderly

In the most severe humanitarian crises, older children and adults are likely to be affected, as well as infants and young children, and so NGOs are increasingly including assessment of adults in nutrition surveys.* Moreover, in some societies children may be preferentially fed in times of food shortage, and nutritional status in children may therefore not reflect that of the population as a whole.

* For adults a range of other measurements are sometimes taken, for example sitting height, to calculate the Cormic index (sitting height divided by standing height: a measure of body shape). Among older people, demi-span measurements have also been taken as a proxy measure for height where people have difficulty standing upright.

Table 4: Comparison of results in Z-scores, percent of the median and unadjusted MUAC (example from a nutrition survey in North Horr, Marsabit, Kenya, January 2001)

Nutritional indicator	n	Severe Acute Malnutrition (SAM)	Total Acute Malnutrition (GAM)
WFH Z-score	906	3.1% < –3 Z-score	21.9% < –2 Z-score
WFH percent of the median	906	2.0 % < 70% of the median	12.6% < 80% of the median
MUAC (unadjusted)	924	0.4% < 110 mm	6.5% < 125 mm

MEDAIR East Africa, *Nutritional survey in North Horr*, 2001.

However, there is no consensus on indices and cut-off criteria. For adults, Body Mass Index (BMI) is the recommended index for population assessments, combined with famine oedema.[19] The UN Sub-committee on Nutrition (SCN) Refugee Nutrition Information System (RNIS – now known as the Nutrition Information in Crisis System) supplement on measuring the anthropometric status of adults also recommends MUAC for population-level assessments, although it only recommends cut-off points for screening adult admissions to feeding programmes (moderate malnutrition < 18.5cm and severe malnutrition < 16cm).[20] A MUAC cut-off of < 22 cm is recommended for pregnant women.[21]

Adolescence is a period of rapid growth occurring between ten to 19 years. WHO recommends that adolescent wasting is assessed by calculating BMI for age (weight/height2 for age). BMI for age scores are compared to reference data for American children, and a cut-off point below the fifth percentile indicates malnutrition.[22] However, the RNIS concluded that 'these recommendations may not be appropriate; surveys using these recommendations have found unrealistically high levels of adolescent under-nutrition.[23] Thus, any presentation of anthropometric data on adolescents should be interpreted with caution.

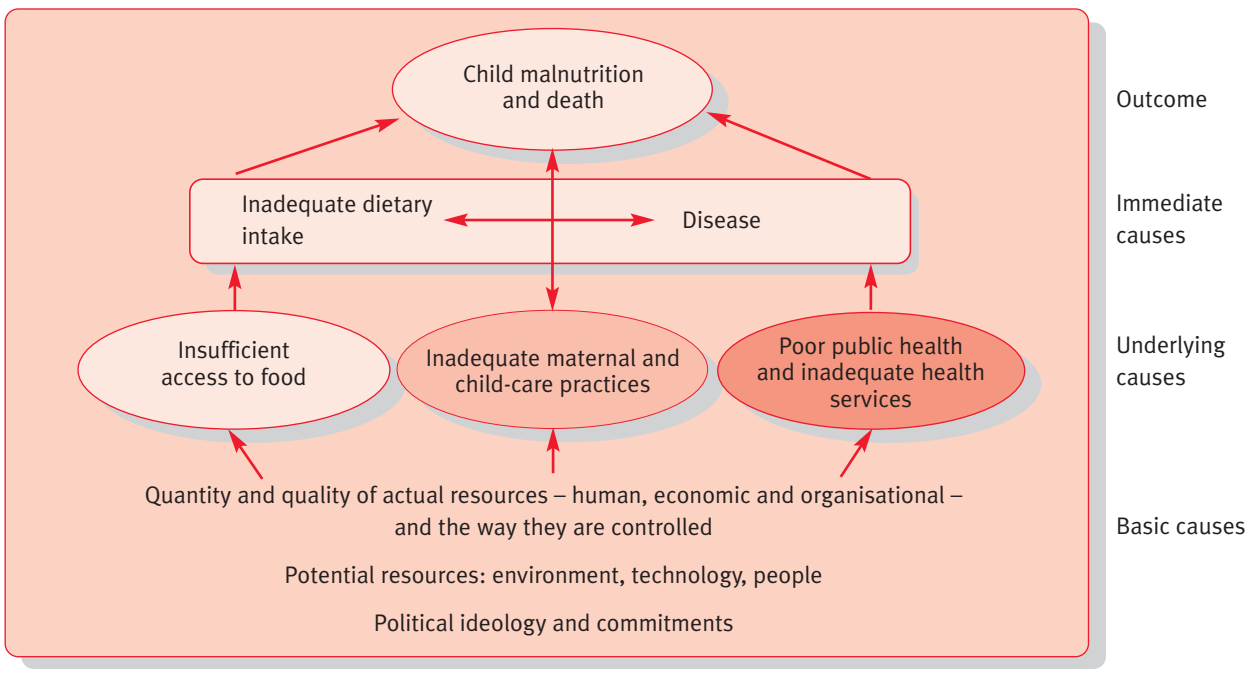
The elderly are a difficult group to assess anthropometrically. They are a hard group to define; in developing countries, a person may be considered elderly from the age of 45 onwards, whereas in developed countries old age is considered to start at around 60 years. Second, accurate height measurements are difficult as older people are more likely to be disabled or unable to stand straight.

The causes of malnutrition

An understanding of malnutrition must also include the causes of malnutrition. These are best represented by

Figure 2

Conceptual framework of the causes of malnutrition



Adapted from UNICEF, *Strategy for Improved Nutrition of Children and Women in Developing Countries. A UNICEF Policy Review*, 1990.

Box 2

The immediate and underlying causes of malnutrition

Inadequate food intake and disease are the two immediate causes of malnutrition affecting an individual. Health and nutrition are closely linked, as malnutrition makes an individual more susceptible to disease, while disease contributes to malnutrition. Severe Acute Malnutrition especially increases the incidence, duration and severity of infectious disease. The four childhood killers which are common in emergency settings – measles, malaria, diarrhoeal disease and acute respiratory infections – may all contribute to malnutrition through loss of appetite, malabsorption of nutrients, and loss of nutrients through diarrhoea or vomiting, or through altered metabolism.

Underlying causes of malnutrition: food, care and health

Food security
Food security exists when all people, at all times, have physical and economic access to sufficient safe and nutritious food for a healthy and active life.[24] The emphasis in this definition is on people's access to food, for example through food production or food purchase, and also availability and affordability. It also emphasises nutritional quality; people need not only sufficient energy, but also protein, fat, vitamins and minerals. Food security is increasingly being viewed in relation to people's livelihoods, particularly the livelihood goals that drive household decision-making. Typically, households adopt a range of coping strategies to manage the risks facing them as a result of food insecurity. While coping strategies may provide some protection against food insecurity, they may also incur nutritional risk. For example, common coping strategies are to cut back on the number of meals, or switching to a cheaper but less preferred or less nutritious food.

Social and care environment
This refers to the wider cultural and social context that shapes caring behaviours within the household and the local community. Appropriate childcare, including sound feeding practices (especially optimal infant and young child feeding), hygiene, emotional support and appropriate health-related behaviours, is obviously essential for good nutrition and health. Often, the care of children is closely linked with cultural and gender issues. Apart from these pre-existing factors, emergencies can generate further constraints that limit or restrict care and therefore contribute to malnutrition. Displacement or forced migration causes severe social disruption and the break-up of the community, even the family, with the loss of social networks that would normally support the household in the care of its children, sick and elderly. HIV/AIDS has a major impact on care within the household, as those most affected by the disease are the primary carers who subsequently need care themselves. The loss of the adult carer often results in older children and older people being burdened with additional responsibility. The social stigma of HIV/AIDS may also affect the household's access to wider social support networks, and isolate them from the usual community support.

Health environment
The health environment, including adequate supplies of clean water, sufficient sanitation, appropriate shelter and clothing, is critical in terms of exposure to disease. Prevention and control of disease through public health programmes, for example immunisation, are also critical in protecting and supporting nutrition. Public health problems are often concentrated where people are displaced, and there is subsequently severe overcrowding and pressure on existing amenities, leading to localised health crises.

means of a conceptual framework, which is a critically important tool for the analysis of the nutritional situation and the underlying nutritional risk factors, and for designing appropriate humanitarian responses. Figure 2 shows the UNICEF Conceptual Framework of causes of malnutrition.

The framework gives inadequate food intake and disease as the two immediate causes of malnutrition affecting an individual. There are three clusters or groups of underlying causes: inadequate household food security, the social and care environment (also known as maternal and child care), and the public health environment. The immediate and underlying causes of malnutrition are described in Box 2.

The three groups of underlying causes overlap and interact with one another; in contexts of severe food insecurity, for example, caring behaviours are often limited by the need for carers to prioritise food security activities over care. Multiple risks frequently coincide, particularly in an emergency context, where there are pressures and constraints in relation to all three groups. Conflict introduces a new dimension of risks to health, nutrition and livelihoods, which are usually much more acute and are sometimes directed intentionally at destroying livelihoods, or the assets upon which they are based.

In the framework in Figure 2, the basic causes include the political ideology and commitments to addressing malnutrition on the part of national and international institutions and the human, economic and organisational resources that are potentially available for this. The basic causes of malnutrition are usually beyond the control or even the influence of humanitarian actors, but nevertheless are important as they represent the

overarching processes that are shaping and influencing the nutrition of communities, and possibly the preconditions for recovery from emergencies.

UNICEF's conceptual framework has generally been adopted by international agencies to form the basis of nutrition assessments in emergencies. It has also been adopted in an increasing number of national information systems. Other frameworks exist, but are less commonly used to analyse the causes of malnutrition. Professor Michael Golden has proposed an alternative conceptual framework on causes, which gives both disease and malnutrition as direct causes of death, but accords a lesser role for disease as a cause of malnutrition. Similarly, the conceptual framework developed by FIVIMS (the Food Insecurity and Vulnerability Information and Mapping Systems of the FAO) also corresponds closely to the UNICEF framework, containing the same core elements relating to food, health and care (see Annex 1).[25] The main components of the UNICEF framework have also been adopted in the OCHA Needs Analysis Framework, which is recommended for organising and presenting existing information on humanitarian needs in the Consolidated Appeals Process and the Consolidated Humanitarian Action Plan.[26]

A conceptual framework is critical for an integrated analysis of malnutrition, ideally to ensure that all stakeholders have a shared understanding of the multiple underlying causes, and thus are able to move forward with a combination of intervention strategies designed to protect and support nutrition and reduce malnutrition and mortality. In practice, this ideal has rarely been achieved as humanitarian response has tended to be dominated by food aid, with concomitant under-funding of a wider range of food security and public health interventions.

Humanitarian response to address acute malnutrition

The conceptual framework in Figure 2 helps in identifying the causes of malnutrition and the level at which they operate (individual, household, community, nationally and internationally). Annex 2 provides examples of interventions designed to address the various levels and clusters of causes of malnutrition. How you prioritise and plan your response strategies depends on your analysis and interpretation. This section gives only a very brief overview of the range of possible interventions.

Where people are dying from acute malnutrition, life-saving nutritional responses should be implemented, such as therapeutic feeding to alleviate severe malnutrition and supplementary feeding to address moderate malnutrition. Such programmes are usually targeted at children under five, but in the severest humanitarian crises, older children and adults may also need therapeutic feeding.

Programmes that address malnutrition by treating individually malnourished children have a direct live-saving impact, although their positive impact may be limited to the duration of the intervention unless attention is given to also addressing the underlying causes of malnutrition and building local capacity, and supporting a wider array of response strategies.

Few interventions directly address inadequate caring behaviours as a result of an emergency. Possibilities include support for appropriate infant feeding practices and care for unaccompanied children. Interventions to address a poor public health environment include immunisation, ensuring sufficient quantity and quality of water, adequate sanitation and access to basic health services.

Most interventions simultaneously influence more than one underlying cause, for example a general food distribution programme obviously addresses food insecurity, but the way that it is planned and implemented has a major impact on women's time and workload, and therefore influences the care of children. Such interventions need to be implemented in ways that do not undermine social and cultural norms.

Addressing malnutrition and supporting and protecting nutrition in emergencies also requires appropriate policy development, coordination, monitoring, evaluation and capacity development. These functions go hand in hand with good programming, and are necessary for a longer-term, more sustained impact on nutrition.

Chapter 3
The uses of data on acute malnutrition

Data on acute malnutrition in emergencies is most commonly collected in nutritional surveys and in supplementary or therapeutic feeding programmes. The uses of nutritional survey information include determining the severity of crisis, advocacy or triggering a response and programming planning, monitoring and evaluation. Nutritional surveillance is also part of some famine early warning systems.

The intended use of nutritional surveys determines their specific aim or purpose. This is in turn linked to the agency which carries out the nutritional survey. For example, for MSF and ACF, one of the purposes may be to determine the need for selective feeding programmes; UNHCR and WFP may use the data to decide whether general rations are needed, and if so what form they should take; Oxfam or SC-UK may use nutrition data to identify appropriate interventions to address the underlying causes of malnutrition. Recent WFP-led surveys in Darfur covered the entire crisis-affected population to estimate the impact of the overall humanitarian response on food security and nutrition.

The uses of nutritional survey information also vary between and during crises. Between crises, the emphasis is often on monitoring nutritional status in order to detect a deteriorating nutritional situation, and thereby prevent a serious food crisis or famine in future. Once a crisis occurs, the main purpose is to get an accurate picture of its severity. Once a relief operation has started, nutritional survey information is used to assist in targeting and monitoring the impact of the humanitarian operation. Table 5 shows how the purposes of nutritional surveys and surveillance have changed over the past two decades in Darfur.

Table 5: Changing nutritional survey objectives and methods in Darfur, 1985–2005

Date	Project	Objectives	Methods
1985–1986 Famine	Nutrition Surveillance and Drought Monitoring Programme jointly by Oxfam, MoH and UNICEF	To determine need for food aid, and to assist with targeting and monitoring of food aid	Two-stage random cluster surveys to collect anthropometric data. Qualitative information on food security. Region-wide coverage (all Darfur states)
1987–90	Crop assessments and rainfall and market price monitoring by the Agricultural Planning Unit. Drought monitoring (including coping strategies) by the Sudanese Red Crescent. Nutritional surveillance by Oxfam	Famine early warning	Rapid assessments using purposive sampling. Sentinel site monitoring (Nov–Feb; June–August) *Coverage:* rapid assessments in areas indicated to be food insecure by APU and SRC. Sentinel site monitoring in most vulnerable locations in North Darfur
1991 Famine	Darfur-wide nutritional surveys. MoH. Monitoring of food security indicators at household level	Estimating the severity of crisis for Darfur as a whole	*Method for nutritional surveys:* random cluster sampling Region-wide coverage (all Darfur states)
1992	Socio-economic and nutritional information collection. SC-UK Food security monitoring. Oxfam	Monitoring of relief operation (food distribution) Informing targeting decisions	Sentinel site monitoring Ad hoc surveys in purposively selected areas
1993–96 Serious food crisis	Darfur Food Security Information System by SC-UK established in 1993	Famine early warning. Estimating food aid needs	Annual harvest assessments by MoA. Baseline assessment of four food economy zones in 1993. SC-UK: bi-annual village and household food security assessments (Sept/Oct and April each year). Analysis of food deficits using Riskmap. Bi-annual nutritional surveys using a random sample of 105 villages. Analysed by rainfall/production strata Monthly market monitoring
1997–2000	Adaptation of SC-UK food security information system	As above	Division of North Darfur into 6 food economy zones by 1997 Nutritional surveys. Annual or bi-annual food economy assessments

(continued)

Table 5 (continued)

Date	Project	Objectives	Methods
2000–2004	Adaptation of SC-UK food security information system	As above	Annual village and household food economy survey. Occasional random cluster nutritional surveys to confirm food insecurity in selected food economy zones from 2000
2004–2005 Famine	Ad hoc surveys by many NGOs amongst displaced populations. Darfur-wide food security and nutrition surveys by WFP and UNICEF. Sentinel site surveillance by UNICEF	NGO surveys, advocacy, identifying appropriate interventions. WFP/UNICEF survey: estimate severity of crisis for entire conflict-affected population and effectiveness of aid operation Sentinel site monitoring: monitor trends in nutrition (impact of relief operation) and inform targeting decisions	WFP/UNICEF: random cluster anthropometric surveys of (accessible) conflict-affected population. Quantitative (dietary diversity) and qualitative indicators of food security Sentinel site monitoring: mean weight-for-height Z score is monitored in a number of sentinel sites in the three states (9 in West Darfur, 7 in North Darfur and 4 in South Darfur) with plans for expansion[27]

Sources: H. Young and S. Jaspars, *Nutrition Matters: People, Food and Famine* (London, IT Publications, 1995); K. De Souza et al., *Sudan Emergency Food Distribution Monitoring Mission*, UK Department for International Development; M. Buchanan-Smith, *The Darfur Early Warning and Food Security Information System: Final Evaluation of Phase III*, Save the Children-UK.

Determining the severity of a crisis and advocating for a response

A key role of nutritional information is to assess the severity of a crisis, and thereby the need for an emergency response. Nutritional surveys to assess severity are most useful where the severity of the crisis is uncertain, or where other information gives contradictory findings, for example in slow-onset crises or chronic emergencies. In some acute crises, however, it may not be necessary to do a nutrition survey in order to justify an emergency response, for example in the case of a massive population displacement where people have no means of meeting their basic needs. In such instances, a response should be mounted from the very start, on the assumption that a crisis exists, but nutritional data should be collected as soon as possible to provide a picture of the true extent of the crisis, and of malnutrition's contribution, to adjust needs and targets.

Thresholds or benchmarks have been identified which correspond to different degrees of severity. However, the use of thresholds is widely debated within the international nutrition community. Different guidelines give different thresholds to identify a serious situation, and some have rejected the use of absolute thresholds. WHO recommends a threshold prevalence of 15% acute malnutrition in a community to indicate a critical situation. The Sphere minimum standards for disaster response recommend the use of relative thresholds, where the prevalence of malnutrition found in assessments is compared with pre-emergency levels of malnutrition and seasonal patterns in the same population:

> *determining whether levels of malnutrition are acceptable requires an analysis of the situation in light of the reference population, morbidity and mortality rates, seasonal fluctuations, pre-emergency levels of malnutrition, and the underlying causes of malnutrition.*[28]

The use of thresholds is further discussed in chapter 5.

Nutritional surveys are a powerful tool for advocacy, and are frequently used to highlight a particular crisis and advocate for a response. For example, MSF successfully raised the profile of the crisis in Darfur via its nutritional surveys in early 2004, and Save the Children's nutritional surveys in Malawi in 2001 and 2002, and its advocacy with donors, played a key role in bringing international attention to the food crisis in Southern Africa.

It is rare for surveys to estimate the overall extent of the crisis, i.e. to cover the entire emergency-affected population. However, there have been two region-wide nutrition and food security assessments in Darfur, the first in September 2004, the second in September 2005. Such surveys are apparently becoming increasingly common; the same methodology has been applied elsewhere in Sudan, and in Pakistan. The main aim of the WFP surveys in Darfur was to estimate the effectiveness of the overall humanitarian response, in terms of its impact on nutrition and food security. This data could also be used for international comparisons.

Acute malnutrition as part of early warning systems

Nutritional data is used in a number of famine early warning systems. In some, this data is collected on a regular

basis (nutritional surveillance), through repeated cross-sectional surveys; alternatively, in some contexts longitudinal monitoring of the same children has been tried. The results are used to complement and confirm food security information.

Famine early warning systems monitor food security information to detect changes in food security early enough to prevent famine. These systems were first developed in the late 1980s in the Horn of Africa. Nutritional status data is one of a number of indicators collected. Early warning systems have seen a surge of renewed interest, particularly in parts of Africa, as a result of an apparent increase in chronic food insecurity and slow-onset crises due to economic decline, drought and HIV/AIDS. Systems can be government-based, for example the Kenya Arid Lands Drought Monitoring Programme; UN-led, for example FAO's Somalia Food Security Assessment Unit (FSAU); or NGO-led, for example SC-UK's nutritional surveillance programme in Ethiopia. They can also be a combination of government- and NGO-led, as in Darfur.

On-going surveillance provides information on trends and allows for the interpretation of malnutrition prevalences as compared to expected seasonal changes, i.e. what is normal for that time of year for that population. In parts of Sudan and Ethiopia, changes in the prevalence of acute malnutrition have coincided closely with other famine early warning indicators, including market prices, terms of trade and rainfall. In these contexts, nutritional surveillance should be able to detect a deterioration in the nutritional situation in the early stages of acute food insecurity.

Recent early warning systems, such as that of the FSAU in Somalia, use a 'phase classification system' to classify the severity of the crisis. The analysis of severity of food insecurity is combined with an early warning level to indicate the likelihood of the situation worsening based on the likelihood of certain hazards occurring and the vulnerability of the population (Alert, Moderate Risk, High Risk).[29]

Key issues relating to nutritional surveillance as part of famine early warning systems are cost and sustainability. Community-based methods, such as the one implemented in Darfur in 1988–90, collapsed during crisis and were replaced by standard one-off surveys to give an estimate of the overall severity of crisis.[30] Surveillance which requires more external input is often considered too expensive at times when there is no crisis. For example, in Ethiopia SC-UK's long-term nutritional surveillance programme was stopped in 1999 and replaced by one-off NGO surveys to confirm indications of food insecurity from the national EWS. However, in countries like Ethiopia, where emergency responses are frequent and interventions to address chronic food insecurity on-going, the cost of nutritional surveillance is a fraction of the cost of interventions to address malnutrition. The cost of SC-UK's surveillance programme in Ethiopia was less than 1% of the cost of US food aid distributed in 1997–98, and eight times cheaper than the nutritional surveys carried out in 2005.[31]

Programme planning, monitoring and evaluation

NGOs often carry out nutritional surveys with the explicit aim of planning their projects, most often to identify the need for therapeutic and supplementary feeding programmes. If the survey identifies the need for such programmes, the survey is then also used to estimate the number of children in need of such an intervention. The prevalence of malnutrition is also an important consideration in the planning of general food rations for a population, as malnutrition affects energy requirements.* If a survey includes an analysis of the underlying causes, it can also identify the most appropriate interventions to address these causes in addition to alleviating any malnutrition that already exists.

Therapeutic and supplementary feeding programmes are targeted at the malnourished or the most nutritionally vulnerable groups. In rare instances, general rations are targeted at families with malnourished children, for example where food aid is in extremely short supply or where there are serious problems with ensuring an equitable general ration distribution, as for example in South Sudan in 1998.

Nowadays, data on the prevalence of acute malnutrition alone is rarely used to trigger or target the overall humanitarian response operation. However, this was common in the 1980s and early 1990s. In the 1980s, rates of malnutrition were used in some African countries to trigger declarations of drought.[32] In Ethiopia, a nutritional surveillance system was developed where a drop in nutritional status below a mean weight for length of 90% triggered a food aid response. Nutritional surveys are still used in Ethiopia to trigger a food aid response outside of the emergency food aid appeal.[33]

Nutritional surveys are often used to estimate the coverage of feeding programmes. The accuracy and relevance of traditional nutritional surveys for this purpose has, however, been questioned, as they do not provide precise estimates of coverage for sub-sections of the population surveyed. A new survey method has been developed specifically for estimating coverage of feeding programmes, known as the centric systematic area sampling methodology.[34] The strengths and weaknesses of this method are described in Box 4 (page 20). Nutritional status is used to monitor the progress of individual children in supplementary and therapeutic feeding programmes, and admission and discharge criteria.

Estimates of the prevalence of acute malnutrition are important for monitoring the wider context in which the intervention is taking place, which will help in assessing the impact of interventions on the nutritional status of the population. Using malnutrition prevalence to assess the impact of interventions is problematic, however, because

* The main information for planning general rations comes from food security assessments, rather than nutritional surveys.

malnutrition is multi-causal, and it is difficult to attribute any change in population nutrition to the intervention, as opposed to other factors. Other data is needed on the underlying causes in order to better understand and assess programme impact.

As discussed above, the recent interest in region-wide nutrition and mortality surveys is in part an attempt to determine the impact of a humanitarian operation overall. Whilst it may be possible to deduce that a reduction in malnutrition and mortality has occurred as a result of the humanitarian operation, it will be impossible to disaggregate the impact of the various programmes within this.

Chapter 4
Estimating malnutrition in emergency-affected populations

Nutrition surveys are done with a practical purpose in mind – usually related to programme decision-making. Good decision-making depends on survey results which are both reliable and valid, which in turn depends on the application of appropriate survey methods and approaches. Over the past two decades, methods for collecting information on nutritional status have been standardised probably more than any other crisis indicator, with the result that acute malnutrition has become one of the most reliable indicators used in emergencies.

Nutrition surveys in emergency settings are designed to estimate the prevalence of acute malnutrition (wasting and nutritional oedema) among children under five years of age,* and assess the underlying causes of malnutrition. A nutrition survey usually refers to a random survey that estimates the prevalence of acute malnutrition in a population. These estimates are based on anthropometric measures (weight and height) so the surveys are sometimes called anthropometric surveys. Most also collect information about measles vaccination coverage, and calculate coverage of feeding programmes. It is good practice also to include an assessment of the underlying causes of malnutrition related to food, health and care as part of the survey, although this is not always done.

Rapid nutrition assessments focus on the risks to nutrition as a result of the emergency by assessing the underlying causes of malnutrition. The Sphere handbook recommends gathering information on underlying causes before conducting an anthropometric survey. Rapid nutritional assessments may also be based on a nutritional screening exercise, which measures the MUAC of all children between one and five years in the population. The results of screening do not provide a reliable population estimate of acute malnutrition, but they do allow an assessment of the potential risk of acute malnutrition.

Food security assessments sometimes use nutritional survey data to confirm the severity of food insecurity, but the main focus is to collect information on changes in access to food for different livelihood groups.

The specific purpose of a nutritional survey depends on how decision-makers and others make use of the findings, ranging from identifying the need for selective feeding programmes to famine early warning, as discussed in chapter 3. The objectives of a nutritional survey should include:

- the outcomes to be measured (e.g. prevalence of acute malnutrition, mortality rates and assessment of underlying causes);
- the target group (e.g. children aged from six to 59 months); and
- the population area to be included in the survey.

The objectives then provide the broad parameters for the survey design.

This chapter starts with an overview of sampling approaches. This is followed by a discussion of methods for assessing the underlying causes, an area which is much less developed.

Sampling

Overview

A nutritional survey selects a representative sample of children to be weighed and measured, to get a statistically reliable estimate of the prevalence of acute malnutrition. For the survey to be representative, each child in the population of interest must have an equal chance of being selected for the survey.

The type of sampling is critically important, as it affects the precision of the results. There are several ways of selecting a sample. The main sampling methods are simple random sampling, systematic sampling and cluster sampling (described in Table 6, page 16). The standard survey method in emergencies is two-stage cluster sampling. Wherever this is applied, the results are comparable between populations and over time.

The method also depends on the objective of estimating the prevalence of malnutrition. For example, where the aim is to determine the severity of a crisis, a one-off cluster survey is appropriate as this gives the most reliable estimate of malnutrition prevalence in emergencies. Another example is early warning, where the aim is to monitor trends in nutritional status. Purposive sampling may be most appropriate in this case to represent specific livelihood groups or areas historically vulnerable to famine (see below).

Non-probabilistic sampling: convenience sampling and purposive sampling

Rapid assessments that rely on convenience sampling – choosing individuals arbitrarily and in an unstructured way (for example those closest at hand) – are almost always unreliable and cannot be assumed to reflect the wider population from which the sample was drawn.

Purposive sampling, on the other hand, refers to the selection of specific survey sites or populations based on where the researchers think it is appropriate to sample. Purposive sampling using smaller sample sizes may be

* Increasingly, adults are also included in surveys, particularly where it is suspected that the crisis has affected their nutritional status.

Table 6: Types of sampling for standard nutritional surveys

Sampling method	Description
Simple random sampling	Individual children are selected at random from the sampling frame, for example by taking random numbers and selecting the child corresponding to that number. This can usually not be applied in emergencies as lists of all children in the affected population are not available.
Interval or systematic sampling	Children are selected systematically at equal intervals, for example every tenth child encountered in a house-to-house survey. This can only be applied where households are arranged in organised lines or blocks, which is often not the case in emergencies.
Two-stage cluster sampling	This is the most appropriate method in emergencies. Thirty clusters are selected from a list of villages or other population units. They are randomly selected at equal intervals from the cumulative population total using a technique known as 'probability proportionate to size'. Thirty children are then selected in each cluster.

appropriate in this case to represent specific livelihood groups or areas historically vulnerable to famine. Thus, purposive sampling should not be confused with convenience sampling.

Cluster surveys – the standard approach

Nutrition guidelines have long recommended the use of a two-stage cluster survey design, that is selecting 30 clusters and up to 30 children under five years of age per cluster. This cluster design is favoured by WHO, and is a variant of the cluster design originally used for estimating immunisation coverage.[35] It has also been recommended by the UN Sub-Committee on Nutrition.[36]

This cluster sampling design is suited to emergency contexts because it does not require a list of households in the target population, and because households do not need to be organised in a regular pattern. It is also quicker than simple random surveys because travel is only required to the 30 selected cluster sites. A cluster is a group of neighbouring households, so once the first household is selected randomly, the remaining households in the cluster are selected by visiting the closest households until the sample of 30 children is complete.

The first stage of cluster sampling involves listing the population according to smaller administrative or geographic units, e.g. village 1, village 2, village n, with their population size and the cumulative population total. Thirty clusters are randomly selected from this list using a technique known as 'probability proportionate to size', which ensures that all children have an equal chance of being selected, irrespective of whether they come from large or small villages. The second stage of cluster sampling involves picking 30 children from each of the selected clusters, giving a total of 900 children. The first household is selected at random, and all children within the sample age group are measured, then the next nearest household is visited and so on until 30 children have been found.

Because children are selected in clusters rather than strictly at random the cluster design is less precise, and there may be variation between clusters. This is taken into account in the sample design, and the sample size for cluster surveys is double that of a simple random sample. This assumes a 'design effect' of 2, which errs on the side of caution. A review of the design effects from previous cluster surveys in emergency settings indicates that this is more than sufficient for a reliable and precise estimate of the prevalence of malnutrition, and covers most situations.[37] In cluster sampling, it is the number of clusters which determines the precision of the results, rather than the number of children. Fewer than 25 clusters will lead to an unacceptable loss in precision.

The standardisation of this cluster survey procedure precludes the need for calculating sample size. A survey of 30 clusters of 30 children always produces results of acceptable precision. Some guidelines, for example those of WFP/CDC and SMART, recommend the calculation of exact sample size for the population in question.[38] The main reason for this is that, in many situations, a sample size below 900 is sufficient, thus reducing the time and resources spent on the survey. The calculation of sample size, however, needs technical expertise or sound technical advice. The important point is that adherence to the 30 x 30 cluster design has enabled thousands of comparable surveys, with acceptable precision, to be completed by multiple stakeholders across continents.

The cluster design has some drawbacks:

1. Accurate population data is needed, but may not be available. Even though cluster sampling does not require a list of all households in the affected population, it does need to accurately list the population numbers in the population units or villages to be surveyed. However, in many developing countries census and other reference data may be inaccurate or out of date. Population data from urban centres is more likely to be available than from mobile

nomadic populations, which means surveys can be biased towards those who have settled around towns. In many emergency situations, nutritional surveys use population data from food distribution or immunisation figures, which may not include the entire emergency-affected population.

2. The data cannot be disaggregated to produce statistically reliable results for different population groups or areas within the sample. A 30 x 30 cluster survey produces one estimate of malnutrition prevalence for all 30 clusters. It is not possible to take a subset of clusters that corresponds to a particular area, and calculate the prevalence. This type of disaggregation is statistically invalid. This can be frustrating where a survey covers an entire region, as in the case of the region-wide Darfur surveys, which provided single point prevalence estimates for Darfur's three states. If there are localised hotspots within the sampling frame, these will remain undetected. This highlights again the importance of determining the specific objectives of the survey.

3. Sparsely populated areas are under-represented. The probability of a cluster being selected is proportional to the size of the population in a particular village or unit. This means that less densely populated areas have less chance of being selected. These may be some of the most remote and poor rural areas, which could well be worse affected than the more densely populated and accessible areas.

4. Mobile pastoral populations are difficult to assess. Large segments of pastoral populations often live in mobile units, which cannot be traced easily. Furthermore, rural pastoralists frequently live in small groups with fewer than 30 children, so even if they can be found a 30 x 30 cluster approach is difficult to apply. In such contexts increasing the number of clusters and decreasing the number of children per cluster or sentinel site monitoring could be considered.

Possible sources of bias in nutritional surveys

There are a number of possible sources of bias in nutritional surveys. Some of these are related to sampling, as indicated above, and some to measurement error; others are specifically related to emergencies, such as migration and population movements, or restricted access to certain sites. The potential for all types of bias needs to be minimised through good planning and training. It is good practice to describe the difficulties faced in carrying out the survey.

Incomplete coverage is one of the most common sources of bias in emergencies. This may be because the population data used was inaccurate, and either did not include part of the population, or over- or under-estimated part of the population. However, it could also be due to population migration or certain areas being inaccessible. Migration is common in emergencies and generates major demographic changes, the direction of which cannot be assumed. This can become particularly problematic when comparing surveys in the same area over time, as they may not have sampled the same populations, and therefore the findings are not comparable.

In emergencies, particularly those related to conflict, access to the conflict-affected population may be restricted due to insecurity, or access may be denied by the controlling authorities. Emergencies often occur in the most isolated and least developed parts of a country. Some of the worst-affected places will take the longest to reach, and are often cut off completely during the rainy season, or as a result of harsh winters (as in Afghanistan, Mongolia and Tibet). WFP/UNICEF survey teams in Darfur had to rely on expensive helicopter transport. For most surveys, such levels of funding are not available.

Age bias may occur if a particular age group, say those under two years of age, are over-represented within the sample. This is because younger children are more susceptible to wasting, and therefore more younger children are likely to give a higher prevalence of malnutrition.

Measurement error can occur as a result of faulty equipment or incorrect measuring techniques. Adequate training and supervision can prevent this.

Sampling frame coverage

The coverage of the sampling frame depends largely on the objectives of the survey. There is often a trade-off between measuring the specific localised effect of an emergency and the wider effects on the surrounding area. The sampling frame for a survey might be a single refugee or IDP camp, a localised rural area of several villages, an urban setting or a much larger region based on political or administrative boundaries.

Decision-making at a local level has different information requirements to national or international decision-making processes. For example, at a local level the need may be to make comparisons within the emergency-affected population for targeting purposes, or to make decisions about the need for feeding programmes, whereas at national or international level there may be a need to determine needs between emergency-affected populations, or the performance of the overall humanitarian operation. A single survey is unlikely to meet the requirements of all stakeholders involved in humanitarian operations. Table 5 shows how the sampling frame of surveys depends on changing objectives.

The coverage of the sampling frame also determines the speed with which surveys can be carried out and data analysed. The larger the coverage, the longer the survey will take. Surveys of large rural areas can take at least a month to carry out, whereas surveys in a camp can be done in a day. This is obviously of critical importance where data

Box 3

Examples of sentinel site nutritional surveillance

Afghanistan
The National Surveillance System (NSS) pilot in Afghanistan focused on monitoring changes in food security and nutrition indicators in selected sentinel sites, and on analysing the information within a livelihoods framework.[39]

Somalia
In Somalia, the Food Security Assessment Unit of FAO has established sentinel sites for nutritional surveillance in Bakool region and Gedo region (eight sites) to monitor trends in the nutrition situation based on indicators of nutritional status (weight-for-height), food consumption and dietary diversity. Sites were chosen based on reports of worsening food security.[40]

Chad
Chad's Système d'Information pour la Sécurité Alimentaire et l'Alerte Rapide (SISAAR) centralises all food security and nutritional information from member technical groups and action committees to identify risk zones (four categories, from famine through to normal). The approach is effectively a sentinel system with data collected from selected markets and sites.

is required for decision-making in life-saving emergency interventions.

Monitoring trends in nutritional status as part of famine early warning systems often relies on sentinel sites which are purposively selected to represent particular livelihood groups or areas most vulnerable to food insecurity or famine. Since samples are generally smaller than the 900 children recommended by the 30 x 30 cluster methodology, results are quickly available and analysed. Nutrition sentinel site surveillance has been applied in a number of countries, and has gained increasing popularity in recent years (see Box 3).

The advantages of sentinel site surveillance can be summarised as follows:

- It can detect differences in how communities are affected by an emergency, within a wider geographical area.
- Data is timely because there is less of it, requiring less statistical analysis.
- The underlying causes of malnutrition are more likely to be closely linked to nutritional status as small more homogeneous populations are sampled (see Box 3).
- The costs of on-going nutritional surveillance in a limited number of sites is likely to be lower than the cost of province-wide two-stage cluster surveys.
- It provides opportunities for a more participatory approach.

Analysing nutritional status data

Data from random samples allows the calculation of statistics that reflect the wider population from which the sample was drawn. The most widely reported statistics are the prevalence of malnutrition and associated confidence intervals.

The prevalence is the percentage of the sampled population below the agreed cut-off points, i.e. below –2 Z-scores for the prevalence of moderate malnutrition, and below –3 Z-scores and nutritional oedema for severe malnutrition.

The confidence interval is a statistical measure of the precision of the results. It shows with 95% probability the range in which the true population prevalence is found. This means that there is a 5% chance that the true prevalence lies outside the range of the confidence interval. The larger the sample size, the narrower the confidence interval. The confidence interval is also necessary for statistically valid comparisons of the prevalence of malnutrition between two surveys. As a general rule, the results from two surveys are significantly different if there is no overlap between the two confidence intervals. Table 7 gives survey results for different earthquake-affected areas in Pakistan as found in a survey in late 2005. This shows that the prevalence of acute malnutrition is highest in Mansehra district, but in statistical terms it is only significantly worse than the prevalence in the AJK camps because the two CIs of 6.7 to 14.3 and 1.9 to 6.5 do not overlap.

Table 7: Prevalence of acute malnutrition and associated confidence intervals among children aged 6–59 months by survey area after the Pakistan earthquake in 2005

	Mansehra District (%)(n=580)	Muzaffarabad Community (%) (n=511)	NWFP camps (%) (n=554)	AJK camps (%) (n=660)
Global Acute Malnutrition (WFH < –2 SD and/or oedema)	10.5 (6.7–14.3)	5.7 (3.8–7.5)	6.0 (3.9–8.0)	4.2 (1.9–6.5)
Severe Acute Malnutrition (WFH < –3 SD and/or oedema)	4.7 (2.5–6.8)	2.5 (1.1–4.0)	3.2 (1.5–5.0)	1.2 (0.0–2.3)

Source: Health and Nutrition Survey in Earthquake-affected Areas of Pakistan, UNICEF, WFP and WHO.

Table 8: Global and Severe Acute Malnutrition by age group, West Darfur, April 2004

	GAM (<–2SD) incl. oedema			SAM (<–3SD) incl. oedema		
	n	%	*CI*	*N*	%	*CI*
6–29 months (n=512)	145	28.3	(23.9–31.9)	26	5.0	(2.9–6.8)
30–59 months (n=403)	52	12.9	(9.6–16.4)	4	0.9	(0.2–2.3)
6–59 months (n=915)	197	21.5	(18.5–23.9)	30	3.2	(1.9–4.2)

Source: Preliminary Findings, Food and Nutrition Survey, Wade Saleh and Mukjar Provinces (West Darfur – North Sudan), MSF, April 2004.

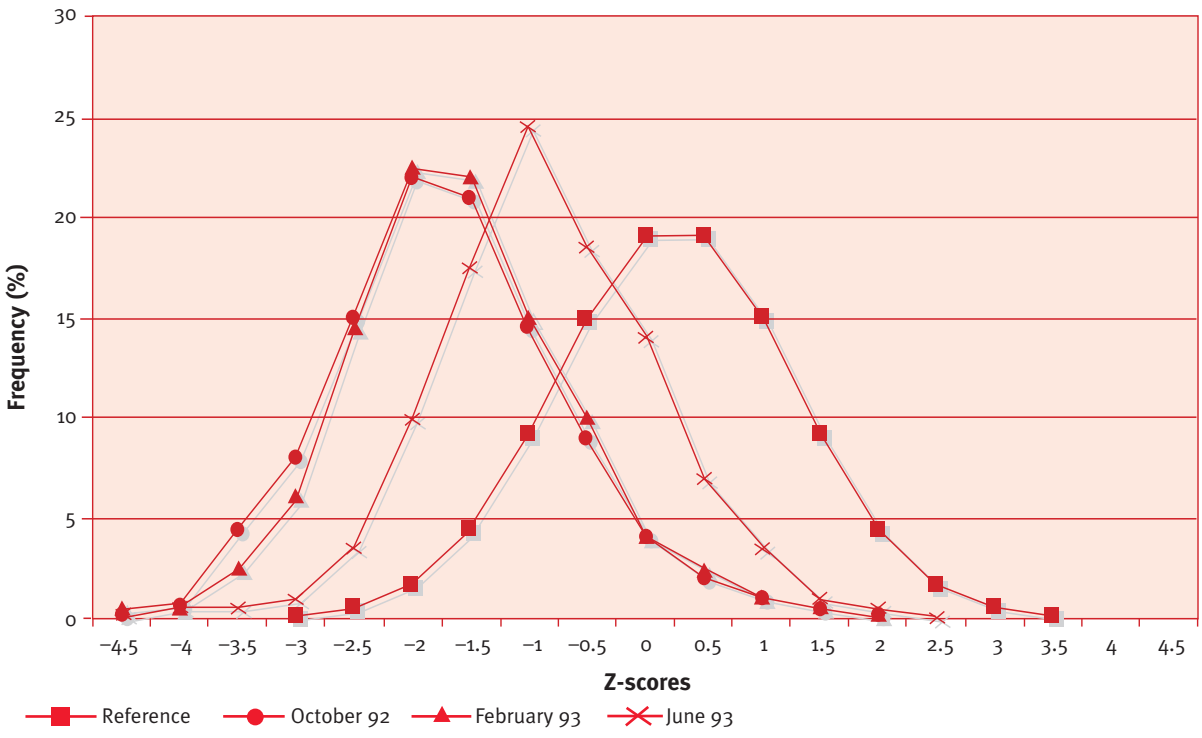
Where possible, prevalence should be presented separately for children under two years and over two years (which roughly corresponds with a height of 85cm). Children under 85cm are more susceptible to wasting, which usually results in higher prevalences of wasting among this younger age group. This is illustrated in Table 8. Examining this age difference in wasting may help in determining whether the cause of malnutrition is related to acute food insecurity. An increasing prevalence of wasting among children over two years of age is more likely to be a result of food shortages and reduced food intake rather than disease.[41]

The mean Z-score is less commonly reported than prevalence estimates, and less likely to be used by programme decision-makers. In Ethiopia, the mean nutritional status was used by Save the Children UK to monitor changes in nutritional status as part of the agency's nutritional surveillance system, which monitored small numbers (about 100) of children in different sites throughout a region. Similarly in Darfur, UNICEF is tracking the mean WFH Z-score of children in sentinel sites throughout the three states. The advantage of tracking the mean rather than the prevalence is that changes over time can be estimated with precision with a smaller sample than is required in cluster surveys.[42]

A frequency distribution curve of the nutritional status of the entire sample is useful for making comparisons with the reference population, and also with the results from other surveys (see Figure 3). This may show not only a high prevalence of malnutrition, but also that the entire

Figure 3

Shifts in frequency distributions over time in El Wak, Kenya



Source: Jaspars and Khogali, 2001, May

distribution has shifted to the left, i.e. the nutritional status of all children in the sample population is below the reference. In other words, food insecurity and famine affect the entire sample, as the frequency curve is shifted to the left of the reference curve. As the situation recovers, the entire curve shifts to the right.[43] Figure 3 illustrates that little improvement in nutritional status occurred in El Wak, Kenya, between October 1992 and February 1993 (except in severe malnutrition), whereas between February and June 1993 the entire distribution shifted to the right, indicating an improvement for the whole camp population.

There are of course many other types of statistical analysis of nutritional data, but these are not routinely applied in nutrition surveys. In larger baseline surveys regression analysis and multivariate statistics are often used to explore underlying relationships between nutritional indicators and a wide array of dependent variables. For example, a survey in East Sudan examined the statistical association between severe and global acute and chronic malnutrition and indicators such as household literacy, household income and time required to reach water sources.[44]

Estimating the coverage of selective feeding programmes

The results of nutritional surveys can be used to estimate the overall coverage of therapeutic and supplementary feeding programmes, i.e. the proportion of malnourished children found in the survey who were registered in the programme. Programme coverage is an important proxy indicator for the overall acceptability of the programme to mothers, which might be related to the location of distribution points, security for staff and those requiring treatment, waiting times, service quality and the extent of home visiting.[45]

However, there are problems with using coverage estimates based on two-stage cluster surveys; while they may find that coverage is adequate overall, they cannot detect differences in programme coverage within the sampled area. Estimates of coverage from individual clusters will not be reliable, as children within clusters are not randomly sampled and the sample is not large enough to give a precise estimate. A new method for estimating coverage, centric systematic area sampling, is currently being piloted (see Box 4).

Methods for assessing underlying causes

The conceptual framework on the causes of malnutrition, described in chapter 2, can form the basis of the assessment of underlying causes of malnutrition. It can be used to develop a local framework which describes the underlying causes for a specific emergency context, which then informs the data collection for the nutritional assessment, i.e. developing the framework helps to identify information gaps which then may be addressed during the assessment. ACF, for example, often carries out a causal analysis (using the conceptual framework) before doing an anthropometric survey. Oxfam and SC-UK also recommend the development of locally specific conceptual frameworks on the causes of malnutrition.[48]

Methods for assessing the underlying causes of malnutrition are much less standardised than the collection of anthropometric survey data. Most nutrition guidelines recommend reviewing secondary sources of information on underlying causes as a minimum. Methods for primary data collection vary, and may include:

- Incorporating a very limited number of additional questions in the form of a household questionnaire as part of the nutritional survey.
- Undertaking a separate questionnaire survey on the issues at hand, for example on infant feeding practices,[49] coping strategies or food security.[50]
- Incorporating a qualitative assessment of underlying causes, as part of a nutrition survey.[51]
- Making use of existing surveys on underlying causes in the area, such as food economy reports, or carrying out a separate food security assessment at the same time as the nutritional survey.[52]

Box 4

Centric systematic area sampling as an alternative method to estimate feeding programme coverage

The centric systematic area sampling methodology for estimating feeding programme coverage places a grid over the area that should be covered by the feeding programme and selects communities closest to the centre of each square to sample. A square of 10km by 10km is recommended. Health workers from the community are asked to bring the surveyors to sick or thin children, who are then weighed and measured. The number of children measured is determined by the number of children that can be measured in a day.[46]

Whilst this method can detect differences in coverage within the sampled area, there are some disadvantages and the method needs piloting in more situations before it can be widely adopted. One disadvantage, found by an AAH team in the DRC, is that the quadrats selected are not always spatially homogeneous, i.e. the space covered by the quadrat is not equally accessible to the population within. In Uvira, territory is 'shelved', varying from highland to middle lands to lowland plains within a very small area. Also, reliance on community health workers to identify sick or thin children can introduce biases into the survey, either because of social or political biases within the community, or because of difficulties in identifying malnourished children. In the AAH survey, 511 out of 858 children were excluded as false positives. The number of false negatives was not known.[47]

Out of the three underlying causes, assessment methods for food security are most well developed. The Sphere Project has developed minimum standards for disaster response for food security and integrated them with the existing Sphere nutrition and food aid standards.[53] The Sphere Project has also developed a number of sectoral checklists for assessing the underlying causes of malnutrition. There has, however, been little headway in standardising approaches. This is in part because most food security assessment approaches are based on qualitative methods (key informant and focus group interviews, Participatory Rural Appraisal techniques), for which tried and tested principles for ensuring good practice have been specified but not adequately incorporated into standardised procedures. Good practice principles that should apply to all qualitative assessments include:

- *Stakeholder analysis:* selection of assessment sites, key informants and focus groups should be clearly presented and preferably based on a stakeholder mapping exercise, following a rationale that supports the objectives of the assessment.
- *Team identity and self-awareness* with a view to understanding potential team bias.
- *Optimal ignorance,* whereby only the information that is needed for the assessment objectives and related decisions at hand is collected.
- The importance of *adaptability* during fieldwork beyond what was foreseeable at the initial point of design. It must be clear what adaptations to survey approaches are acceptable at the field level.
- *Iterative analysis,* whereby data collection and analysis is based on an iterative process, with continual review and examination of information that influences adaptations of the assessment (e.g. modifications to checklists, sequencing of PRA techniques, groups and sites visited) and contributes to a continual learning process (i.e. data analysis does not wait until the end of the assessment).
- *Triangulation* is necessary in order to cross-validate findings, by seeking out a range of information sources and perspectives.
- *Accountability and participation*, with field reviews with stakeholders, including users of the information.

A further difficulty in standardising the collection of food security data as part of nutritional surveys is that the two-stage cluster design is not compatible with most food security assessment methods. Food security assessment methods usually use purposively sampled livelihood zones, rather than random cluster sampling. If food security information is asked for as part of a household questionnaire, quantitative data on household food security indicators can be analysed for statistical associations with nutritional status, but this does not enable conclusions about causation. As for analysing data within cluster surveys, it will not be possible to analyse the relationship between food security and nutrition for population groups or areas within the sample.

Table 5, on surveys and surveillance in Darfur, shows how, at various times, agencies have attempted to link food security and nutrition information in a way that could be interpreted more meaningfully, as part of the sentinel site monitoring of small and homogeneous communities, and cluster surveys in specific food economy zones to confirm the severity of food security. In both these instances, the food security and nutrition information could be linked because it was known in advance that a homogeneous community or area would be sampled.

There has been a lot of interest in dietary diversity as a quantitative indicator of food insecurity. The advantage of this is that it can be linked directly to nutritional survey methods, and allows for quantitative analysis, but it does not tell us anything about the nature or causes of food insecurity, and therefore appropriate responses. The use of dietary diversity indicators is described in more detail in Box 5.

In practice, quantitative and qualitative approaches are complementary. A quantitative assessment of anthropometric status provides an objective and statistically reliable estimate of the prevalence of malnutrition, and thus an indicator of the severity of the crisis in a particular

Box 5

Dietary diversity: a quantitative measure of food insecurity?

Dietary diversity as an indicator of food insecurity was developed by FANTA in collaboration with IFPRI.[54] WFP has used the indicator both in its food security and nutrition assessments (for example in Darfur) and in its baseline assessments (comprehensive food security and vulnerability analysis). The indicator is based on information about household consumption over the past seven days. Households are classified according to the number of days in which a household eats each of 12 selected food items in the seven days before the interview. In Darfur these were: sorghum, millet, other cereal, pulses, meat, cooking oil/fat, vegetables, fruit, milk, sugar, eggs and wild food.

The actual household consumption indicator is compared with a reference food consumption indicator to estimate food gaps in a population. A benchmark is determined by grouping the individual food items into three main food groups, and then assigning scores which correspond to the number of days on which food items would normally be consumed during a seven-day period. The total of these scores is the benchmark, with which the actual consumption score is compared. The population is then grouped according to the size of consumption shortfalls. Whilst dietary diversity can be a good indicator of the severity of food insecurity, it is unlikely to be adequate on its own. It does not relate food insecurity to livelihood or wealth groups, nor does it say anything about the causes of food insecurity, so it has no value for identifying appropriate interventions.

population group. Qualitative information on the underlying causes (possibly combined with some quantitative information) can provide insights into the causes of malnutrition and the process of change. The most important point about information on underlying causes is that it needs to explain, and match, findings on the severity of the crisis. As such, combining quantitative information on nutrition with qualitative information on underlying causes will increase the validity of nutritional survey findings.

A checklist for decision-makers

This section provides a checklist of the key points and issues that decision-makers need to be aware of when reading, and judging the reliability of, nutritional survey reports.

Table 9: Checklist for assessing the reliability and validity of nutritional survey reports

What to check	How to check	Key points and questions to ask
Reliability of methods	Sampling design Sample size Confidence interval Nutritional indices	A two-stage cluster survey is often the most appropriate sampling design in emergencies There should be 25–30 clusters How accurate was the sampling frame? (Population census used as sampling frame should be reasonably accurate) A sample size of around 900 should give a precise estimate of the prevalence of malnutrition. Smaller sample sizes need a calculation for the specific context The size of the *confidence* interval reflects the precision of the results and is affected by the sample size and differences within the surveyed population Weight-for-height is the recommended nutritional index in emergencies MUAC is also used to estimate numbers of severely malnourished needing treatment
Bias	Incomplete coverage Age bias Measurement error	Have all population groups in the affected area been included (e.g. nomadic groups)? Have any people recently migrated into or out of the area? How has this been included in the survey? How many clusters was the team unable to access? What measures were taken to address this? What is the demographic composition of the sample, and is this unusual? Has this affected the overall prevalence of malnutrition? Did the survey team have experience in conducting nutritional surveys? What training did they receive?
Comparing surveys	Methods Coverage Population changes	Were the methods used the same for both surveys? Was coverage the same? Has the population demography changed as a result of migration? Who has migrated? Were the surveys done at the same time of the year? Is there a shift in the frequency distribution (and/or mean) as well as the prevalence of malnutrition?
Information on underlying causes	Information sources Methods Interpretation of prevalence of malnutrition	What secondary sources have been used? Are they reliable? Have all underlying causes of malnutrition been assessed (food security, health, care)? Have findings from qualitative methods been triangulated? Do findings on underlying causes match indications of severity of crisis from anthropometry?

Chapter 5
Interpretation and decision-making

The major challenge to improving the practical use of nutritional data concerns how that data is interpreted and used by decision-makers. While the quality and analysis of nutritional data have improved greatly in the past two decades, interpretation has lagged behind. In most nutritional surveys, recommendations are still limited to food-related interventions, such as improving the general food distribution and establishing selective feeding programmes. Such recommendations focus on the immediate causes of malnutrition, rather than using an analysis of underlying causes to address malnutrition at a population level. To properly understand and interpret nutritional data, it should be reviewed from the following inter-related perspectives:

1. Actual prevalence rates of acute malnutrition in relation to thresholds and decision-making frameworks.
2. Trends over time and seasonality (inter- and intra-annual variation): reviewing expected seasonal changes in nutritional status (and associated seasonal changes in food security, morbidity patterns and caring practices). Is it normal for the time of year, for the population of concern?
3. Underlying causes: reviewing the underlying causes of malnutrition, by considering patterns of nutritional status in relation to likely causes, including food security, caring practices and public health.
4. The relationship between malnutrition and mortality.

This provides the analysis of the overall severity of nutritional risk, characterises the main underlying causes and future scenarios, and helps to identify appropriate intervention strategies to address this.

Actual prevalence of acute malnutrition in relation to thresholds and decision-making frameworks

The most commonly used thresholds for the prevalence of malnutrition in emergencies are in WHO's classification of severity of malnutrition in a community, shown in Table 10.[55] Similar thresholds are used in decision-making frameworks for determining the need for different types of feeding programmes. There is no technical basis for the thresholds in these frameworks. Different classification systems use different thresholds, and some systems have changed their thresholds over time. Thresholds should therefore be seen as a starting point for interpretation, rather than the sole basis for interpreting nutritional survey findings.

The use of absolute thresholds to judge the severity of a situation was rejected by the Sphere Project, which instead recommends examining trends by estimating whether the acute malnutrition prevalence is unusual for the time of the year, and on the basis of a review of nutritional risks related to food, health and care. In Ethiopia, SC-UK has developed acute malnutrition thresholds for each season and district. Using relative thresholds may, however, be difficult if pre-emergency levels of malnutrition are not known. It also creates difficulties in comparing severity between crises.[56]

Prevalence thresholds are still commonly used in decision-making frameworks for selective feeding programmes. These were first developed in the 1980s,[57] and have been adopted by INGOs and incorporated within the UN guidelines.[58] In addition to thresholds for the prevalence of malnutrition, these frameworks use a range of aggravating factors to determine whether feeding programmes are needed, and if so what type. Both the thresholds and the range of aggravating factors vary in different agency guidelines (as shown in Table 11, page 24). The WHO guidelines caution that the framework is for guidance only, and should be adapted to local circumstances.[59]

There are several difficulties with using a decision-making framework like the one shown in Table 11.

1. The framework reinforces the 'food first' culture of emergency response. The most common humanitarian response strategy has been free food relief even though malnutrition can have multiple causes.
2. The use of two or three aggravating factors to interpret the prevalence of malnutrition is not consistent with the use of the conceptual framework of underlying

Table 10: WHO classification of severity of malnutrition in a community

Severity of malnutrition	Prevalence of wasting (% below median – 2SD)	Mean weight for height Z-score
Acceptable	‹ 5%	› –0.40
Poor	5–9%	–0.40 to –0.69
Serious	10–14%	–0.70 to –0.99
Critical	› 15%	‹ –1.00

Table 11: Decision-making framework for selective feeding programmes

Oxfam (1984)	MSF (1995)	WHO (2000)	Action required
	General rations < 2,100 kcals/person/day	Food availability at household level < 2,100kcal/p/day	Unsatisfactory situation: • Improve general rations until local food availability and access can be made adequate
Over 20% malnourished (other factors: poor general ration)	Malnutrition rate over 20%, or malnutrition 10–19% with aggravating factors (CMR > 1/10,000/day; inadequate general ration, epidemic of measles, shigella or other communicable diseases, severe cold or inadequate shelter)	Malnutrition rate* 15% or more or 10–14% with aggravating factors (general food ration below mean energy requirement, CMR > 1/10,000/day, epidemic of measles or whooping cough)	Serious situation: • General rations (unless situation is limited to vulnerable groups), plus: • Supplementary feeding generalised for all members of vulnerable groups, especially children and pregnant and lactating women • Therapeutic feeding for severely malnourished individuals
10–20% malnourished (other factors: general ration less than 1,750 kcals/day, severe public health hazard, significant diseases – especially measles)	Malnutrition rate 10–19% or malnutrition rates 5–9% plus aggravating factors (see above)	Malnutrition rate* 10–14% or 5–9% with aggravating factors (see above)	Risky situation: • No general rations, but: • Supplementary feeding targeted to individuals identified as malnourished in vulnerable groups • Therapeutic feeding for severely malnourished individuals
Less than 10% malnourished (less than 2% severely malnourished)	Malnutrition rate < 10% without aggravating factors	Malnutrition rate* under 10% with no aggravating factors	Acceptable situation: • No need for population interventions • Attention to malnourished individuals through regular community services

* Malnutrition rate is defined as the percentage of the child population (6 months to 5 years) below either the reference median weight for height –2SD or 80% of reference weight-for-height

causes of malnutrition which, in addition to disease and food intake, gives underlying and basic causes which contribute to malnutrition. Maternal and child care as an underlying cause of malnutrition is not covered by such decision-making frameworks.

3. It does not take account of pre-emergency levels of malnutrition or seasonality.
4. The relationship between malnutrition and mortality is assumed to be consistent (this is discussed later).

The framework was not adopted in the Sphere Minimum Standards, and has been rejected by some agencies (SC-UK is one). In practice, however, it is still widely used and can be found in many agency guidelines. This chapter presents the steps required for a better interpretation of nutritional survey findings, and how to determine appropriate responses based on these findings.

Trends over time and seasonality

The prevalence of malnutrition found in a nutritional survey needs to be interpreted in relation to pre-emergency levels of malnutrition and normal seasonal changes in nutritional status.

To interpret whether a prevalence of malnutrition is unusual, it needs to be compared with the prevalence of malnutrition that is normal for the time of the year for the assessed population. A sudden increase in malnutrition can say more about the impact of crisis than a prevalence at a single point in time. This means that, sometimes, an emergency response can be justified even if the prevalence of malnutrition has not reached the 'emergency threshold'. For example in 2002, an increase in the prevalence of malnutrition in one area in Southern Africa from 2.5% to

Box 6

Silent emergencies: the problem of chronically high levels of acute malnutrition

Large parts of the Horn of Africa, the Sahel and South Asia now experience prevalences of acute malnutrition higher than 15% on a regular or continuous basis. For example, in Niger the prevalence of acute malnutrition has been around 15% or higher since 1985.[60] In Bangladesh, at the time when thresholds were being developed, the national rate of acute malnutrition in Bangladesh was 17.8%.[61] Using WHO-recommended thresholds, this means that entire countries in these regions would be considered in a critical situation, involving huge numbers of people, for much of the past two decades. Short-term emergency responses alone are not enough to address such long-term problems, but at the same time, the risks to health may be similar to many acute emergencies.

Such situations are caused by extreme poverty in large sections of the population and/or chronic conflict and political instability (in the case of Somalia). Populations which experience high levels of wasting on a regular basis need immediate life-saving assistance, but also long-term programmes to meet people's basic needs such as social safety nets, adequate public services such as health care, water supply, access to credit and well-functioning markets. Levels of wasting above emergency thresholds are not unique to emergencies and must also be addressed as part of the development agenda.

5% led to a large-scale humanitarian response as humanitarian agencies feared malnutrition would increase to 10%.[62]

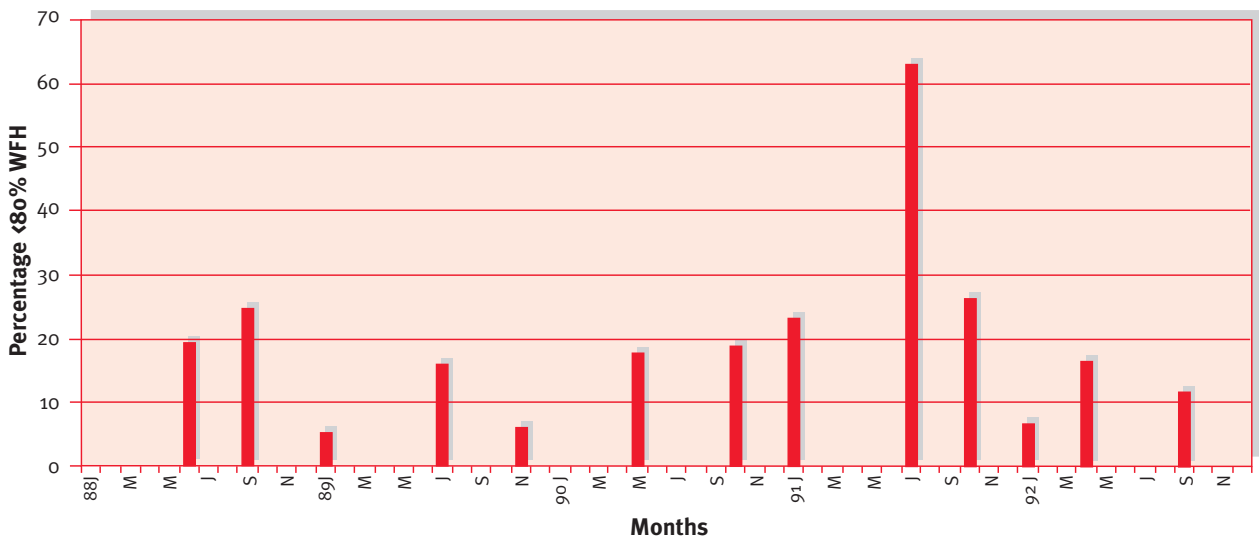
One danger of basing decisions on comparisons with pre-emergency levels is that unacceptable pre-emergency levels of malnutrition may be perceived as normal. Many parts of the world are now suffering protracted crises associated with high levels of acute malnutrition on a regular basis (see Box 6).

Many populations experience seasonal changes in nutritional status. These are most extreme for rural communities that depend on a single harvest, with the lowest prevalences found just after the harvest or when grain prices are at their lowest, and the highest prevalences being found during the hungry season prior to the harvest, when food is scarce. The hungry season usually coincides with the rainy season, which is also associated with a higher prevalence of disease and a higher workload because it is the planting time in agricultural societies.

The prevalence of malnutrition can change by as much as 20% within the space of three months. Figure 4 gives the seasonal changes in malnutrition in Malha, North Darfur, between 1988 and 1992. Expected seasonal changes are indicated between 1988 and 1990, when the prevalence of malnutrition is lowest between November and January, around the time of the harvest, and highest during the hungry season in July–August. In early 1991, however, the prevalence of malnutrition remained at the level of the hungry season, which is unusual for the time of the year. This was followed by an extremely high prevalence during the hungry season in 1991, when Darfur experienced famine.

Figure 4

Seasonal changes in the prevalence of malnutrition in Malha, North Darfur



Source: Jaspars and Khogali, 2001, May

The relative importance of different underlying causes: food, health and care

An important part of a nutritional survey concerns reviewing the underlying causes of malnutrition in order to better understand the relative importance of food, health and care as nutritional risk factors, and thereby determine the priority response to address malnutrition and improve nutrition in the population as a whole. There is no neat formula for working this out, or indeed for proving causality; each cluster of causes has to be reviewed in turn, with the aim of identifying potential nutritional risk factors that could be contributing to an increase in malnutrition. The existence of a known nutritional risk factor should be sufficient to justify action, for example where people have become suddenly displaced and no longer have access to food, as is the case in sudden refugee displacements.

Box 7 provides examples of actual emergency situations that correspond to a food crisis, a health crisis or a care crisis, although in practice underlying causes of malnutrition frequently co-exist.

The highest prevalences of malnutrition are usually a result of severely restricted access to food, or a failure in two or more underlying causes, i.e. interactions between underlying causes. There are few if any clear examples of where increased disease prevalence or inadequate caring practices in isolation have contributed to malnutrition exceeding emergency thresholds.

Food insecurity often has a population-wide effect on nutritional status, i.e. it causes a decline in the nutritional status of all individuals in the sample, which causes a shift in the frequency distribution curve to the left. This was

Box 7

Examples of food, health and care crises

Food crises

Niger 2005

The food crisis in 2005 developed in the south of the country, in areas normally seen as less marginal and less food insecure and therefore not the focus of early warning systems. Food insecurity was attributed chiefly to a doubling in food prices, which reduced food entitlements. In the southern province of Maradi MSF raised the alarm by publicising increasing rates of admissions to its therapeutic feeding programmes (between February and April 2005 admissions nearly doubled). A nutritional survey by the WHO in Zinder and Maradi in January 2005 found 13% acute malnutrition.

Ethiopia 2003

Relief food aid needs reached unprecedented levels in Ethiopia in 2003. The Disaster Preparedness and Prevention Commission launched an appeal in January 2002 and estimated that relief needs would peak in July 2002 at 3.6 million people. This appeal was revised three times, until in April 2004 a total population of 12.6 million were estimated to have a food requirement of 1.54 million MT. A total of 90 nutritional surveys were conducted in 2002 and 2003, although coverage 'only reflects areas of humanitarian operations'. Prevalences of malnutrition revealed a wide variation in malnutrition and mortality, with 'hotspots' in a small number of locales, particularly Fik Zone of Somali Region, where the food security situation was reported to have seriously deteriorated and the GAM had reached 33.9%.[63]

Health crisis

Goma, 1994

The mass exodus of 500,000–800,000 Rwandan refugees into Zaire in July 1994 overwhelmed the humanitarian response. Within one month of the influx, almost 50,000 refugees died – an average crude mortality rate of 20–35 per 10,000 per day. This death rate was associated with epidemics of cholera and dysentery. Three to four weeks after the influx of refugees, acute malnutrition rates among children under five years old ranged between 8% and 23%. Children with a recent history of dysentery and those in households headed by women were at higher risk of malnutrition, illustrating the impact of health and possibly care factors on nutritional status.[64]

Care crises

Care crises are rarely found in isolation from either food insecurity or health crises.

Sarajevo, 1992–93

Nutritional surveillance of vulnerable groups in the besieged city of Sarajevo in 1992–93 identified the elderly as the most nutritionally vulnerable due to cold, stress, sickness and problems related to food preparation. While the nutritional status of adults and children consistently remained normal, high levels of undernutrition were detected among the elderly, ranging from 16% to 21% (BMI ‹ 18.5).[65] While this was in part due to a negative trend in food security, it was also a result of care factors, and a failure of wider social support systems.

Iraq: 1991 Kurdish refugee crisis

Prior to the crisis there was a high proportion of bottle feeding, but during the emergency the safe preparation of breast-milk substitute was almost impossible given the prevailing unhygienic and overcrowded conditions. The risk of diarrhea and other infections was very high, as reflected in the high prevalence rates among infants under two years of age. Essential actions were the development of appropriate policies and guidelines, and the promotion, protection and support of breastfeeding.[66]

illustrated in Figure 3 and emphasises the importance of examining the frequency distribution curve, in addition to looking at trends in malnutrition prevalences.

There is a long-standing debate over whether malnutrition is an early or late indicator of food insecurity. Acute malnutrition data can be a good early indicator of food insecurity, as changes in the prevalence of malnutrition may closely mirror market prices of staple foods.[67] One recent study of the relationship between malnutrition and indicators of food insecurity (rainfall, market prices and relief receipt) in Ethiopia, however, showed a clear link between trends in nutrition and food security indicators in three areas, but no such association in three other locations.[68]

Whether acute malnutrition is an early indicator of food insecurity will depend in part on whether a reduction in food intake is an early coping strategy for all groups within the affected population. It also depends on whether, in times of food shortage, children are given priority in the allocation of limited food supplies, hence the importance of considering caring practices within the household. The link between findings on food security and nutrition can also be a methodological issue, however. A clear relationship between malnutrition and food insecurity is more likely if the sample represents a homogeneous population in terms of its main food or livelihood sources.

Even for those situations where it is established that acute malnutrition is an early indicator of food insecurity, it may not be feasible to monitor this adequately, mainly because of resource constraints.

A simple rule of thumb for determining whether food insecurity is the main underlying cause of malnutrition is by considering the prevalence of malnutrition in different age groups. In situations of severe food insecurity, children older than two years as well as children under two years may have elevated prevalence rates. (Usually, children less than two years of age have higher rates of wasting than older children.) In contrast, disease usually only affects a proportion of the population, which might be expected to skew the distribution to the left or possibly flatten it out and increase the prevalence of acute malnutrition in the tail of the distribution. Reviews to date have been inconclusive about this, as there is often insufficient data and analysis on the underlying causes. More research is needed.

This overview of underlying causes shows how the determination of nutritional risks for a population needs to consider all underlying causes of malnutrition. The Nutritional Information in Crisis Situations (NICS) of the UN Sub-committee on Nutrition (SCN) has developed a global nutrition information system which does exactly this. It classifies emergencies according to the severity of nutritional risk, based on an analysis of available information on all underlying causes of malnutrition (Figure 5, page 28). As can be seen from Figure 5, information on public health and the social and care environment is frequently not collected. Clearly, the better the analysis and interpretation of the prevalence of malnutrition in survey reports, the easier it is to assign a nutritional risk category.

The relationship between malnutrition and mortality

Whilst most guidelines recommend the collection of mortality data as part of nutrition surveys, few guidelines consider how acute malnutrition and mortality relate to each other, and how this can help us interpret the situation.

The obvious assumption is that malnutrition and mortality would increase in parallel, in other words as malnutrition increases then so would mortality, and most of the deaths would occur among the malnourished, which might then reduce the overall prevalence of malnutrition (making it appear stable, when in fact there is extreme excess mortality). Unfortunately, both these assumptions are false, and the reality is more complex. For decision-makers, there are two points to understand about this relationship:

1. There is a strong association between malnutrition and mortality, especially in refugee and IDP contexts. But in other emergency contexts this association may be weaker. This means that malnutrition *cannot* be used to predict mortality. It also means that situations of high malnutrition but low mortality, and vice versa, are qualitatively different, and can potentially be used to diagnose a food crisis as against a health crisis.
2. Malnutrition and mortality increase slowly at first, but as time progresses the deterioration gets rapidly worse. This exponential increase has implications for tracking the rate of progression from food insecurity to a famine that kills, as 'hotspots' may appear unexpectedly.

Reviewing rates of malnutrition to diagnose food crises, health crises and famines that kill

We know there is a strong association between malnutrition and mortality among refugee populations.[69] While this is useful and important, this relationship is not necessarily found in all emergency contexts, which means that high levels of malnutrition can occur without mortality levels exceeding the emergency threshold, and high levels of mortality can occur without concomitant increases in the prevalence of malnutrition.

Figure 6 shows the results of 15 nutrition and mortality surveys in Ethiopia in late 2002. It shows situations of high malnutrition and low mortality, and vice versa. These surveys were vetted by the Emergency Nutrition Coordination Unit to ensure their rigour and reliability.

Figure 5

The NICS nutritional risk classification system

The NICS approach classifies emergency situations into five categories relating to prevalence of malnutrition and/or levels of nutritional risk. NICS uses 5–8% malnutrition as a worrying nutritional situation and 10% as a serious situation. However, these levels are used with caution, recognising the importance of contextual and trend analysis.

The five categories are given below:

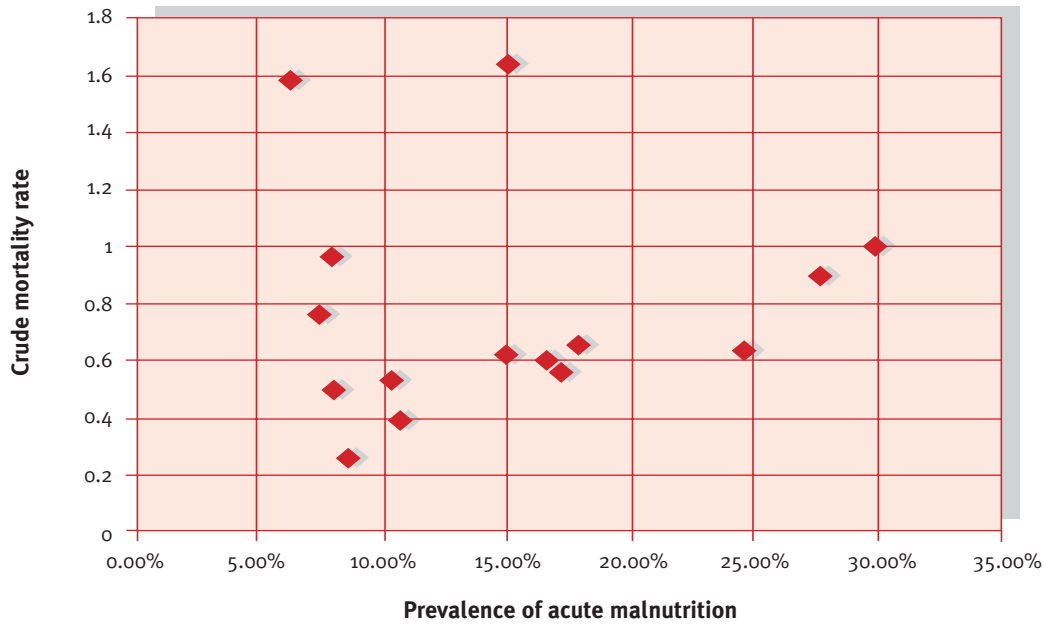
I Population is currently in a critical situation. Either very high risk of malnutrition (based on an analysis of underlying causes), or very high prevalence of malnutrition and/or elevated mortality rates
II High risk of becoming malnourished or have a high prevalence of malnutrition
III Moderate risk of malnutrition or have moderately high level of malnutrition. There may be pockets of high malnutrition
IV Not at elevated nutritional risk
V Risk is not known

	Ethiopia Hartisheik and Fanfen IDP camps	**Ethiopia** Refugee camps in Gambella region	**Kenya** Northern Turkana	**Sudan** Darfur	**Niger** Parts of the South	**Uganda** IDP camps in Gulu district	**Chad** Oure Cassoni and Am Nabak refugee camps	**Western Saharawi refugees in Algeria**
Nutritional risk category	II	II	II	II/I	II	III	II	III
	Food security							
Households' livelihoods	☹	☹	☹	☹	☹	😐	☹	😐
External assistance	☹	☹	☹	😐	😐	😐	😐	😐
	Public health environment							
Availability of water and access to potable drinking water	☹	☹	☹	😐	?	☹	☹	?
Health care	☹	?	☹	😐	☹	😐	😐	?
Sanitation	?	☹	☹	😐	?	😐	😐	?
	Social and care environment							
Social environment	☹	?	?	☹	?	☹	☹	?
Child feeding practices	?	?	?	?	?	?	?	☹
	Delivery of assistance							
Accessibility of population	😐	?	😐	😐	😐	😐	😐	😐
Resources for humanitarian Intervention	☹	😐	😐	😐	😐	😐	😐	😐
Availability of information	😐	😐	☺	😐	😐	😐	😐	😐

☺ Adequate 😐 Mixed ☹ Inadequate

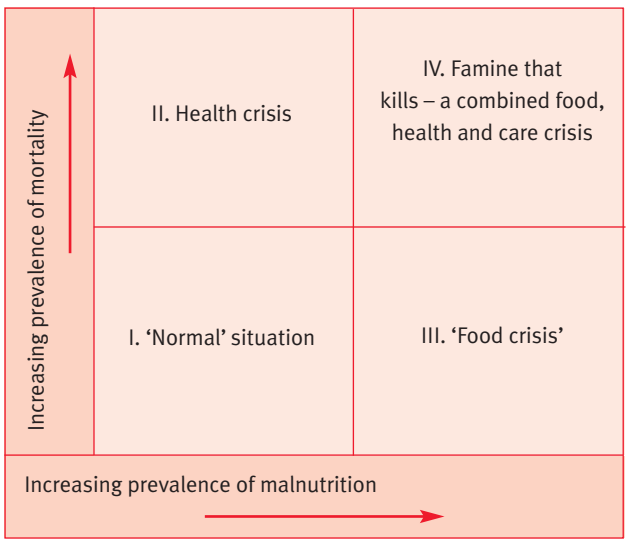
Figure 6

Prevalence of acute malnutrition and crude mortality rates from 15 surveys in Ethiopia (August to December, 2002)



Source: Emergency Nutrition Coordination Unit summarised by VAM WFP

If the graph is divided into four quadrants using the thresholds, then each quadrant potentially describes a different situation, for example:



I. 'Normal'

Where rates of malnutrition and mortality are both below the thresholds, then the situation approaches normal or baseline.

II. Health crisis

Situations of elevated mortality but lower prevalences of malnutrition are relatively easy to explain, as the mortality is probably caused by factors not related to malnutrition, for example disease epidemics or 'health crises'. Examples of this are given in Box 7 for Northern Iraq and Goma, where high mortality was a result of diarrheal disease and cholera respectively. Another context where high mortality can occur with relatively low levels of malnutrition is when a large number of adult deaths are due to violence, as was found in MSF surveys in Darfur in 2004 (see Table 12).

III. Food crisis

Assessments during periods of severe food insecurity among more settled or home-based populations have shown no obvious relationship between mortality rates and the prevalence of malnutrition.[70] Elevated levels of malnutrition may therefore occur without mortality rates exceeding emergency benchmarks.

IV. Famine that kills: a combined food, health and care crisis

In emergency contexts where there is displacement and a concomitant deterioration in the public health and care environment, increasing malnutrition prevalence is likely to be associated with mortality. This may explain the strong relationship between malnutrition and mortality in refugee contexts.

In the most extreme emergency situations, where crude mortality rates exceed 10/10,000/day (the emergency threshold is 1/10,000/day), this may affect the prevalence of malnutrition as proportionally more malnourished

Table 12: Mortality and malnutrition in South Darfur, September 2004

Location	Prevalence of malnutrition (< –2 Z-scores)	CMR (per 10,000/day)	U5 MR (per 10,000/day)	Causes of mortality
Kass	14.1%	3.2	5.9	18% of deaths due to violence 24% of deaths due to diarrhea (in general most deaths due to medical causes)
Kalma	23.6%	2	3.5	47% of deaths due to diarrhea
Muhajariya	10.7%	2.3	1	72% of deaths due to violence – mainly young men

Source: F. Grandesso et al., 'Mortality and Malnutrition Among Populations Living in South Darfur, Sudan: Results of 3 Surveys, September 2004', *Journal of the American Medical Association*, 293, 2005: 1,490–1,494.

Box 8

Survivor bias and replacement malnutrition

It is a widely held belief that high mortality in a population can mask deteriorating nutritional status. This originates from a paper published in 1986,[71] which compared anthropometric data from two cross-sectional surveys of nutritional status among refugees in eastern Sudan. The team found that nutritional status appeared serious, but relatively stable between the two surveys, which were performed over a two-month interval. But during this time other data indicated high childhood mortality in the camp. The authors argued that the deceptive appearance of stability in nutritional status in the face of high mortality may be explained by ongoing nutritional deterioration ('replacement malnutrition') among surviving children.

The concept of 'replacement malnutrition' and the associated 'survivor bias' has been widely used in nutritional survey reports and refereed academic papers to argue that high mortality is masking a deteriorating nutritional situation.[72] The possibility of replacement malnutrition is the most commonly cited reason in nutritional guidelines for assessing mortality, along with nutritional status in nutritional surveys.

However, in an emergency context infant and child deaths are not limited to the severely or moderately malnourished; deaths occur among the malnourished and those who are not malnourished. If the data are examined, it has been found that this only holds true if under-five mortality rates are extremely high (in excess of 15 or 20 per 10,000 per day). It thus seems unlikely that, even under conditions of 'Famine: Out of Control' (U5MR > 10/10,000/day), there would be a significant effect on the prevalence of acute malnutrition.

children are dying as compared to children not considered malnourished. However, this issue of survivor bias and replacement malnutrition is not a concern in most surveys, despite the fact that it is referred to in many (see Box 8).

Changes in the relationship between malnutrition and mortality over time

The strength and nature of the relationship between malnutrition and mortality are likely to change over time as emergencies develop. For example, in a developing famine, as food security worsens, people adopt increasingly damaging coping strategies, causing widespread destitution, distress migration and the formation of famine camps. While the early stages represent a food crisis, it takes time for the health and possibly care crisis to develop. Therefore at the early stages of food insecurity acute malnutrition is likely to be associated with a lower mortality risk than in the later, more acute context of a famine camp and associated health crisis (see Figure 7). This has implications for interventions; in the early stages of food insecurity, the response should be focused on improving food security for the population as a whole, including for example market, income and production support, as well as preventive health care. In the later stages, the emphasis needs to be on life-saving interventions including public health.

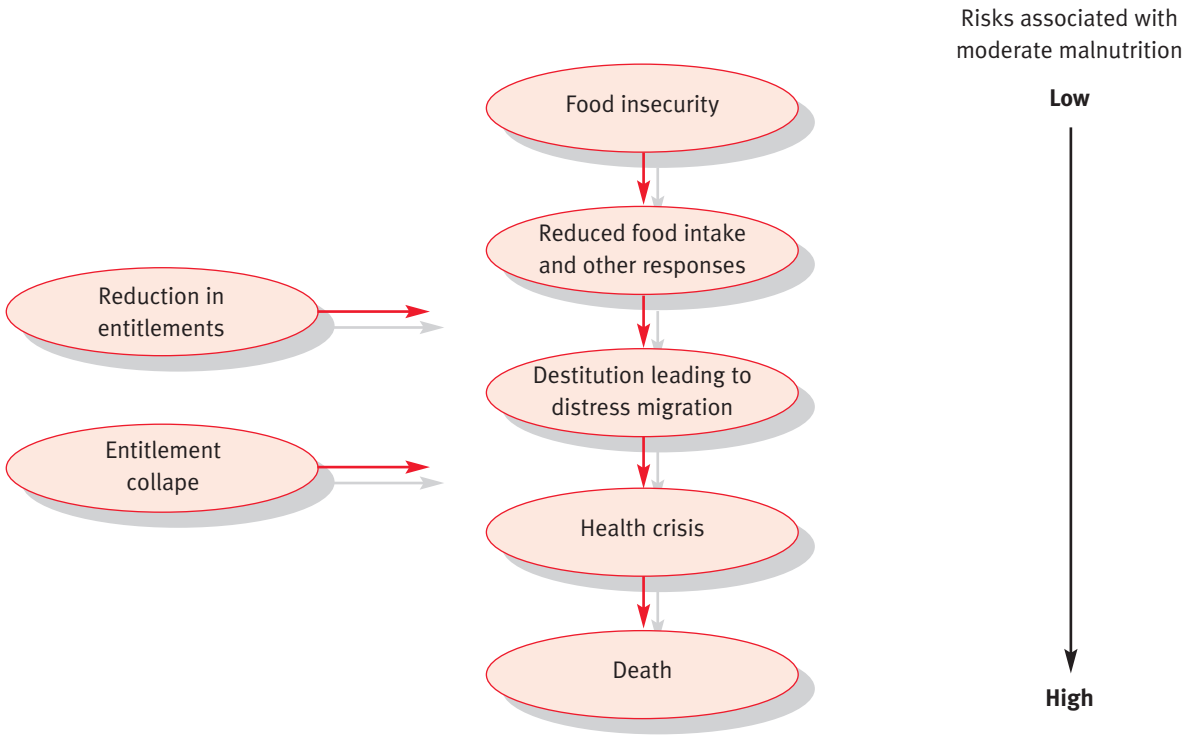
The sequence presented in Figure 7 does not apply to all famines, but many will display the characteristics of different stages in the model presented. The challenge is therefore to determine the stage that is represented by a particular situation, and thereby deduce the likely relationship between malnutrition and mortality.

Why do 'hotspots' or 'famines that kill' sometimes appear suddenly?

The range of malnutrition and mortality rates found in emergencies is extremely wide, with malnutrition rates of

Figure 7

A conceptual framework for food security, malnutrition and death in famine



Source: H. Young and S. Jaspars, *Nutrition Matters – People, Food and Famine* (London: IT Publications, 1995).

up to 50% and crude mortality rates as high as 20 or even 30/10,000/day. Often, these most extreme situations seem to occur out of the blue, taking the international community by surprise. For example, in Ethiopia in 2003, where the largest-ever relief food programme was taking place, 'hotspots' still regularly occurred, with extremely high acute malnutrition and mortality rates.[73] This can be explained either by a lack of sufficient regular monitoring, or because the increase in rates and localised deterioration is happening so fast that it takes the international community by surprise. We believe it is the latter – *malnutrition and mortality can deteriorate very quickly in the context of a combined food, health and care crisis*.

Studies among non-emergency-affected populations show that mortality increases exponentially with declining nutritional status in any population.[74] This has been termed the potentiating effect of malnutrition on mortality.[75] Malnutrition and morbidity are themselves influenced by a range of conditions, including the underlying causes of malnutrition – food, health and care. It is likely that the synergism that occurs between malnutrition and morbidity also exists between these underlying conditions. This would mean that the combined effects (multiplicative model) of a failure in all three groups of underlying causes of malnutrition (food, health and care) are far greater than the sum of their individual effects (additive model), which would account for the exponential increase in mortality with declining nutritional status in any population. This may partly account for the profound difference in malnutrition and mortality rates found in situations of extreme food insecurity versus situations of outright famine, described by one group of famine scholars as 'the difference between freezing water and ice'.[76] When food insecurity reaches the point of destitution, distress migration and subsequent localised public health crises, acute malnutrition has increased because of food insecurity, and exposure to disease has simultaneously increased, thus ratcheting up the combined impact of malnutrition and morbidity on mortality. This confluence of failures and risk factors partly explains why, during the most severe famines (such as in Bahr el Ghazel, Southern Sudan, in 1988), rates of malnutrition and mortality in a very short time spiral far beyond any rates previously witnessed.

Decision-making using nutritional survey data

Nutritional data, analysis and interpretation can be used to prioritise humanitarian actions which are designed to support and protect nutrition and also to address malnutrition, morbidity and mortality. Prioritising responses is the critical final step in nutritional assessment, and is the natural follow-up to interpretation.

Obviously, humanitarian response to immediate life-threatening risks takes priority over the wider range of interventions to reduce nutritional risk and to protect livelihoods.

Life-threatening risk may be reduced in a variety of ways, depending on whether the emergency-affected population is facing a health crisis, a food crisis or a famine. During a health crisis, the priority is to address those public health risk factors contributing to morbidity and mortality, including provision of adequate water, sanitation, shelter and measles immunisation. In the context of famine, a combination of interventions is needed to address all nutritional risk factors related to food, health and care. Where high levels of acute malnutrition are found on a regular basis, over a number of years, long-term investment in social safety nets may be just as important as immediate life-saving interventions.

Although free food distribution tends to be the most common response to a food crisis, it may not be the most appropriate response for the situation at hand. A less direct means of addressing the problem, for example cash distribution, may work as well. On this point the Sphere standards also recommend flexibility in designing the response:

> *Where people's lives are at risk through lack of food, responses prioritise meeting their immediate food needs … although food distribution is the most common response to acute food insecurity in disasters, other types of response may also help people meet their immediate food needs. Examples include sale of subsidized food; improving purchasing power through employment programmes, and destocking initiatives or cash distributions.*[77]

In other words, whilst life-saving needs may be prioritised, how those needs are addressed very much depends on the nature of the crisis and capacities to respond. *This reinforces the importance of an objective assessment of nutritional risks (prevalence and underlying causes of malnutrition) combined with an analysis of local capacities to cope at the household level and also within the wider community and region.*

Chapter 2 describes humanitarian interventions designed to address the causes of malnutrition. Annex 2 provides examples of interventions designed to address specific nutritional risks related to the various levels and clusters of causes of malnutrition. Each underlying cause of malnutrition represents a serious nutritional risk or threat that needs to be addressed according to the local context. The next chapter describes in more detail systems for defining and classifying food insecurity and famine.

Table 13 provides a checklist with questions to ask, what to look for and suggestions for responses according to different indicators.

Table 13: A checklist for interpreting nutritional survey information

Question	What to look for	Appropriate responses
Does the prevalence of acute malnutrition exceed emergency thresholds?	A prevalence of › 10% indicates a serious situation A prevalence of › 15% indicates a critical situation	Any prevalence above 10% needs further investigation to determine appropriate responses
How does the prevalence of malnutrition compare with the usual prevalence at this time of year, and with previous years?	A prevalence of malnutrition which is unusual for the time of the year indicates a serious situation Continuously high levels of acute malnutrition (above emergency thresholds)	Early warning of crisis if outside of hungry season Emergency response if prevalence of malnutrition exceeds emergency thresholds Long-term investment in social safety nets, public health, emergency preparedness and capacity development is needed, in addition to immediate life-saving interventions
Is the most important cause likely to be food insecurity, disease/poor health environment or constraints on caring behaviours?	If food security is the main cause this can be indicated by the following: • Prevalence of malnutrition above emergency threshold • Low mortality • Shift in entire frequency distribution to the left (rather than changes in tail end of distribution only) • Increasing prevalence of malnutrition in children aged 2 to 5 years	Food security responses, such as food distribution, cash transfers, production support and market-related initiatives

(continued)

Table 13 (continued)

Question	What to look for	Appropriate responses
	Health crisis can be indicated by high mortality, low malnutrition Combined food and health crisis creates high risk of both malnutrition and mortality Problems in caring behaviours are unlikely to create a crisis on their own, but may create crises in specific groups, e.g. infants, orphans, elderly Failure in all three underlying causes at the same time is likely to lead to famine, with high malnutrition and mortality	Health care and ensuring an adequate public health environment Supplementary and therapeutic feeding programmes in addition to above interventions Social protection programmes for those excluded from society and not cared for by others Immediate life-saving responses, e.g. general food distribution, supplementary and therapeutic feeding programmes, emergency health care
What are the likely risks associated with malnutrition?	Prevalence of acute malnutrition above emergency thresholds and high disease prevalence will increase the risks of dying associated with malnutrition	Therapeutic and supplementary feeding programmes as well as improving access to food

Chapter 6
The role of nutrition in classifying and defining food insecurity and famine

Food security phase classification systems

In every food crisis, there is a debate about the severity of the situation, whether it corresponds to a famine or a food crisis, and in turn what type of response might be appropriate. The use of a nutritional risk or food security phase classification system can assist in gaining clarity and agreement on when a population is experiencing food insecurity, a food crisis, a health crisis or famine.

There is currently great interest in classifying the severity of food insecurity according to different phases. The main reasons for the development of these classification systems are:

- To achieve greater consistency in describing the nature and severity of food insecurity.
- To identify whether a famine is occurring or not.
- To have thresholds which will identify a certain degree of severity of food insecurity.
- To be able to better match appropriate responses to defined food security phases.
- To have systems which are comparable between populations.
- To promote the impartiality of global humanitarian response.

Table 14 compares four different classification systems. All systems give thresholds for prevalence of malnutrition as one of the indicators to help define the severity of food insecurity or famine.

These systems include some of the underlying causes of malnutrition to help determine the nutritional risks that emergency-affected populations face. They also take account of situations of on-going or chronically high levels of acute food security and malnutrition, such as those found in the Horn of Africa and the Sahel. The thresholds for prevalence of malnutrition for different phases vary between systems, however. Other indicators used to help define the phases include mortality rates, disease prevalence, availability of water, food security indicators (food deficits, dietary diversity, coping strategies, market information), the management of livelihood assets, social disruption, civil insecurity and displacement.

These systems include recommendations for interventions other than feeding programmes, including health care, water and sanitation, improving access to food, and protecting and supporting livelihoods, and social welfare or safety nets in situations of chronic food insecurity. The Integrated Phase Classification (IPC) system of FAO Somalia's Food Security Analysis Unit (FSAU) also includes recommendations for advocacy to bring about policy change.

In each of the classification systems there is an implicit assumption that malnutrition, mortality and food security increase in parallel with each phase. Chapter 5 showed that the relationship between these three indicators is not consistent between emergency-affected populations and over time. The FSAU technical manual for Integrated Phase Classification explains that the thresholds are used as guides, and do not have to be met across all indicators to define a phase.[78] This allows for situations where different indicators do not indicate the same phase class, e.g. high prevalence of malnutrition, but low mortality or vice versa, as has frequently been the case in Somalia.[79] The focus is on convergence of evidence, rather than the strict application of indicators. The food security phase is determined by a technical working group, and subject to technical peer review, rather than on strict adherence to indicators crossing critical thresholds.[80] The IPC is currently being expanded throughout the Horn of Africa, and will be piloted outside of Africa (e.g. in Palestine).

The food security phase classification systems represent important steps forward in understanding and classifying situations of food insecurity, but there is room for improvement, particularly in integrating an understanding of acute malnutrition and its interactions with mortality. For example, systems do not account for health crises. The Howe and Devereux system comes closest to recognising the possibility of a health crisis by including a food security descriptor (whether the population defines food as the dominant problem), which would distinguish between food and health crises.[81]

If a phase classification system is to be adopted internationally, there will need to be consensus about the levels of different thresholds, the number and type of phases and most importantly how these are interpreted to identify appropriate responses. An international technical steering committee with sufficient local knowledge on each of the specific crises to make the final food security phase determination will also be necessary. At present, the systems use different phases, classifications and thresholds for determining the severity of food insecurity, food crisis or famine. The differences between the classification systems reflect the serious definitional issues around what constitutes a famine.

Defining famine

With every new food crisis there is a debate about whether the crisis constitutes a famine or not. Ethiopia, Sudan,

(continued on page 40)

Table 14: Food security phase classification systems

Food security phase	MSF (2004b); Van der Kam (2001)	Integrated food security and humanitarian phase classification – IPC (FSAU, 2006)	Darcy and Hoffman (2003)	Howe and Devereux (2004)	Examples of recommended interventions
Extreme famine				CMR › 15/10,000/day Complete social breakdown; widespread mortality Affected population identifies food as dominant problem	
Famine (severe famine in Devereux system)	Global Acute Malnutrition › 40%–50% CMR › 5/10,000/day Malnutrition amongst adults No or severely reduced food availability or access to food Distress migration, *social collapse (migration, broken families, trauma)*	Global Acute Malnutrition › 30% CMR › 2/10,000/day Disease: pandemic Food access/availability: extreme entitlement gap (much below 2,100 kcals/p/day) Water: ‹ 4l/person/day Displacement: large-scale Civil security: widespread, high-intensity conflict Livelihood assets: complete loss/collapse	Global Acute Malnutrition: › 25% (or dramatic increases) CMR: › 2/10,000/day Catastrophic lack of food access: market collapse, mass destitution, social breakdown Coping strategies: exhausted, distress migration, high-risk activities	Global Acute Malnutrition › 40% and/or prevalence of oedema Widespread social breakdown; markets closed or inaccessible, survival strategies widespread Affected population identifies food as dominant problem	MSF: general food distribution and selective feeding programmes FSAU: comprehensive assistance with basic needs Immediate policy/legal revisions Negotiate with various political and economic interests Use crisis as opportunity to address underlying causes Darcy and Hoffman: general ration distribution, selective feeding, health care
Humanitarian emergency		Global Acute Malnutrition › 15%, › than usual, increasing CMR: 1–2/10,000/day U5MR: › 2/10,000/day Disease: pandemic Food access/availability: severe entitlement gap (unable to meet 2,100 kcal/p/day)			FSAU: urgent protection of vulnerable groups Urgently increase access to food through a range of interventions Provision of sectoral support (water, sanitation, health etc.) Protect livelihood assets Advocacy for access

		Dietary diversity: regularly ‹ 2–3 main food groups consumed Water: ‹ 7.5 l/p/day Civil security: widespread, high-intensity conflict Coping: distress strategies, CSI significantly › than reference Livelihood assets: near-complete and irreversible depletion			
Serious food crisis (famine in Howe and Devereux system)	Global Acute Malnutrition › 20% Severe Acute Malnutrition › 5% CMR › 2/10,000/day General reduction in access to food or food availability			Global Acute Malnutrition › 20% CMR › 1 but ‹ 5/10,000/day Signs of social breakdown, markets begin to close, coping strategies exhausted Affected population identifies food as dominant problem	MSF: general food distribution and selective feeding programmes
Acute food crisis	Global Acute Malnutrition rate › 10–15% Severe Acute Malnutrition › 3–4% CMR › 1/10,000/day Access to food reduced for vulnerable households *Sale of capital assets, reduced expenditure on health care, water* *Social breakdown: long-term migration, abandoned children and elderly*	Global Acute Malnutrition 10–15%, › than usual, increasing CMR: 0.5–1/10,000/day U5MR: 1–2/10,000/day Disease: epidemic, spreading Food access/availability: lack of entitlement. 2,100 kcal via asset-stripping Dietary diversity: acute deficit Water: 7.5–15l via asset-stripping Displacement: emerging/diffuse Civil security: limited spread, low-intensity conflict Coping: crisis strategies CSI › than reference Livelihood assets: near-complete and irreversible depletion of assets	Global Acute Malnutrition 2.3–10% CMR: 0.2–2/10,000/day (or increases in wasting) Production: drought or war lead to crop and livestock losses Decline in food availability Income: loss of jobs, fall in wages, increased dependence on informal economy Markets: dramatic rise in price of basic goods Coping: normal strategies start to break down	Global Acute Malnutrition › 10% CMR: ›0.5/10,000/day Social systems significantly stressed but remain cohesive Dramatic rise in price of basic goods Increase in irreversible coping mechanisms	MSF: priority to GFD Targeted SFP FSAU: support livelihoods and protect vulnerable groups Strategic and complementary interventions to improve access to food Selected provision of sectoral support Strategic interventions at community level to stabilise or rehabilitate livelihoods assets Create or implement contingency plan Darcy and Hoffman: stepping up of longer-term strategies, targeted general ration, perhaps selective feeding programmes, increased health care, production inputs, etc.

Table 14 (continued)

Food security phase	MSF (2004b); Van der Kam (2001)	Integrated food security and humanitarian phase classification – IPC (FSAU, 2006)	Darcy and Hoffman (2003)	Howe and Devereux (2004)	Examples of recommended interventions
Chronic food crisis			Global acute malnutrition: 15–30%. CMR: 1–2/10,000/day Low crop and livestock production over a long period. Poverty and destitution high. High unemployment High dependence on welfare and marginal activities Markets: prices of basic goods unaffordable for poorest Coping: use of unsustainable crisis strategies during specific seasons		Darcy and Hoffman: longer- term strategies with some emergency response Strengthening civil society, livelihood support, targeted general food distribution, selective feeding
Food insecurity	Severe Acute Malnutrition rate ‹ 3–4% CMR ‹ 1/10,000/day Food availability and access slightly reduced *Labour more important, use of reserves, sale of non-capital assets.* *Changes in food habits, reduced expenditure on water, health care, firewood* *Less time for care, which is restricted to family*			Global Acute Malnutrition › 2.3% CMR: › 0.5 but ‹ 1/10,000/day Social systems cohesive Price instability, seasonal shortage of key items Reversible coping strategies	MSF: food security measures: seeds and tools, veterinary care Referral of malnourished to health centres Support medical facilities

Chronic food insecurity		Global Acute Malnutrition: 3–10%. Stable CMR: ‹ 0.5/10,000/day U5MR: ‹ 1/10,000/day Stunting: › 20% WFA Food access/availability: borderline adequate (2,100 kcals/p/day). Unstable Dietary diversity: chronic deficit Water: borderline adequate: 15l/p/day. Unstable Coping: insurance strategies Livelihood assets: stressed and unsustainable utilisation Structural: pronounced underlying hindrances to food security	Global Acute Malnutrition: 2.3–10% Stunting: › 40% CMR: 0.2–1/10,000/day Production: poor yields leading to hungry season Income: high unemployment, low wages Dependence on marginal activities Markets: instability of prices for basic goods Assets: low asset base Coping: adaptive or insurance strategies		FSAU: design and implement strategies to increase stability, resistance and resilience of livelihoods Provision of safety nets to high-risk groups Interventions for optimal and sustainable use of livelihoods assets Create contingency plan Redress structural hindrances to food security Darcy and Hoffman: long-term support for livelihoods, public health, social safety nets
Food secure		Global Acute Malnutrition: ‹ 3% CMR: ‹ 0.5/10,000/day Stunting: ‹ 20% WFA Food access/availability: usually adequate (2,100 kcals/p/day) Dietary diversity: consistent quality and quantity Water: usually adequate: › 15l/day Hazards: moderate to low probability and vulnerability Civil security: prevailing and structural peace Livelihood assets: generally sustainable utilisation		Global Acute Malnutrition ‹ 2.3% CMR: ‹ 0.2/10,000/day Cohesive social system, prices stable, negligible adoption of coping strategies	Strategic assistance to pockets of food-insecure Investment in food and economic production systems Enable development of livelihoods systems Prevent emergence of structural hindrances to food security

Box 9

Problems of political bias and manipulation of data

Rates of malnutrition and images of starving children are some of the most emotive and often most successful ways of getting the attention of the international community and triggering a response to a particular crisis. The clear link between nutritional data and (usually) food aid responses has sometimes led to the politicisation and subsequent manipulation of nutritional information. Some examples are given below.

Agencies may choose to respond to or ignore their own survey results. For example, in the Ogaden region of Ethiopia in 2001, many agencies decided to phase out their programmes at a prevalence of malnutrition that was similar to the prevalence rate that had justified the start of emergency interventions one year before (although food security indicators suggested that the situation had improved). Similarly in Kebkabiya in North Darfur in 2006, one agency decided to phase out its programme because malnutrition levels were 'stable' at around 18%. Commonly used thresholds would classify this situation as critical.

Many national governments are sensitive to malnutrition and mortality data, because the situation is a result of their own mismanagement (as in North Korea), or a consequence or objective of conflict (in which case governments do not want to declare a national emergency and seek international assistance). The governments of Sudan and Zimbabwe have in the past delayed the release of nutritional survey findings. In some cases, local authorities may deliberately create malnutrition among displaced populations to attract resources. Examples of this have been noted in South Sudan and Somalia.

At an international level, indicators of the severity of a humanitarian crisis are rarely matched with a proportional response. Situations like the Southern Africa food crisis in 2002, which was not accompanied by high levels of malnutrition, can result in large international responses, whereas much higher levels of acute malnutrition in places like Somalia and Niger rarely result in a large-scale response and have been termed normal because high levels of acute malnutrition are found on a regular or continuous basis (but exceed 'critical' thresholds).

Niger and Southern Africa are recent examples. As Howe and Devereux write: 'the search for an internationally accepted definition of famine is not merely a technocratic or instrumentalist concern – it also has political significance'.[82] An internationally agreed definition of famine can be used to uphold the right to food and to enforce accountability when human rights are being violated. The absence of an agreed definition leaves the international humanitarian system open to political bias and manipulation of nutritional data. Some examples of this are given in Box 9.

Using the criteria developed for the various different food security phase classification systems, famine can be defined as:

> *the advanced stages of acute food insecurity linked with the exhaustion of coping strategies, social collapse and destitution, which is accompanied by localised health crises, increased prevalence of malnutrition and consequently elevated morbidity and mortality.*

In addition to severity, defining famine needs an assessment of the scale of the crisis; a prevalence of malnutrition above 20% means something different depending on whether it covers a single village or an entire region. Howe and Devereux have developed a scale for categorising the magnitude of different famines (see Table 15).[83] This does not necessarily take account of situations which suffer a high level of acute food insecurity and malnutrition, but not necessarily an increase in mortality.

The classification systems described above are an important step towards developing consensus about the stages leading to famine, and even a definition of famine itself, both of which will make the humanitarian system more accountable.

Table 15: Famine magnitude scale

Category	Phase designation	Mortality range
A	Minor famine	0–999
B	Moderate Famine	1,000–9,999
C	Major famine	10,000–99,999
D	Great famine	100,000–999,999
E	Catastrophic famine	1,000,000+

Chapter 7
Institutional and capacity issues

Multiple stakeholders

Even with a clear definition of famine (and other phases of food insecurity or nutritional risk) to which governments and agencies can be held accountable, there are problems of responsibility among the different stakeholders. As illustrated in Figure 8, the range of actors with an interest in acute malnutrition is considerable.

The roles and responsibilities of the different stakeholders are summarised in Annex 3. Even within a single agency, there are multiple units or teams working on nutrition-related issues; for example in WFP, there is a nutrition team in the policy unit, nutrition surveys are implemented by VAM (vulnerability assessment and mapping) and ODAN (emergency needs assessment), which also prescribe best practice, while programming works with the actual results of nutrition surveys in designing and implementing WFP's programmatic response.

The system is based on volunteerism and financial interdependence rather than any formal overarching regulation. Government donors have no obligation to respond to any specific emergency in another sovereign state; the UN technical organisations 'are not autonomous, and broadly act in support of the government of the affected country'; and the international NGOs are subject to the legislation of the country in which they are based.[84] The system therefore consists of 'a collection of nominally independent organizations',[85] which presents challenges for coordination, professional and wider capacity development and analysis. The humanitarian reform process of the IASC attempts to address the lack of clear responsibilities for nutrition in emergencies through the development of sectoral 'clusters', with UNICEF taking responsibility for nutrition. It has a major challenge ahead.

Lack of coordination of nutrition data internationally

The UN's Nutrition Information in Crisis Situations (NICS) information system and the Complex Emergency Database (CEDAT) of the Center for Research on the Epidemiology of Disasters (CRED) are the only two international systems for collating nutritional data in emergencies. The two systems are quite different.

CEDAT is a relatively recent initiative, and is essentially an electronic database for eight countries which reports quantitative data on nutrition, mortality and vaccination. NICS issues quarterly reports on crisis situations which collate nutritional survey information, interprets the information in relation to the underlying causes of malnutrition and provides recommendations.* NICS compares the severity of different crises by assigning a nutritional risk category to each crisis situation (see Figure 5). There is no mechanism in either system to ensure that they are integrated with standard early warning approaches, consolidated appeals or action plans and subsequent response. CEDAT's close association with a key donor (USAID) makes the use of information by this donor more likely.

Both NICS and CEDAT obtain information from a wide range of the same collaborating agencies, both UN and NGOs. The limitations of these systems are that they rely on voluntary submission of survey data by contributing agencies, which is not always regular or timely. NGO internal procedures often mean that reports are submitted late. For NICS, the information is collated in Geneva, and for CEDAT in Brussels, which means that those who collate or interpret the data are removed from the realities in which emergencies take place, and cannot participate in national or regional coordination meetings. NICS often has to get information on the underlying and basic causes of malnutrition from OCHA information systems or food security assessments in the same areas. This means that NICS and CEDAT are only as good as the quality of the reports they receive.

Lack of capacity in national and international institutions

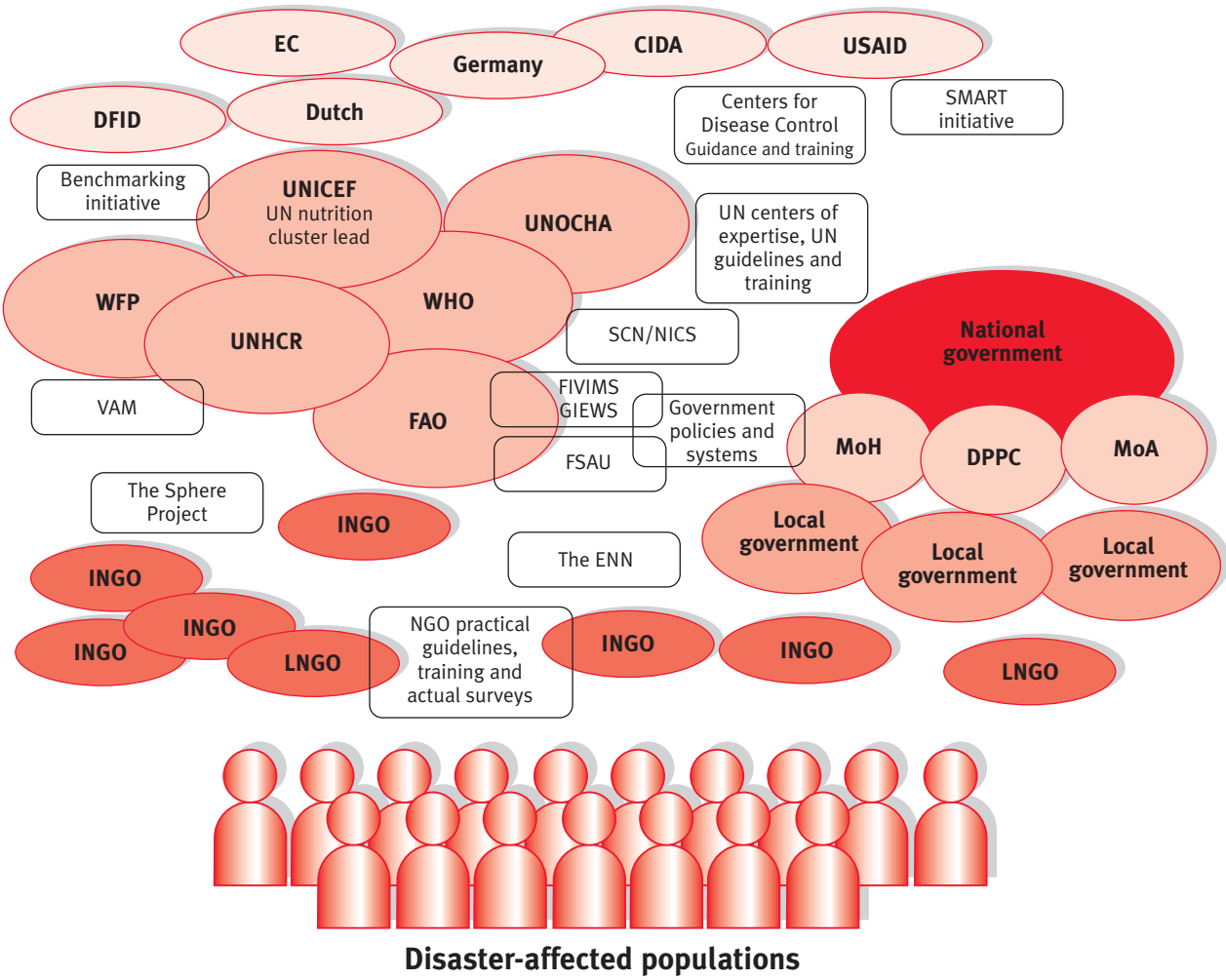
National governments have formal responsibility for emergency response, and therefore are responsible for planning and coordinating nutritional surveys, usually with support from UNICEF. National Ministries of Health often lack experience of nutritional assessment and response, and may not be aware of recent international developments.

Even in WFP and UNICEF, however, there is a recognised lack of technical nutrition capacity and skills, even though they are the lead agencies in food and nutrition. UNICEF technical staff are not necessarily knowledgeable or experienced in emergency nutrition surveys, as these skills are not routinely taught in universities. Often, such skills are learnt 'on the job' in the midst of health or nutrition crises. As a result, in 2002 UNICEF launched a global initiative called 'Training for Improved Practice' intended to strengthen the capacity of UNICEF health and nutrition technical staff to address health and nutritional problems in emergencies. Similarly, WFP has developed a 'Food and Nutrition Training Module' and 'Trainers Toolbox' to complement its Food and Nutrition Handbook. One difference with this initiative is that it has been targeted at all staff, and does not assume a technical background in nutrition.

* See the SCN website for examples of NICS reports: www.unsystem.org/scn/publications/html/rnis.html

Figure 8

Organisations and institutions engaged in nutritional surveys or surveillance related activities



Stakeholders

- UN agencies (UNICEF IASC cluster lead in nutrition, WHO cluster lead in health, WFP, UNHCR, FAO, UNOCHA). The UN Standing Committee on Nutrition (SCN) produces regular reports on Nutrition Information in Crisis Situations (NICS, formerly the RNIS).
- Professional and technical networks (SCN Working Group on Nutrition, Emergency Nutrition Network (ENN), the Sphere Project consultative groups on Minimum Standards in Disaster Response; the UN SCN Working Group on Nutrition in Emergencies includes technical experts from the UN, INGOs, academics and independent nutritionists.
- Donor-supported technical groups: the SMART initiative, Centers for Disease Control, the Brussels-based CRED CEDAT.
- National governments and their ministries of health and ministries or commissions coordinating humanitarian response. There are several examples of government-supported nutritional surveillance systems and units coordinating nutrition surveys, including the Emergency Nutrition Coordinating Unit of the Disaster Preparedness and Prevention Commission in Ethiopia and the Public Nutrition Section within the Ministry of Health in Afghanistan.
- International and local NGOs, e.g. ACF, SC-UK, Oxfam, MSF. NGOs are often the primary implementers of nutrition surveys, and in the past have been at the forefront of technical developments in the measurement of malnutrition and mortality and the response to it, often in collaboration with technical experts from academia and technical institutions like CDC.
- The Red Cross Movement, including the International Committee of the Red Cross, national Red Cross/Red Crescent societies and the Federation.

Source: IAWG on FIVIMS, *Guidelines for National Food Insecurity and Vulnerability Information and Mapping Systems (FIVIMS): Background and Principles*, Rome, 2–5 June 1998.

Some international NGOs are specialised in nutrition (e.g. MSF and ACF) and these agencies are generally better resourced and have the capacity to carry out emergency nutrition surveys. This does not apply to all NGOs, however, and there are still plenty of examples of poor-quality nutritional surveys.[86] This issue of limited capacity and the need for a coordinated multi-UN agency strategy to capacity development has been taken up by the IASC, which is the first step in addressing this serious problem.

Humanitarian reform, standards and benchmarks

Over the past two decades the nutrition sector within the humanitarian system has demonstrated a remarkable degree of collaboration and cohesion in a range of joint initiatives aimed at addressing some of the more technical issues around nutrition. These in turn have greatly contributed to improved practice, in terms of the application of standard procedures and protocols and the development of a collective process of institutional learning.[87]

Two recent global initiatives, Sphere and SMART, have used this existing emergency nutrition community for consensus-building around standards (Sphere) and methods (SMART) for nutrition surveys. Whilst these two initiatives reflect major progress in the nutrition community, the IASC humanitarian response review concluded that there is no agreed system for estimating the severity of a crisis and the impact of humanitarian response overall, and no set of benchmarks to which the humanitarian community can be held accountable.[88] This was the start of a broad agenda for humanitarian reform, which includes a proposal for a tracking service to monitor humanitarian performance and outcomes. The two key indicators recommended for tracking, as a starting point, are mortality and malnutrition.

The proposal for a global tracking service for monitoring humanitarian outcomes is an important initiative for ensuring greater accountability within the humanitarian system. It provides an opportunity to resolve some of the outstanding technical issues, as well as the institutional issues on the collection and use of malnutrition information in emergencies. This includes standardising the assessment of underlying causes, better interpretation of the relationship between malnutrition and mortality in emergencies and building the capacity of some of the key institutions involved in nutrition in emergencies. A tracking service will also need to be sufficiently independent that it is not subject to government manipulation.

Conclusion
The way ahead?

More than ten years ago, in *Nutrition Matters*, we wrote: 'Despite ever increasing amounts spent on humanitarian assistance, there are still great inconsistencies in international response to emergencies, which are as likely to be determined by political priorities, the availability of funding, and the world's media as any assessment of need'.[89]

So, what has changed? Problems of acute malnutrition are still escalating, and to this we now need to add the growing number of chronically food-insecure people who cannot meet their basic needs on a daily basis, and who also suffer unacceptably high prevalences of acute malnutrition. Growing criticisms that humanitarian assistance is not based on objective assessments of need have now prompted donors, UN agencies and other stakeholders to ask for indicators that can be used to allocate resources and effectively monitor the performance of the humanitarian response.

This paper shows that acute malnutrition data can be used as an indicator of the severity of a humanitarian crisis, as well as for programme planning and monitoring. Over the past ten years, there has been important progress in the standardisation of methods for gathering and analysing acute malnutrition data as part of nutritional surveys or nutritional surveillance. The UNICEF model on causes of malnutrition has been widely adopted as the basis for nutrition assessments in emergencies.

However, the assessment of micronutrient deficiency disorders and of the underlying causes of malnutrition has not been standardised in emergencies. Agreement on methods for assessing these is urgently needed. Combining quantitative data on nutritional status with qualitative information on underlying causes will improve the validity of survey data and overcome some of the drawbacks of standard nutritional surveys.

There are still a number of technical issues which remain to be resolved, in particular relating to the interpretation and use of acute malnutrition data. The inter-relationship between malnutrition and mortality varies, and the nature of the inter-relationship is critical for both predicting and diagnosing crises. There is, however, little practical experience at looking at these indicators in combination. The inter-relationship between malnutrition and mortality in turn is closely linked to the underlying causes of malnutrition, and we emphasise the critical importance not only of estimating malnutrition and mortality rates, but also simultaneously assessing failures in all three underlying causes of malnutrition, and combining this in a comprehensive analysis that correctly identifies a strategic humanitarian response. Nutritionists and epidemiologists will need to reach a common understanding that malnutrition and mortality data need to be interpreted together to diagnose the type of crisis at hand.

The lack of progress in broadening the role of nutrition also reflects a growing divide between nutritionists who focus on improvements in therapeutic feeding, and those who have switched to food security and livelihoods analysis and programming. Important advances have been made in both domains, first with the advent of community-based therapeutic feeding and advances in the treatment of malnutrition, and second in seeking alternatives to food aid to address food insecurity. One consequence of this division has been that the discipline of public nutrition, or the study of nutrition in society, has become more marginalised. There is a need for the revitalisation of public nutrition, and for commitments to a broader range of strategies for addressing malnutrition in a more comprehensive and coherent manner.

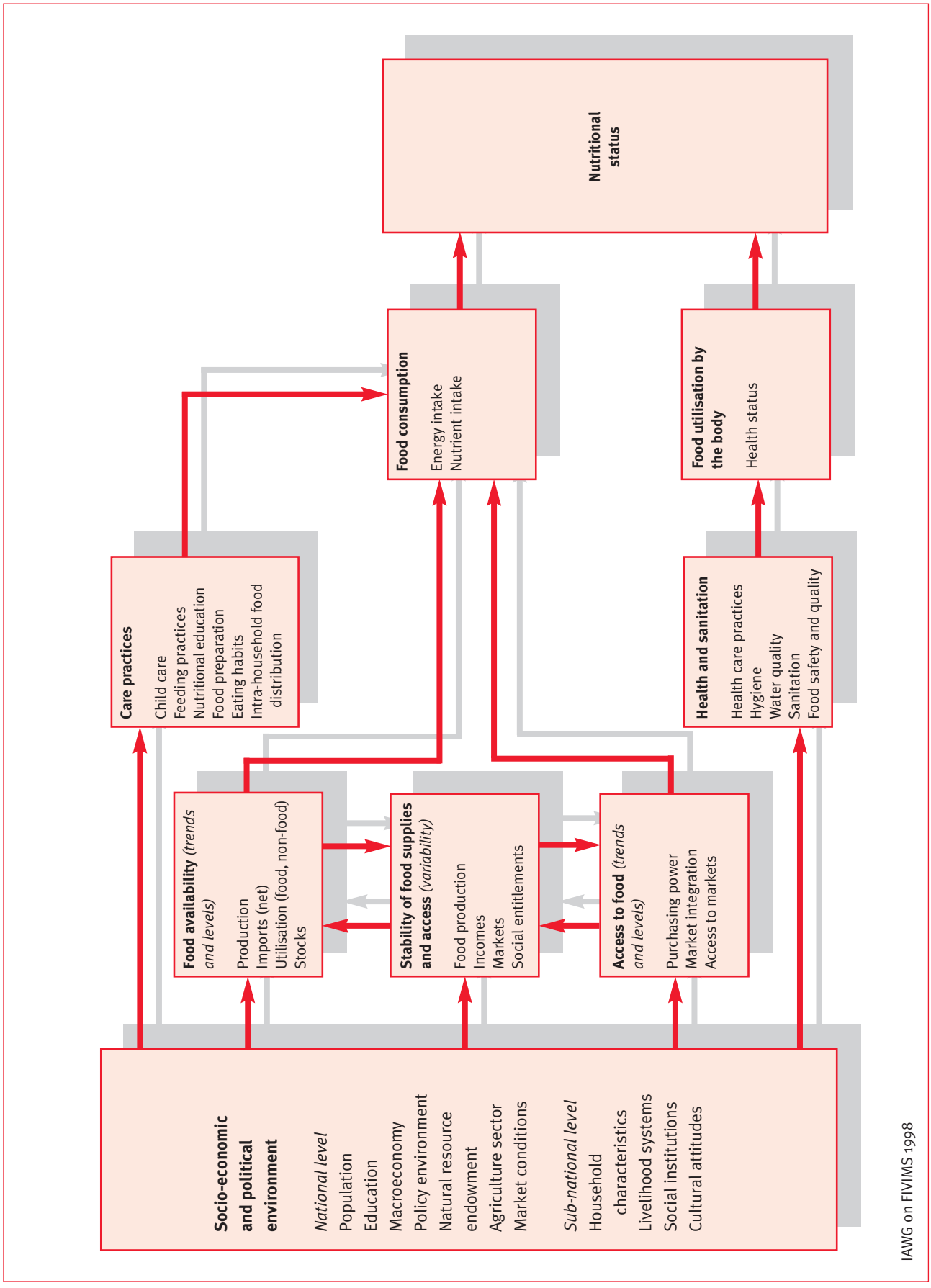
We also need a common vision and strategy among the wide range of stakeholders with an interest in collecting, analysing and acting on nutritional information. It is only following the humanitarian response review in 2005 that clear responsibility for nutrition in emergencies has been assigned to UNICEF as the nutrition cluster lead. Currently, the national coordinating bodies usually only have access to data provided by the rather patchy and limited coverage of NGOs. Authoritative and competent leadership in nutrition in emergencies is needed at all administrative levels, but is often sorely lacking. UNICEF and the nutrition cluster members have a major challenge ahead.

There is also a key issue of capacity for all actors involved in planning, coordinating, implementing and collating nutritional survey information. Many of the key actors involved in humanitarian response, including UN agencies with a mandate for improving nutrition, do not have the capacity to plan, coordinate, implement and monitor nutritional surveys. The recognised lack of capacity in the leading UN agency on nutrition in emergencies is an example of this.

There have been promising advances in systems for classifying nutritional risk or the severity of food insecurity, with the Nutrition in Crisis Information System and the system developed by FAO's Food Security Assessment Unit in Somalia. However, to promote consistency in the use and interpretation of acute malnutrition thresholds, further research is needed to review the evidence base for such thresholds, and the practical use by different stakeholders. Such classification systems also bring us closer to agreeing a definition of famine, which will make the interpretation of survey findings according to political objectives more difficult.

In this paper we have shown that we have the knowledge and the tools to use acute malnutrition data as an objective indicator of crisis. It can form an important part of an information system that promotes the global allocation of resources according to need. With better guidance on interpretation, acute malnutrition data can help in identifying the severity and nature of crisis, and thereby help identify appropriate responses to address malnutrition and its underlying causes. It is now up to the international humanitarian community as a whole to take up the challenge of putting this into practice, and making the humanitarian system more accountable.

Annex 1 Conceptual framework for understanding possible causes of low food consumption and poor nutritional status



Annex 2 Examples of humanitarian response options to address the causes of malnutrition

Immediate causes – Food intake and disease

Response option: **Therapeutic feeding**
Objective: Treatment and care of the severely malnourished, leading to a reduction in malnutrition, morbidity and mortality
Target group: Children under five years who are moderately malnourished

Response option: **Targeted supplementary feeding**
Objective: To provide a food supplement for selected individuals at increased risk e.g. moderately malnourished individuals, and thereby address moderate malnutrition
Target group: Children with moderate acute malnutrition (< 80% WFH)

Underlying causes – Food, health and care factors

Food security

Response option: General food distribution
Objective: To provide a regular food basket or ration as direct nutritional support (macro and micronutrients). Other objectives may include to preserve assets and prevent asset depletion, to prevent distress migration and social disruption, to reduce risks associated with coping strategies
Target group: All members of the affected group or population

Response option: *Milling and fortification of cereals*
Objective: To improve the utilisation of food aid cereals through milling and the addition of one or more nutrients to the milled flour to maintain, improve or enhance the quality of the diet
Target group: All individuals who consume the relevant food

Response option: Blanket supplementary feeding
Objective: To provide a food supplement for all members of a particular group
Target group: Elderly people, pregnant and lactating women, all children in selected age category e.g. under three years

Response option: Food security interventions. This includes a wide range of interventions relating to primary agricultural production, income and employment and access to markets and services
Objective: To protect, support and promote food security, including food availability, food access and food utilization
Target group: The food-insecure, as determined through food security assessments

Public health

Response option: Public Health interventions. This includes a wide range of interventions including measles immunisation, provision of adequate supplies of clean water, sanitation, hygiene promotion, access to basic health services and essential drugs

Response option: Vitamin A distribution
Objective: To reduce the incidence of vitamin A deficiency and associated risk of morbidity and mortality
Target group: Infants and children from 6 months to 6 years; lactating mothers

Social and care environment

Response option: Policies and programmes concerned with infant feeding
Objective: To protect, support and enhance breastfeeding and appropriate infant feeding practices
Target group: Women of breastfeeding age, infants and young children under two.

Response option: Care of unaccompanied children through tracing services, orphanages and home based care

Like gender, 'care' is a cross-cutting theme in all direct and indirect nutrition programmes, rather than an independent set of programmes. The design and implementation of any programme is likely to impact on the care of the child, and thereby indirectly on nutrition. For example, employment programmes without adequate childcare arrangements may restrict access for mothers; food distribution programmes targeted at men may limit access to food by women and children

Annex 3 Examples of stakeholder groups and their policies, guidelines and training initiatives

Group	Policies	Technical papers and guidelines	Training and capacity development
UN agencies: WHO UNICEF WFP UNHCR NICS/RNIS, Administrative Committee on Coordination/ Sub-Committee on Nutrition FAO/FIVIMS	UNICEF (2000) *UNICEF Core Corporate Commitments in Emergencies* UNHCR and WFP (2002) *Memorandum of Understanding between the Office of the United Nations High Commissioner for Refugees (UNHCR) and the World Food Progrmme (WFP), UNHCR, WFP*	WHO Working Group (1986) 'Use and Interpretation of Anthropometric Indicators of Nutritional Status', *Bulletin of the World Health Organization*, 64(6): 929–941 WHO Expert Committee (1995) *Physical Status: The Use and Interpretation of Anthropometry. Report of a WHO Expert Committee*. Geneva: WHO. WHO (2000) *The Management of Nutrition in Major Emergencies*. UNICEF (2001) *Technical Notes. Special Considerations for Programming in Unstable Situations* Collins, S., A. Duffield and M. Myatt (2000) *Adults. Assessment of Nutritional Status in Emergency-affected Populations*. Geneva: Administrative Committee on Coordination/Sub-Committee on Nutrition Woodruff, B. A. and A. Duffield (2000) *Adolescents. Assessment of Nutritional Status in Emergency-Affected Populations*. Geneva: Administrative Committee on Coordination/Sub-Committee on Coordination (ACC/SCN). WFP (2000) *Food and Nutrition Handbook*. Rome: WFP UNHCR and WFP (2000) *Food and Nutrition Needs in Emergencies* FAO (2000) *Guidelines for National FIVIMS (Food Insecurity and Vulnerability Indicator Monitoring Systems). Background and Principles*	WFP – Food & Nutrition Training for all staff UNICEF – Public Health & Nutrition training for technical staff

Annex 3 (continued)

Group	Policies	Technical papers and guidelines	Training and capacity development
Professional and technical networks The SCN Emergency Nutrition Group (diverse membership) Emergency Nutrition Network		The Sphere Project consultative groups NutritionWorks The Sphere Project (2003) *Humanitarian Charter and Minimum Standards of Disaster Response*, 2004 revised edition. Oxford: Oxfam GB	NutritionWorks short training courses on Nutrition in Emergencies. This is being handed over to Westminster University (UK)
Donors and donor-led technical groups The US-led global initiative SMART The Centers for Disease Control		MMWR Guidelines SMART (2005) *Measuring Mortality, Nutritional Status and Food Security in Crisis Situations: The SMART Protocol. Version 1. Final Draft* (January)	
National governments The Nutrition Working Group of the Food Security Analysis Unit, Somalia The Emergency Nutrition Coordination Unit of the Disaster Preparedness and Prevention Commission, Ethiopia	Afghanistan Nutrition Policy Ethiopia Disaster Prevention Policy and National Nutrition Strategy	FSAU Nutrition Working Group (2005) *Nutrition Assessment Guidelines for Somalia*. Nairobi: Nutrition Project of the Food Security Analysis Unit (FSAU) DPPC (1995) *Guidelines on Nutritional Status Data and Food Relief*. Addis Ababa: Disaster Prevention and Preparedness Commission ENCU (2002) *Training Manual on Emergency Nutrition Assessment* Nutrition Working Group (2002) *National Nutrition Survey Guidelines*. Addis Ababa: Disaster Prevention and Preparedness Commission	In Ethiopia, the ENCU has an extensive training programme
NGO networks and families e.g. Action Contre la Faim, Oxfam, Save UK, MSF, Red Cross movement		Prudhon, C. (2002) *Assessment and Treatment of Malnutrition in Emergency Situations. Manual of Thereapeutic Care and Planning for a Nutritional Programme*. Paris, London, Madrid, New York: Action contre la Faim. MSF (2002) *Nutrition Guidelines Revised Draft March 2002*, Médecins Sans Frontières Save the Children (2004) *Emergency Nutrition Assessment Guidelines for Field Workers*. London: Save the Children Jaspars, S. and H. Khogali (2001) Oxfam's Approach to Nutritional Surveys. Oxford:	Oxfam GB. ACF and MSF have training courses for their staff

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