PART 2: TECHNICAL NOTES

The technical notes are the second of four parts contained in this module. They provide information on measuring malnutrition in populations. The measurement of micronutrient malnutrition is not included as it is covered in Module 4. The technical notes are intended for people involved in nutrition programme planning and implementation. They provide technical details, highlight challenging areas and provide clear guidance on accepted current practices. Words in italics are defined in the glossary.

Summary

This module concentrates on nutrition surveys and provides an overview of the steps that should be followed in carrying out a survey.

Key messages

1. Anthropometric nutrition surveys are commonly conducted during emergencies to estimate the level of malnutrition in a population.
2. Two-stage cluster sampling is commonly applied.
3. Nutrition surveys require time, financial resources, trained staff and logistical support.
4. There are standard ways of presenting anthropometric data in reports as prevalence with 95 per cent confidence intervals.
5. Survey reports should include a description of objectives, methodology, limitations as well as the findings and recommendations.
6. Level of malnutrition should be interpreted in line with contextual factors, such as food security, public health and care practices.

These technical notes are based on the following references and Sphere standards in the box below:

- Save the Children United Kingdom (2004), *Emergency Nutrition Assessment Guidelines*. London: SCUK.
- World Food Programme (2000), *Food and Nutrition Handbook*. Rome: WFP.
- Food and Nutrition Technical Assistance (2003), *Anthropometric Indicators Measurement Guide*. Washington: FANTA.
- World Food Programme and Centers for Disease Control and Prevention (2005), *A Manual: Measuring and Interpreting Malnutrition and Mortality*. Rome: WFP.
- SMART (2006) Measuring Mortality, Nutritional Status and Food Security in Crisis Situations: SMART Methodology, Version 1.

Sphere standard

Food security and nutrition, Assessment Standard 2: nutrition

Where people are at increased risk of undernutrition, assessments are conducted using internationally accepted methods to understand the type, degree and extent of undernutrition and identify those most affected, those most at risk, and the appropriate response.

Key actions

- Compile existing information from pre-disaster and initial assessments to highlight the nature and severity of the nutrition situation
- Identify groups with the greatest nutritional support needs and the underlying factors that potentially affect nutritional status
- Determine if population level qualitative or quantitative assessments are needed to better measure and understand anthropometric status, micronutrient status, infant and young child feeding, maternal care practices, and associated potential determinants of undernutrition
- Consider the opinions of the community and other local stakeholders on the potential determinants of undernutrition
- Include an assessment of national and local capacity to lead and/or support response
- Use nutrition assessment information to determine if the situation is stable or declining

Key indicators

- Assessment and analysis methodologies including standardised indicators adhering to widely accepted principles are adopted for both anthropometric and non anthropometric assessments
- Assessment findings are presented in an analytical report including clear recommendations of actions targeting the most vulnerable individuals and groups

Source: *Sphere Handbook*, 'Chapter 3: Minimum Standards in Food Security and Nutrition', The Sphere Project, Geneva, 2011.

Introduction

Nutrition assessments are essential to guide response during an emergency. In this module, nutrition assessments encompass analysis of anthropometric data as well as contextual factors such as food security, mortality, public health and caring practices, and interventions which are key to analyse to interpret the overall nutrition situation.

This module has three parts. It starts with a short discussion of *rapid nutrition assessments* and then concentrates on *anthropometric nutrition surveys*, and finally describes the *information needed for an overall analysis of the nutrition situation*.

Nutrition surveillance is covered in depth in Module 10. The assessment of micronutrient malnutrition is covered in Module 4.

Rapid nutrition assessments

In some situations a rapid nutrition assessment must be carried out to quickly establish whether there is a major nutrition problem or not and to identify immediate needs. In the initial stages of an emergency, a rapid nutrition assessment may be carried out to verify the existence or threat of a nutrition emergency; estimate the number of people affected; establish immediate needs; identify local resources available and external resources needed.

Rapid assessments are also done where there is poor security and very limited access.

Commonly, information relating to nutrition is gathered from key informants as part of a broader emergency needs rapid assessment. For example, informants may be asked whether malnutrition has become more common and whether any children are displaying signs of *kwashiorkor* (*oedema* or fluid retention) or micronutrient deficiencies. Informants may be asked about changes in dietary habits such as reduction in food quantity, quality and reduced frequency of meals. Consumption of unusual wild foods is also frequently a sign that nutrition is becoming compromised. Direct observations of population and environment can also be used as well as review of records from available feeding centres and/or health facilities.

Anthropometric household rapid assessment can also be undertaken. In this case, as it is often not possible to draw a random sampling representative of the population surveyed, the findings must be used cautiously. The measurement of the *mid-upper arm circumference* (MUAC) is often used in these circumstances as it can be done quickly and requires very little equipment (only a measuring tape). **Case example 1** provides an example from the Central African Republic.

Rapid assessments are frequently multi-agency (involving several agencies) and multi-sectoral (involving several technical sectors) in order to have a broad analysis of risks, needs and priorities and to make recommendations to ensure all the health and nutrition needs of an emergency-affected population are met. An initiative to improve the effectiveness of rapid assessments has resulted in a multi-cluster Initial Rapid Assessment (IRA) tool.[1] This has been developed by the nutrition, health and WASH (water, sanitation and hygiene) clusters since 2007.[2] It serves to collect, compile and analyse information on the public health, food and nutrition status of the population and the current availability of nutrition and health services. It mainly involves analysis of secondary data and interviews with key informants. It is designed to provide a quick, initial description of the current situation and identify the priority problems, risks and gaps in service provision. The tool includes guidelines, a standard data collection form, an associated aide memoire for field teams, and a data entry and analysis template and software. A Needs Assessment Task Force was also established by OCHA (Office for the Coordination of Humanitarian Affairs) to improve coordination of rapid assessments.[3]

Case example 1: Rapid anthropometric nutrition assessment in Central African Republic: 2007

An upsurge of violence in the north of the Central African Republic in 2006 led to the displacement of thousands of people. The conflict had serious consequences for food security. The loss of food stocks and productive assets, increased food prices and complete disruption to trade with rest of the country caused imported goods such as sugar, oil and salt to be entirely absent in rural markets. An assessment by the World Food Programme (WFP) found a significant decrease in food frequency and diet diversity. Most people only ate once a day and meat, fish and oil had disappeared from their diet. Cereal consumption had also decreased. Most families had consumed roots, tree bark and wild fruit the day before the assessment. People were also reported to have few cooking instruments and little access to water.

A rapid anthropometric nutrition assessment was conducted in two provinces in the north, in areas which were not representative of the entire population but which were relatively secure. Among 104 displaced children aged 6 months to 59 months who were screened using MUAC, none had a MUAC of less than 110 mm and only one had a MUAC of less than 120 mm. Among the 381 resident children screened, four (or one per cent) had a MUAC of less than 110 mm and 16 (4.2 per cent) had a MUAC of less than 120 mm. No oedematous children were found.

Source: United Nations Standing Committee on Nutrition, *Nutrition Information in Crisis Situations, Report Number XIII*, SCN, May 2007.

Anthropometric nutrition surveys

Anthropometric nutrition surveys involve the collection of anthropometric information which is used to establish the prevalence (level) of acute malnutrition in a population (Box 1). In addition, underweight and stunting can be estimated, keeping in mind that the uncertainties about the age will undermine the accuracy of those results in some populations.

Surveys are cross-sectional (one-off) and provide a 'snap-shot', e.g., the information collected reflects the situation for a particular point in time. When repeated surveys of the same population are conducted, trends can be established. Most of the time, it is not possible to measure everyone in the area surveyed so a sample of the population will be selected who will then be measured to determine the prevalence of acute malnutrition.

[1] For details go to http://www.who.int/hac/global_health_cluster/guide/tools/en/index.html

[2] The 'Cluster approach' is one of the outcomes of the Humanitarian Reform, led by the Inter-Agency Standing Committee with the aim of improving coordination and the quality of humanitarian action. For details see http://www.humanitarianreform.org/

[3] For details see the IASC website http://www.humanitarianinfo.org/iasc

Box 1: Definitions of key epidemiological terms

Survey: a systematic canvassing/investigation of persons to collect information, often from a representative sample of the population.

Sample: a selected subset of a population. A sample can be random or non-random and representative or non-representative.

Sample, random: a sample of persons chosen in such a way that each one has the known (and often the same) probability of being selected.

Sample, representative: a sample whose characteristics correspond to those of the original or reference population.

Prevalence: the proportion of persons in a population who have a particular disease at a specified point in time.

Confidence Interval a range of values for a measure (e.g. prevalence) constructed so that the range has a specified probability (often, but not necessarily, 95%) of including the true value of the measure. A narrow confidence interval indicates high precision; a wide confidence interval indicates low precision.

From Centers for Disease Control and Prevention. Principles of epidemiology in public health practice. Third Edition. An introduction to applied epidemiology and biostatistics

Other data can be collected in addition to anthropometry but it is not recommended that many additional data are added to the survey as it might undermine the quality of the whole survey due to surveyors' and respondents' fatigue. Moreover, information on food security or public health might be available from secondary data or might be collected more efficiently using other types of assessment methodologies.

Due to the significant financial, human and logistic resources needed, it is essential to consider carefully the reasons for doing a survey. A survey is undertaken when there is a reasonable indication from a rapid assessment, surveillance or early warning systems that there is likely to be a nutritional problem. Before starting the survey, it is important to identify how the results will be used and to ensure that a survey leads to action if a problem is identified. Although there are well-established techniques for doing anthropometric nutrition surveys, there are some unresolved technical challenges and some limitations in conducting and interpreting anthropometric surveys that practitioners and policy makers need to be aware of (Box 2).

Box 2: Some drawbacks in conducting and interpreting anthropometric nutrition surveys

Accurate population data is needed to list the population in villages or population units. This may not be available in an emergency.

The data cannot be disaggregated to produce statistically reliable results for geographical sub-samples when cluster sampling is used.

Surveys are time- and resource-consuming, but are often necessary to assess the anthropometric situation with accuracy.

Mobile and pastoral populations are difficult to assess because they do not easily form an identifiable cluster with sufficient children to be measured

Sampling is especially challenging in big towns, particularly when clusters represent a large number of households and where households are aggregated, such as in buildings.

Interpreting results of anthropometric nutrition surveys in relation to contextual factors and interventions is not straightforward and requires a wealth of information including food security and public health.

A good survey design is crucial as a poor design may mean that the survey results are invalid. Once it has been decided that a nutrition survey is necessary, the key steps shown in **Box 3** should be followed.

Box 3: Key steps in designing and implementing a nutrition survey

1. Decide whether or not to do a survey
2. Define objectives
3. Define the geographical area and population group to be surveyed
4. Gather relevant background information
5. Communicate with stakeholders
6. Determine the timing of the survey
7. Decide what information to collect
8. Design the survey: determine the appropriate sampling method, calculate sample size and select the sample
9. Design the questionnaires
10. Obtain and prepare equipment and survey material
11. Select and train field workers
12. Field test questionnaires and data collection procedures
13. Conduct field work and supervise teams
14. Check measurements, enter and clean data
15. Check data quality and analyse the data
16. Write and disseminate the findings through reports and presentations

Modified from World Food Programme and Centers for Disease Control and Prevention, *A Manual: Measuring and Interpreting Malnutrition and Mortality*, WFP, Rome, 2005.

Survey objectives

It is important to develop specific survey objectives so as to avoid any unnecessary collection of data.

The objective for anthropometric nutrition surveys during emergencies is generally to measure the prevalence (level) of acute malnutrition among children aged 6-59 months within a specified geographical area.

The results of an anthropometric nutrition survey can be used for different purposes:

- For **advocacy** to highlight a nutritional problem and elicit a response
- For defining **appropriate interventions**
- For **measuring change** in nutritional status over time to inform the evolution of the situation in relation to contextual factors and interventions and whether programmes need to continue or can be safely phased out

Survey populations

Anthropometric nutrition surveys need to be representative of the affected population. The population to be surveyed may be refugees or internally displaced persons (IDPs) living in camps or other settlements, or people living within a livelihood zone (area where the population has similar *livelihoods*) or a particular administrative area (district or region). It is preferable to survey livelihood zones, as people's food security within the zone will tend to be similar as well as their nutritional status. Survey results are only representative of the geographical area from which the survey sample is selected. Generalization to other similar or neighbouring areas should be done with extreme caution and followed by clear justification as to why the prevalence in these areas may be similar to the area that was surveyed.

Once the population has been defined, the specific group within the population who will be assessed needs to be defined. Typical groups are:

1. **Children aged from 6 months to 59 months**

   In most African and Asian countries young children are the most nutritionally vulnerable and act as a proxy for the nutritional status of the entire population. Since the children aged 6-59 months are routinely measured in nutrition surveys, they serve as a principal group for which comparisons could be drawn among populations measured at different times and places.

2. **Other age groups**

   Younger or older children, adults and the elderly are assessed less frequently but may be included where there is reason to believe that they are nutritionally vulnerable. For example, the elderly were found to be more nutritionally vulnerable during the Bosnian crisis of the early 1990s while the focus in Kosovo 2000 was on infants under six months of age. The nutritional status of women, usually mothers or carers, is sometimes assessed in nutrition surveys. Women who care for young children are often nutritionally vulnerable, especially as they are most likely to be pregnant or lactating.

Sampling

Sampling methods

Anthropometric nutrition surveys are usually based on the representative sampling of a sub-set of the affected population. This requires the use of internationally recognized statistical methods so that the prevalence of acute malnutrition in the sampled population can be generalized to that of the whole population. For nutrition surveys to be representative, every individual measured has to have an equal chance of being selected. Different sampling methods are described in Table 1.

Table 1: Different sampling methods used in nutrition surveys

Sampling method	Brief description	Main use
Census or exhaustive survey	If the population of interest is sufficiently small, a survey of the entire population can be carried out.	Small static communities such as a refugee or displaced camp
Simple random sampling	Individuals (or households) are randomly chosen (using a random numbers table) from a complete list of all the individuals (or households) in the population.	Communities with up-to-date lists of all individuals (or households) such as established refugee or displaced camps or villages/towns with accurate census information
Systematic or interval sampling	If a complete list of all individuals (or households) is available, then every Nth entry on the list is selected. If there is no list but dwellings are arranged in some order and the total number of dwellings is known, then every Nth dwelling can be selected.	Communities with up-to-date lists of individuals (or households) or where houses or tents are laid out in blocks such as established refugees or displaced camps or well-organized villages
Cluster sampling	Cluster sampling involves a number of stages. Two-stage cluster sampling starts with the first stage where a number of clusters (collections of individuals or households) are randomly selected. The second stage is when individuals or households are randomly selected within each cluster.	Cluster sampling is done very frequently. It allows random sampling in situations where other forms of sampling are not possible. It can be used in widely dispersed populations such as rural households. However, the survey sample needs to be larger than with other methods.

In practice while simple or systematic random sampling can be used in some camp settings, it is necessary to use cluster sampling in many situations.

Cluster methodology involves selecting a number of clusters (cluster refers to a grouping of neighbouring households, i.e. a village or part of a city) randomly in the first stage. For the survey to be representative of the surveyed area, at least 25 clusters need to be surveyed. The clusters are randomly selected from the population data of the smallest available administrative units with probability-proportional-to-size: the larger the population size, the higher chance for the administrative unit to be selected.

A design of 30 clusters of 30 children was recommended in the past. It was adopted because it is relatively simple to understand and implement, and will guarantee a good precision around the estimate of acute malnutrition prevalence in most emergency settings, i.e. it involves random selection of the sample and ensures sufficient sample size. However, new recommendations are to calculate the sample size needed (see below) and to derive the number of clusters from the sample size and the number of children or households measurable per day. For example, if it is estimated that it takes a team on average 20 minutes to complete each household survey and the field work will be on average 4 hours per day, then each team could measure 12 households per day. If the total sample size requirement is 396 households, 33 clusters (396/12) will be visited to achieve the overall sample size. **Annex 1** describes how to do cluster sampling in more detail.

There are a number of options for the second step of sampling (box 4 and Annex 2).

Box 4: Selection of households to form the clusters

1. Simple or systematic random sampling
The best method is to treat each cluster as if it is a "small population" and to select the houses using the simple or systematic random sampling methods as described in table 1.

2. Segmentation and simple or systematic sampling
If the cluster is to be taken from a larger population, the first step of stage two is to subdivide the population into segments of roughly the same number of people. One of these segments is then chosen from the random number table. In this way the "village" is reduced to an area containing up to 250 households. These households are then listed, and the required households selected from the list by simple or—if they are arranged in some logical order—systematic random sampling. If the population is divided in segments of unequal household sizes, segments should be chosen with probability-proportional-to-size.

3. Modified "EPI" (Expanded Programme of Immunisation) method
If it is not possible to select the households in the ways proposed above, the modified "EPI" method can be used (see Annex 1).
Although, this method is simple, widely known, easy to train, and rapid, it results in a somewhat biased sample, as households closer to the centre of the village are most likely to be selected. However, the time taken to select the sample and move from house to house is far less when the EPI method is used.

From SMART manual version 1, April 2006

There might be a number of challenges in selecting clusters, especially in pastoral populations and in big cities. A new methodology for anthropometric surveys in pastoral areas has been recently proposed (Case Example 2).

Calculation of sample size

The sample size is the number of individuals or households who will be assessed in the survey and which will be representative of the entire population from which the sample is drawn. Sample size is related to three factors:

1. The expected **prevalence** of acute malnutrition: The smaller the expected proportion of children presenting with acute malnutrition, the lower the size of the sample required for a given level of precision. Expected prevalence can be drawn from previous assessments in the area.
2. The expected **precision** of the survey results: Precision is a measure of how close the survey value is to the true value. It is reflected in the confidence intervals of the results. The greater the precision required, the more people are needed in the sample. The survey should have a sufficient precision to ensure the results are meaningful for planning purposes.

Case example 2: Specific method for anthropometric nutrition surveys in pastoral areas

There are specific problems of sampling pastoral populations as they often represent mobile, scattered populations where detailed population data is lacking.

A new method for estimating prevalence of acute malnutrition in pastoral areas has been developed. There are two phases to the assessment: qualitative and quantitative. During the qualitative phase, the sampling frame of pastoralist *troupes* is constructed using information gathered locally from key informants in the pastoralist community. This information is managed using an organogram (organisational chart). During the quantitative phase, the selected communities are located and surveyed and the data analysed. The nutrition assessment is carried out by measuring all eligible children in the sampled *troupes*. Data can be computerised using specially designed software.

This method was tested in Mali and the authors concluded that the method is practical for use in pastoral populations, is valid and is simple to apply. The quantitative data collection and data entry should present no difficulties for staff that are already familiar with cluster surveys. Many staff will be unfamiliar with collecting and analysing qualitative data and will require some training in the methods and experienced staff may be needed during the early stages. The delay between qualitative data and quantitative data collection needs to be as short as possible because seasonal changes and other movements of people affect the validity of the qualitative data. Further testing is necessary, especially in different pastoralist settings.

Mayer AM, Myatt M. The pastoralist survey method guidelines- Nutrition and Pastoralism project

For Action Contre La Faim – International Network- November 2008- Draft 4; Mayer A-M, Myatt M, Ait Aissa M and Salse N (2009) New method for assessing acute malnutrition in nomadic pastoralist populations. *Field Exchange 35*

3. The **design effect**, which is only applicable in cluster surveys, reflects the extent to which the variable being measured (acute malnutrition) is spread in the population. Malnutrition, for example, may be geographically clustered because the determinants of malnutrition are likely to affect individuals living in the same area. The latest evidence suggests a design effect of about 1.5 for acute malnutrition; in areas with previously documented higher design effects this may be adjusted accordingly. This means that the sample size for a nutrition cluster survey must be increased about 1.5 times compared to the sample size needed for a simple or systematic random survey.

A common misunderstanding is that the size of the sample needed for a ùgoodû nutrition survey is dependent on the population size. In fact, the sample size makes little difference except in populations of fewer than 5,000. The only factors that affect the sample size are those described above. This means that bigger samples are not needed for bigger populations.

The sample size can be calculated by hand by following a particular formula. See **Annex 3**. Alternatively the computer software programmes that can be used for analysing nutrition surveys also include programmes for calculating sample sizes (see **Data analysis** chapter below).

New methods for interpreting results of nutrition surveys have recently been proposed. They are based on comparison of prevalence found in the survey to a given threshold. This has implications on the sample size required (Challenge 1).

For children's anthropometry, the number of children required for the sample can be converted to a number of households, if the average number of eligible children per household is known. Even households without eligible children need to be interviewed for mortality and other information not specific to children.

Planning and preparation for surveys

There are a number of practical and technical issues that have to be addressed in the process of planning and preparing for a survey. These are shown in **Table 2**. It is extremely important to involve national staff from government departments and from civil society at the outset to build national capacity and to ensure the recognition of the survey findings.

It is also important to factor in *seasonality* as prevalence of acute malnutrition can vary quite dramatically depending on the season. For example, levels of acute malnutrition are usually higher during the ùhungryû season, just before the harvest, when food stocks are low, and which also may coincide with higher levels of infection such as malaria and diarrhoea as a result of weather patterns. The seasonal factors will also directly affect the logistical aspects of the survey in terms of road access, accommodation for field staff and the likelihood of finding the survey population.

Timing

Field data collection for nutrition surveys can take anything from a few days in camp situations to several weeks for dispersed populations in large rural areas. In addition to field work, survey preparation can take up to two weeks, and analysis and report writing one to two weeks.

Challenge 1: New methods for interpreting results of nutrition surveys

A new method for interpreting results of surveys has recently been proposed. It is based on the Lot Quality Assurance Sampling (LQAS). This approach aims at classifying the results of a survey above or below a given threshold (generally, 10, 15 and 20%) to assess the severity of the situation. The sample size needed is lower than when the objective of the survey is to assess the actual prevalence with sufficient precision. Cluster sampling of 33 clusters of 6 children or 67 clusters of 3 children have been proposed.

This method of interpretation has been challenged as being prone to producing false-positive results and therefore suggesting interventions when there is no need. Alternatively, interpretation using the probability of prevalence to exceed the threshold has been proposed.

Validity and field use of these new methods are still not entirely clear.

FANTA 2 (2009) Alternative sampling designs for emergency settings: a guide for survey planning, data collection and analysis; Bilukha O, Blanton C (2008) Interpreting results of cluster surveys in emergency settings: is the test the best option? Emerging Themes in Epidemiology. 5:25.

Table 2: Planning nutrition surveys

Practical and procedural issues	Technical issues
• Confer with the relevant local authorities and obtain permission to carry out the survey. • Check out the security situation. The safety of fieldworkers is paramount. • Obtain and test equipment such as height/length boards, scales, pens, clipboards, etc. • Organize transport, fuel and timetables for moving fieldworkers from one site to another.	• Gather accurate population data • Develop, translate, back-translate and test questionnaires and/or data assessment sheets. • Recruit and train fieldworkers. • Pilot all survey procedures to identify challenges.

Survey teams

Teams are usually composed of three people each. The composition of team members needs to be sensitive to the local context in terms of gender, ethnicity and language skills as well as local knowledge of the survey area. At least two people are required to do weight and height measurements and one to record the data. The latter is the team leader responsible for the quality and reliability of the data collected. The team leader can also conduct interviews if additional information is included in the survey. It is important to have team leaders who have taken part in planning the assessment and, ideally, who has previous experience with nutrition surveys.

Two to six teams can be used depending upon the time allocated to complete the survey and the size and accessibility of the area to be covered. Although it is faster with more teams, it is much more difficult to train, supervise, provide transport and equipment, and organise a large number of teams.

Data collection

Minimum information to be collected is:

- Age in months from a known date of birth or based on an estimate derived from a calendar of local events
- Sex
- Weight in kilograms (*to the nearest 100g*)
- Height/length in centimetres (*to the nearest millimetre*)
- Presence or absence of bilateral oedema

MUAC is also often collected. Further details on how to collect this information are given in Module 6. Additional data collected will depend on the objectives (e.g. vaccination coverage, micronutrient supplementation or deficiencies) and the age group(s) to be surveyed.

Data collection forms should be simple to understand and use. An example can be found in **Annex 4**. In many cases, the data collection forms and questionnaires will have to be translated into the local language. To avoid misunderstanding, it is essential to use one translator to translate into the local language and a second translator to translate back from the local language.

Data which can be collected in addition to anthropometry in surveys

It can be attractive to collect additional information about the determinants of malnutrition together with an anthropometric nutrition survey.

However, it is inadvisable to attempt to obtain all this additional information via a nutrition survey. Firstly, in many settings, this information will already be available or will be collected as part of assessments done by other sectors (including food security and health) (Challenge 2). Each additional piece of data that is collected as part of a nutrition survey will prolong the training and the survey itself, complicate the analysis and potentially degrade the accuracy of the data.

Secondly, the sample size and the population to be surveyed will likely be different for the different information. For example, the number of households to be surveyed might be different for infant and young children feeding practices surveys than for anthropometric surveys. For assessing infant and young child feeding practices, the targeted group will be preferentially mothers of children under two years and not mothers of children 6-59 months. Moreover, some information collected in isolation will not be very informative. For example, it will be difficult to interpret data on the number of meals consumed by families if there is no information on the pattern in a "normal" situation.

Challenge 2: Which additional data to collect during an anthropometric survey

The decision to collect additional information during a nutrition survey should be clearly stated and justified in the objectives and have a realistic prospect of leading to a meaningful intervention. Consideration has to be given to whether the information is available from secondary sources, could be collected more efficiently in other ways (e.g. *secondary data collection from health clinics, sentinel sites or a surveillance system*), or whether it would be better to conduct a separate assessment to collect the supplementary information. If additional information is to be included in the survey it should be quickly and reliably obtainable during a short visit to the household.

Nevertheless, some limited additional information can be coupled with an anthropometric survey. Measles vaccination coverage is often asked as part of an anthropometric nutrition survey as it is relatively easy to collect and can lead to clear recommendations. Data on the health status of the person being measured is also sometimes collected by asking about illness during the previous two weeks. However, the quality of the response is questionable and there might be suspicion that both the lack of standardisation of questionnaires and the difficulty for the households to diagnose the illness might lead to poor data. Mortality surveys are often coupled with nutrition surveys when no data on mortality is available.

Training and field data collection

The training usually takes at least two or three days and should include the following topics:

- A clear explanation of the objectives of the survey
- A discussion of the ethical considerations (*including importance of getting consent from families*)
- An explanation of the sampling method
- A standardisation test of anthropometric measurements to evaluate the strengths and weaknesses of each surveyor and select the best measurers
- Practice on estimating age with the local events calendar
- An explanation of any additional data that needs to be obtained
- A pilot field-testing of the questionnaire and procedures

There should be regular supervision of survey teams by the supervisor or coordinator throughout the survey. In particular, teams usually need the most support from the supervisor or coordinator at the early stages of the survey as many of the procedures are new, as well as at the end of the survey as team members tire and make more mistakes. In addition, whenever feasible, there should be a daily 'wrap up' session with all the teams to discuss any problems that have arisen during the day.

It is advisable to inform the population in advance that a survey will take place and ask people to stay home. This will diminish the risk of bias where a high number of families are absent when the survey is conducted. Once the team is in the area to be surveyed, local authorities must be informed of the survey. The sampling principle should be explained and it should be made clear that the survey will not necessarily lead to humanitarian assistance in this area. When arriving in a household, permission for measuring the children should be sought from an adult caretaker. Again, it should be explained to the family that the survey will not automatically lead to humanitarian assistance.

Data analysis

Analysis of anthropometric data can either be done by hand or using freely-available software, including Emergency Nutrition Assessment (ENA) for Standardised Monitoring and Assessment of Relief and Transitions (SMART), Epi Info combined with ENA hybrid or WHO Anthro.[4]

International guidelines (The Sphere Handbook, 2010) stipulate that where anthropometric surveys are conducted among children 6 months to 59 months, they should report primarily weight-for-height index in Z-score according to WHO standards. Weight-for-Height in Z-score according to NCHS reference may also be reported in addition to allow comparison with past surveys. Wasting and severe wasting measured by MUAC should be included.

For adult malnutrition the prevalence of the Body Mass Index (BMI) and corresponding cut-offs can be calculated using EpiInfo or other statistical programmes. The same is true for MUAC. See Module 6 for a detailed explanation of nutritional indices.

Before starting the analysis, the data needs to be prepared and ùcleanedû. Some of the information collected will probably be incorrect due to errors in measurement and recording. The objective of ùcleaningû is to remove any false or improbable data and to check where there are missing data. For example, outliers of height, weight and anthropometric indices will be excluded from final analysis. ENA also includes a battery of tests for assessing the overall quality of the data, such as age heaping and digit preference for weight and height (box 5).

Box 5: Plausibility checks in ENA Software

Measurement bias occurs when the team has not been adequately trained or supervised or

when the measuring equipment is faulty. There are several useful methods to check the quality of the anthropometric data collected during a nutrition assessment and after the data has been collected:

1- **The distribution of the final decimal for height and weight**. This will tell you if the team members are rounding weights and height to the nearest kilogram or centimeter, respectively. This phenomenon is called "digit preference." ENA examines the data for digit preference. Furthermore, it examines the digit preference for each of the teams. There may be one team that is "cutting corners" or has been improperly trained or supervised.

2- **The standard deviation of the z-scores for Weight-For-Height (WFH)** should be examined. This can tell you if there is substantial random error in the measurements. If the standard deviation is high (over 1.2), it is likely that there are a lot of extreme values.

3- There are other statistical measures that are computed on the data and for each team's results to assess the extent to which the survey results are valid.

From SMART manual version 1, April 2006

Presenting and interpreting results

Anthropometric nutrition survey results are usually presented in a standard way. ENA software provides the results in a standardized reporting form.

Age and sex distributions

The age and sex distribution of the population is frequently analysed to check that there was no bias in the survey sampling. The sex ratio (number of male divided by number of female) should be around 1. A low proportion of children in some age groups could indicate either a problem with the survey method or high age-related mortality. The prevalence of acute malnutrition is generally expected to be higher in the 6 month to 36 month age group.

[4] For download, see www.cdc.gov/epiinfo; http://www.smartmethodology.org/; http://www.who.int/childgrowth/software/en/

Prevalence and Confidence Intervals

The prevalence of acute malnutrition in the sample measured represents an estimate of the overall prevalence of acute malnutrition in the population at a given point in time. The 'precision' of the estimate is measured by a statistical term known as the *confidence interval* (CI). This reflects the error introduced by the sampling method and the sample size. Confidence intervals are usually associated with a probability of 95 per cent, which is equivalent to saying that if the survey is done 100 times the true population value of acute malnutrition will be within the range of the confidence interval 95 times out of 100. A true difference between two percentages can be assumed where CIs do not overlap. When the CIs overlap slightly, there may still be a significant difference between the two estimates, but this needs to be statistically tested. Centers for Disease Control and Prevention (CDC) developed a simple calculator to test the difference between two survey estimates[5]. The percentage of oedematous children should be recorded separately within the report, as well as being included in the overall percentage of acute malnutrition.

Table 3 illustrates a table of results from nutrition surveys conducted in Pakistan in December 2005. The minimum information that should be presented is shown. In this example, it is possible to conclude that the prevalence of acute malnutrition is higher among residents of Mansehra district compared to IDPs from Muzaffarabad district as the CI ranges do not overlap. However, there is an overlap in the CI ranges for all other groups.

Table 3: Presentation of anthropometric data

Survey Area	Muzaffar-abad district IDP camps	Muzaffar-abad district	Mansehra district IDP camps	Mansehra district
Date	Dec. 2005	Dec. 2005	Dec. 2005	Dec. 2005
Population	Displaced	Residents	Displaced	Residents
Survey conducted by	UNICEF/WFP/ WHO/MOH	UNICEF/WFP/ WHO/MOH	UNICEF/WFP/ WHO/MOH	UNICEF/WFP/ WHO/MOH
Global acute malnutrition % (95% CI)	4.2 (1.9-6.5)	5.7 (3.8-7.5)	6.0 (3.9-8.0)	10.5 (6.7-14.3)
Severe acute malnutrition % (95% CI)	1.2 (0.0-2.3)	2.5 (1.1-4.0)	3.2 (1.5-5.0)	4.7 (2.5-6.8)
Oedema	1.0	2.5	1.7	2.6
Measles immunization coverage % (proved by card)	77.0	64.3	46.5	37.4
Women's anthropometric status	BMI < 16.0: 2.7% BMI < 18.5: 16.1%	BMI < 16.0: 1.5% BMI < 18.5: 15.5%	BMI < 16.0: 1.0% BMI < 18.5: 17.4%	BMI < 16.0: 2.3% BMI < 18.5: 14.8%
Crude mortality ((/10,000/day) (95% CI)	0.2 (0.06-0.47)	0.44 (0.21-0.8)	0.2 (0.0-0.4)	0.1 (0.0-0.3)

Source: United Nations Standing Committee on Nutrition. (May 2006). *Nutrition Information in Crisis Situations Report Number IX*. SCN.

[5] Available at http://www.cdc.gov/nceh/ierh/ResearchandSurvey/calculators.ht

Seasonality and trend data

The prevalence of acute malnutrition should be interpreted in relation to what is expected for that time of the year (season). This will confirm whether the prevalence is unusually severe for that time period. In many parts of the world prevalence of acute malnutrition increases in the hunger period before the main harvest also often corresponding to the rainy season when there is increased incidence of disease. It can be useful to conduct surveys in hunger gap and post-harvest periods to document seasonal variations. Analysis of trends can be done by comparing results of the current survey to results of previous surveys conducted in the same area and taking into account the season when the surveys were done.

Thresholds

Currently, there are no universally agreed thresholds that indicate the severity of a nutritional situation. Rather, acute malnutrition levels are very context-dependent and whereas in one context a prevalence of 15 per cent may lead to immediate emergency action, in other contexts it is considered 'normal'. Module 1 discusses classification systems and thresholds in detail. **Table 4** presents the thresholds set by the United Nations for child acute malnutrition prevalence. There are no thresholds set for adult malnutrition. The rationale behind these thresholds is not clear. Moreover, they were determined with the NCHS reference and it is unclear whether they remain applicable with the World Health Organisation (WHO) standards.[6]

For those interested in comparing survey estimates to the thresholds CDC has developed a simple calculator that provides a probability of the true population value exceeding a given threshold based on observed survey results[7].

Table 4: United Nations thresholds for acute malnutrition

Interpretation	Prevalence of global acute malnutrition (< 80% below median/or < - 2 Z scores)	Mean weight-for-height Z score
Acceptable	< 5%	> -0.4
Poor	5-9%	-0.4 to -0.69
Serious	10-14%	-0.7 to -0.99
Critical	> 15%	< -1.00

Source: The Management of Nutrition in Major Emergencies 2000 (IFRC, UNHCR, WFP, WHO)

Report preparation and dissemination

The findings of a nutrition survey should be written up and disseminated as soon as possible after completion of the survey. Reports should be as clear as possible and always include a summary of one to two pages with key findings and recommendations. The summary can be turned into a separate fact sheet. It is useful to do a verbal presentation of the results to help get the message across quickly and accurately as many people will not have the time to read through whole reports. See **Annex 5 and 6**.

Interpretation of the results, which leads to clear recommendations, is advisable. This will require interpretation of anthropometric surveys in line with contextual factors (see below). **Box 6** illustrates how to ensure that recommendations are clear.

Survey reports should also be sent to global initiatives that collate nutrition survey results, including Complex Emergency Database (CE-DAT) and United Nations System Standing Committee on Nutrition (SCN) Nutrition Information in Crisis Situations (NICS).[8]

Follow-up surveys

In many cases follow-up surveys will be needed to assess whether the situation is improving, remaining the same or deteriorating. Repeat surveys among the same population should be carried out at the same time of the year to take account of seasonal differences.

[6] Young H and Jaspars S (2009) *Review of the nutrition and mortality indicators for the integrated food security phase classification* (IPC). Reference level and decision making.

[7] Available at http://www.cdc.gov/nceh/ierh/ResearchandSurvey/calculators.htm

[8] http://www.unscn.org/; http://www.cedat.be/

Box 6: Report recommendations

There is no fixed blueprint for interventions in nutrition emergencies, it is useful to consider the following:

- severity of the situation (including an understanding of malnutrition, mortality and the major acute determinants of malnutrition and whether the situation is going to get better or worse), which dictates the urgency of the required response
- sub-groups of the population that are at greatest nutritional risk
- chronic determinants of malnutrition that need to be addressed
- community's recommendations and understanding of their existing levels of capacity
- feasibility of possible responses

Nutrition Survey Recommendations need to:

- be based on need and prioritized
- be linked to assessment findings
- be based on Sphere standards
- be time specific and feasible
- be built on existing capacity and community recommendations
- promote coordination and avoid duplication

All agencies undertaking nutrition surveys must send their results to the government, or the UN agency responsible for emergency nutrition interventions, so that they can build up a central database of information on the prevalence of acute malnutrition in different parts of the country.

Based on: Save the Children United Kingdom 2004. (YEAR). Emergency Nutrition Assessment. Guidelines for Fieldworkers. Chapter 3: Presenting the Report.

Putting results of anthropometric surveys into context: assessing and analysing the overall nutrition situation

Anthropometric data can only provide information on the level of malnutrition. Non-anthropometric data has to be collated to interpret the level of acute malnutrition and to understand the overall humanitarian situation as well as to determine adequate response. **Annex 7** provides a checklist of questions to consider as part of an overall assessment of the nutrition situation.

This information will help in identifying the factors likely to be associated with malnutrition in a specific context and in designing appropriate interventions and emergency responses. The conceptual framework on the determinants of malnutrition (immediate, underlying and basic)[9] is illustrated in Module 5.

The conceptual framework illustrates that while immediate determinants include inadequate dietary intake and disease, there are interrelated underlying determinants:

- insufficient access to food (household food insecurity)
- inadequate maternal and child caring practices
- poor water and sanitation, and inadequate health services
- basic determinants related to the political and social systems at a national and international level

Basic determinants reflect the resources available to a population (human, structural and financial), whereas the political ideology determines how these resources are allocated. Poverty is often the overriding determinant of malnutrition. Basic determinants include macroeconomic and government policies or development strategies that exclude or marginalize a section of the population. The existence of a competent government, which is politically accountable to all sections of society, is probably the most important determinant in freedom from famine. It is important to assess the underlying determinants of malnutrition in the context of the most likely basic determinants.

[9] This is also referred to as the *Conceptual framework on the determinants of undernutrition*

Lack of standardization in assessing the determinants of malnutrition

There are no standard methods for collecting information on the determinants of malnutrition either in terms of what to collect or how to collect it. Different agencies tend to use their own data collection forms and collect different types of information. These frequently reflect the particular interest and specialization of that agency. For example, agencies that are largely concerned with delivery of food aid may concentrate heavily on household food security and focus less on health or water and sanitation. Agencies with a bias towards health may concentrate more on the health or therapeutic care needs of the community.

Furthermore, agencies tend to have their own individual methods of data collection. These may include primary data (information collected in the field for the express purpose of the survey) as well as secondary data (information that is already available and may have been collected by other agencies). It may include quantitative data (based on amounts or numbers) or qualitative data (based on qualities or opinions). Box 7 presents the most common tools used to assess the determinants of malnutrition.

Box 7: Common assessment tools

Secondary information

Collation of existing information from various sources such as government departments or international agencies working in the area (e.g., previous survey results, information from surveillance or early warning systems)

Questionnaires

Questionnaires of set questions that may be qualitative or quantitative; often filled in by the survey fieldworkers who take a sample of mothers (of children who are being anthropometrically measured) or household heads from the geographical area of interest

Key informant interviews

Individual interviews possibly with local leaders or government representatives varying in the degree to which they are 'formalized' (using set questions) or 'open' (encouraging informants to articulate their own opinions and concerns)

Focus group interviews

Possibly with small groups of local people such as village women or farmers; the degree to which the interviews are 'formalized' varies.

Direct observations

Observations of the environment such as sources of drinking water, sanitation systems, quality of housing, and health facilities and services

Seasonal calendars

Seasonal calendars drawn to illustrate the seasonal variation of various factors that affect nutritional status, such as disease, different sources of food and the agricultural cycle

Currently, agencies use different sources and techniques and collect very different types of non-anthropometric data. The risk of non-standardization is that assessments are not comparable and that recommendations for interventions will be based on different kinds of information. See **Challenge 3**. Despite the difficulties of non-standardization, non-anthro-pometric data should still be collected using rigorous methods.

Assessing household food insecurity

A household's ability to secure adequate food to meet the dietary needs of all members, either through its own food production or food purchases, is an essential pre-requisite for adequate nutritional intake. Food security assessment involves assessment of food availability, food access and food utilization at the household level. Emergency-affected populations often have to change the way they access and prepare food and household food security becomes compromised. Food security assessments are discussed in detail in **Module 9**. A module to assess food security in combination with an anthropometric nutrition survey is proposed by SMART.

Challenge 3: Lack of standardization in assessment of causal information on nutrition

There are no standards for the collection of information relating to the potential determinants of malnutrition in an emergency. As a result, each assessment tends to collect a unique set of non-anthropometric indicators that are specially developed for a particular context. These are usually a mixture of quantitative (numeric) and qualitative (descriptive) indicators. Furthermore, a variety of different tools are employed to collect the data, typically individual questionnaires, focus group interviews, key informant interviews and rapid appraisal techniques.

The lack of standardization means that non-anthropometric information is often patchy and can be skewed towards a particular determinant. For example, food security is often emphasized above the other underlying causal factors of health and care. This can be because food aid is easily available and so information to justify the distribution of food aid is needed. Causal information is often presented in a way that is not easily translated into appropriate interventions. For example, lists of coping strategies may not necessarily mean much without comparative data.

Despite the absence of standard methodologies, rigorous methods need to be employed to collect information on all three underlying determinants in nutrition assessments. Methods should be clearly explained.

As household food security worsens, so often does nutritional status, although this is not always the case. Sometimes households can become severely food insecure before there is any sign of malnutrition. Household food security changes seasonally and is often worse before the harvest when food prices are highest.

Assessing maternal and child caring practices

Appropriate childcare is an essential element of good nutrition and health and is often disrupted in emergency situations. The major childcare activities that influence nutritional status are feeding behaviours (breastfeeding and weaning) and hygiene practices. These, in turn are culturally determined and dependent on resources such as income, time and knowledge. Assessments should aim to identify adverse changes in caring practices such as having less time for child care because of the need to forage for wild food. A guideline for collecting and analysing data on infants and young child feeding was recently developed.[10]

In addition to individual caring practices, there are often changes that occur among wider social networks. Formal and informal support systems change and individuals resort to new coping mechanisms such as borrowing or illegal behaviour in order to meet their needs. Displacement or forced migration is likely to cause social disruption and assessments can provide an opportunity to identify the main manifestations of this.

Assessing health and sanitation environment

Exposure to, and therefore incidence of, infectious disease increases morbidity and can affect malnutrition and mortality rates (case example 3). Seasonal factors are crucial. For example, diarrhoea and malaria are often more prevalent during rainy seasons. Measles vaccination coverage is also essential information as measles outbreaks might have a major impact in emergencies. **Module 8** describes health assessments in detail.

Case example 3: Health and nutrition of Sudanese refugees in Eastern Chad: 2004

High levels of malnutrition (above 20 per cent) were found among Sudanese refugees living in four camps in Eastern Chad in 2004. Repeat surveys carried out three months later showed that although mortality rates were stabilizing, acute malnutrition rates were still high in two of the camps: northern and southern. Humanitarian aid provisions were assessed to be similar in all four camps. Further analysis concluded that unhygienic conditions in the most northern camp due to the population sleeping with their animals and slaughtering sick animals at the camp site was likely to be causing widespread disease. Similarly, in the most southern camp, there was an increase in diarrhoeal disease associated with deteriorating malnutrition prevalence among young children.

Source: United Nations Standing Committee on Nutrition, *Nutrition Information in Crisis Situations, Report Number III*, SCN, August 2004.

[10] Care USA (2010) Infants and Young child feeding practices: Collecting and using data: a step by step guide.

Assessing mortality rate

It is essential to know about mortality rates to understand the overall humanitarian situation. Mortality rates can be collected through ongoing surveillance systems or estimated by collecting retrospective data, usually 90 days prior to the survey date. This is described in detail in **Module 8**. Methodology of mortality surveys is included in the SMART manual and mortality rates can be calculated by ENA software.

In emergencies mortality rates are expressed as number of deaths per 10,000 people per day (unlike stable contexts where they are expressed per annum). Two types of mortality are important: crude mortality rate (CMR) equivalent to all deaths and under-five mortality rate (U5MR) equivalent to the deaths of children under five years of age.

Mortality data can be extremely difficult to collect accurately as **Challenge 4** illustrates.

Challenge 4: Collection of mortality data in emergencies

Mortality data can be collected during emergencies through:

- Official data: through consulting lists of deaths registered by local authorities, clinics, hospitals or religious authorities.
- Grave counting: possible in some situations to go around counting graves, though not possible where, for example, bodies are burnt
- Retrospective mortality surveys: surveys conducted to estimate the number of deaths over the previous 90 days

The problems associated with collection of mortality data include:

- Lack of official data: during conflict, official statistics possibly lost or unavailable
- Bias: health services or registration with official authorities inaccessible to the poorest and most vulnerable
- Inaccurate population figures: where population numbers are rapidly changing due to migration
- Double counting: where one death is reported more than once
- Clustering of deaths: deaths very high in particular area due, for example, to aerial bombardments or other types of military action
- Political pressure: pressure to either overestimate or underestimate civilian casualties and/or combatant casualties in a conflict situation

Mortality data should always be analysed in relation to nutrition survey findings but should be treated with caution as it may not be accurate.

Assessing coverage of nutrition programmes

Nutrition programme coverage could be estimated during an anthropometric nutrition survey by asking the mother if the child attends a feeding centre. The coverage will be the percentage of targeted children who attend the programme.

For blanket feeding programmes, surveys will likely provide adequate precision for coverage prevalence, as all children in the sample are eligible for the programme and can be assessed for enrolment.

For selective feeding programmes however the surveys will likely provide inadequate precision in measuring coverage. Since only a small proportion of the survey sample would be malnourished and eligible for enrolment, this sample size (only including those malnourished in the sample) would be inadequately low to estimate coverage with acceptable precision, especially for severe acute malnutrition.

Two other methods, which have a good precision, for estimating programme coverage, have been developed, especially suitable for Therapeutic Feeding Programmes (TFPs). These approaches use different kind of sampling than the ones described above: the Centric Systematic Area Sampling (CSAS) and the Lot Quality Assurance Sampling (LQAS). They have been successfully used in several countries.[11]

[11] Valid International (2006) Community-based Therapeutic Care. A field manual; Myatt & al. SQUEAC and SLEAC: low resource methods for evaluating access and coverage in selective feeding programmes. http://www.validinternational.org

Conclusion

Nutrition assessments are essential to guide response during an emergency. Anthropometric nutrition surveys are frequently carried out to establish the prevalence of acute malnutrition. Additional data, such as information on food security, public health and care practices is needed to understand the overall nutrition and humanitarian situation.

There are well-established techniques for conducting anthropometric nutrition surveys and a large number of guidelines are available but their implementation still needs careful preparedness, training and supervision.

There are some technical challenges to current practice, however. For example, methods for comparing prevalence of malnutrition to thresholds are being tested, while the collection of non-anthropometric data remains non-standardised.

Annex 1: Two-stage cluster sampling methodology

In this example, the sample size required is 600 children. It was estimated that 20 children could be surveyed by day and therefore that 30 clusters needed to be selected.[12]

Step 1: Selection of the clusters

1. Identify the population to be surveyed (e.g., population of a refugee camp or drought stricken area).
2. Divide the population into the lowest existing or natural groupings (e.g., villages, districts or camp sections).
3. Estimate the population in each village, district or camp section (use census data if available).
4. Make a table with six columns (see **Box** below).
   - Column 1 should include the name of each locality (village, district or camp section) in any order.
   - Column 2 should contain the estimated total population of each locality.
   - Column 3 should contain the estimated population of the children in each locality.
   - Column 4 should contain the cumulative population of the children (obtained by adding the population of each locality to the combined population figure of the preceding localities).
   - Column 5 should contain the attributed numbers for each unit – the range of the cumulative population for each unit.

Geographical unit	Estimated total population	Estimated children 6-59 months	Cumulative population 6-59 months	Attributed numbers	Location of clusters
Locality 1	2,500	500	500	1-500	1
Locality 2	1,000	200	700	501-700	2
Locality 3	800	160	860	701-860	0
Locality 4	3,250	650	1,510	861-1,510	3, 4
Etc…	…	…	…	…	…
Total	**50,000**	**10,000**			**30**

5. Calculate the 'sampling interval'. This is obtained by dividing the total 6 to 59 months population by the desired number of clusters, which is 30 in this example. The sampling interval is therefore 10,000/30 = 333.
6. Determine the location of the first cluster. Its location is randomly chosen by selecting a number within the first sampling interval (1 to 333 in this example). The number can be randomly selected using a random number table. Let us assume that 256 is the starting point. This number places the first cluster in 'Locality 1' in the example because it has the attributed numbers 1 to 500.
7. Select the other clusters. Add the sampling interval sequentially to the starting number until 30 numbers are chosen. Each number chosen represents the population of a geographic unit. In this example, the first cluster is at 256 (Locality 1), the second cluster at 256 + 333 = 589 (Locality 2), the third cluster is at 589 + 333 = 922 (Locality 4), the fourth cluster is at 922 + 333 = 1,255 (Locality 4), etc. A large geographical unit may appear twice - two clusters are drawn in Locality 4 in the example. In the same way, a small geographical unit (smaller than the sampling interval) may not be selected – Locality 3 in the example.

[12] ENA and ENA for epi-info software can do the selection automatically

Step 2: Selection of the 20 children in each of the 30 clusters[13]

In this example it was assumed that there was an estimated 1.5 eligible children per household, meaning that 14 households (20/1.5 = 13.3, rounded up to 14) needed to be surveyed per cluster.

Random or systematic sampling

There are several methods of choosing the households from the cluster. The best way is to treat each cluster as if it is a "small population" and to select the houses using the simple or systematic random sampling methods described above (see table 1 p 9). If the cluster is to be taken from a larger population, the first step of stage 2 is to subdivide the population into segments of roughly the same number of people. One of these segments is then chosen from the random number table. If segments are of unequal size, one segment should be chosen by probability-proportional-to-size.

Modified EPI method

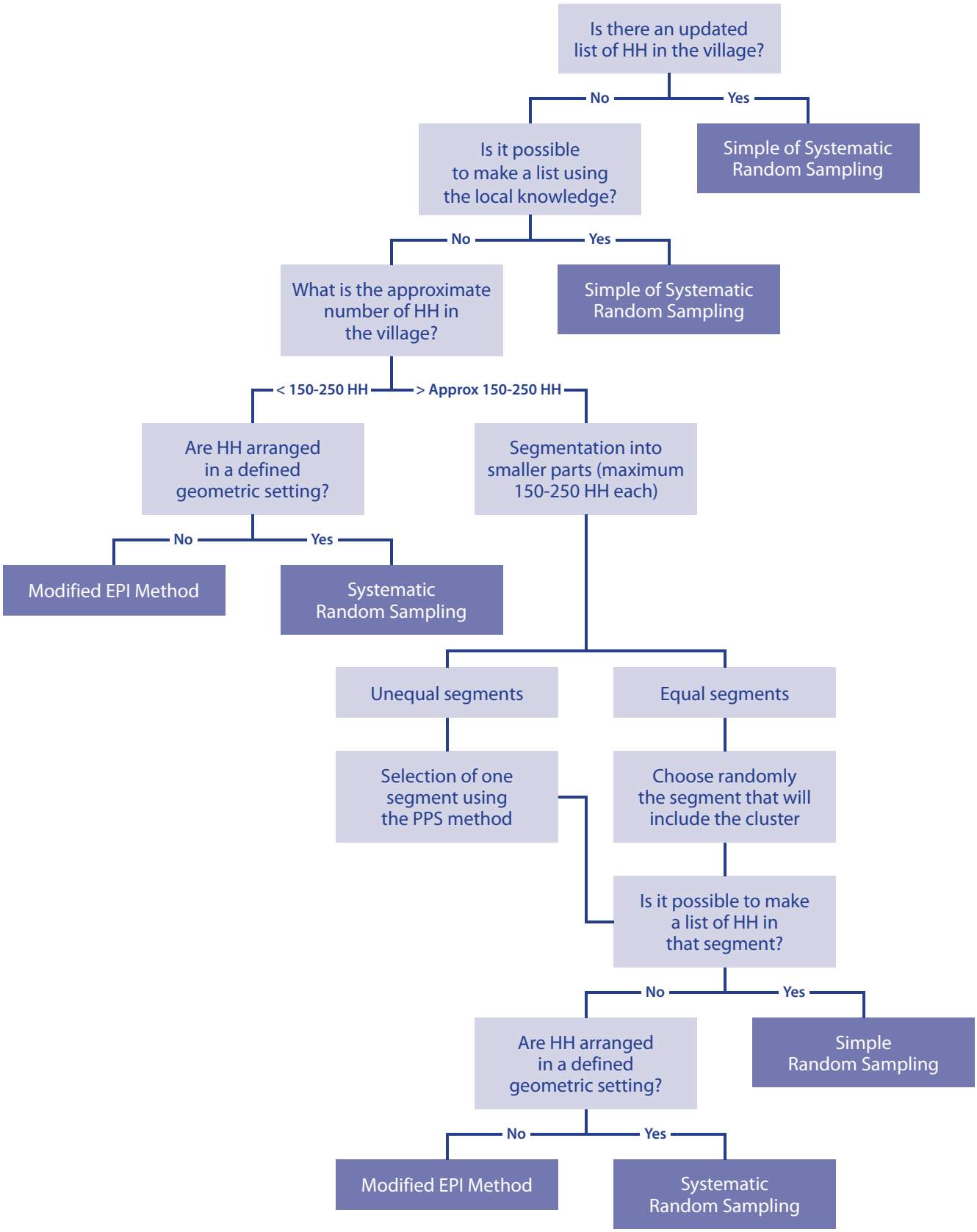
If it is not possible to select the households in this way, the "EPI" method can be used. Although, this method is simple, widely known, easy to train, and rapid, it results in a somewhat biased sample. However, the time taken to select the sample and move from house to house is far less in some circumstances (e.g. no list of households, sparse population) when the EPI method is used.

When the team arrives at the village that will contain the cluster, the following procedure should be followed after discussions with the village leaders:

1. Go to somewhere near the center of the selected cluster area.
2. Randomly choose a direction by spinning a bottle, pencil, or pen on the ground and noting the direction it points when it stops.
3. Walk in the direction indicated, to the edge of the village. At the edge of the village spin the bottle again until it points into the body of the village. Walk along this second line counting each house on the way.
4. Using a random number list select the first house to be visited by drawing a random number between 1 and the number of households counted when walking. For example, if the number of households counted was 27, then select a random number between one and 27. If the number 5 was chosen, go back to the fifth household counted along the walking line. This is the first house you should visit.
5. Go to the first household and examine all children aged 6-59 months in the household for the nutrition survey and complete the additional questionnaire(s), if any (e.g. mortality).
6. The subsequent households are chosen by proximity. In a village where the houses are closely packed together, choose the next house on the right. Continue in this direction until the required number of children or households have been surveyed. The same method should be used for all the clusters. If the village is spread out, choose the house with the door closest to the last house surveyed, whether on the right or left; this saves a lot of time in an area where the dwellings are spread.

[13] From SMART manual, Version 1

Annex 2: Second Stage Sampling Decision Tree



Annex 3: Calculation of sample size (n)

The population of an emergency-affected district in rural Asia is 10,000 and the estimated (expected) prevalence of acute malnutrition (weight for height < -2 SD) is 10 per cent. The precision required is 3 per cent and the design effect is 1.5.

Using the formula below where:

p = estimated prevalence of acute malnutrition

d = estimated precision

deff = design effect

$$\frac{p \times (1 - p)}{(1.962 \times d2) \times deff} = \frac{0.10 \times (1 - 0.10)}{1.962 \times 0.032 \times 1.5} = 390$$

The required sample size is a minimum of 390 children aged 6 to 59 months.

Annex 4: Examples of anthropometric data collection forms

CLUSTER COLLECTION FORM (1 form to be filled per cluster)

Date_____ Team Number_____ Cluster Number_____ Cluster Name_____ District:_____

Chid no.	HH no.	Age in months	Sex (F/M)	Weight (kg)	Height (cm)	Oedema (Y/N)	WHM	Measles Card = 1 Yes but no card = 2 No = 0	Vit A within the last 6 months(Y/N)

HOUSEHOLD COLLECTION FORM (one form to be filled per household)

Household Number_____ Date_____ Team Number_____ Cluster Number_____ Cluster Name _____ District _____

First Name Follow same order as per table on page 1	**Age (months)**	**Sex** 1 = Male 2 = Female	**Oedema** 1 = yes 2 = No	**Height (cm)** To the nearest one tenth)	**Weight (kg)** To the nearest one tenth)	**MUAC (cm)** To the nearest one tenth)	Diarrhoea[1] in last two weeks 1 = Yes 2 = No	Serious ARI[2] in last two weeks 1 = Yes 2 = No	Febrile illness/ suspected Malaria[3] in the last two weeks 1 =Yes 2 = No	Suspected Measles[4] in last one month 1 = Yes 2 = No	Where did you seek healthcare assistance when child was sick? (If yes in 1 = No assistance sought 2 = Own medication 3 = Traditional healer 4 = Private clinic/ Pharmacy 5 = Public health facility
1											
2											
3											
4											

[1] Diarrhoea is defined for a child having three or more loose or watery stools per day

[2] ARI asked as oof wareen or wareento. The three signs asked for are cough, rapid breathing and fever

[3] Suspected malaria/acute febrile illness: – the three signs to be looked for are periodic chills/shivering, fever, sweating and sometimes a coma

[4] Measles (Jadeeco): a child with more than three of these signs- fever and, skin rash, runny nose or red eyes, and/or mouth infection, or chest infection

CHILD COLLECTION FORM (one form to be filled per child)

Team no. …☐☐ Cluster no. …☐☐ Household no. …☐☐ Date ☐☐/☐☐/☐☐☐☐ Child ID ☐☐☐☐☐		
C. Child Questionnaire (This should be administered to the primary caretaker of the child). Complete one form per child aged 6-59 months in the household visited.		
C 1.1	What is the child's name? (optional)	……
C 1.2	Date of birth of child (record from EPI/ health card if available)	☐☐-☐☐-☐☐☐☐
C 1.3	Age of child (months) (estimate using event calendar if EPI/health care not available)	☐☐
C 1.4	Sex of child	Male …… 1 Female …… 2
C 1.5	Weight (Kg)	☐☐.☐ N/A (refused to measure/not measured) …… 88.8
C 1.6	Height/length (cm)	☐☐☐.☐ N/A (refused to measure/not measured) …… 888.8
C 1.7	Bilateral pitting oedema	Yes …… 1 No …… 2
C 1.8	Mid upper arm circumference (mm)	☐☐☐ N/A (refused to measure/not measured) …… 888
C 1.9	Weight-for-height (% median or z-score)	
C 2.0	Child referred	Yes …… 1 No …… 2
C 2.1	If any of the above measurements was not done, what was the reason for not measuring the child?	Not present at the time of measuring …… 1 Sick …… 2 Not willing to be measured …… 3 Other specify …… 4

Annex 5: Template for a nutrition survey report

Based on Save the Children United Kingdom's *Emergency Nutrition Assessment: Guidelines for Fieldworkers*, Chapter 3: Presenting the Report.

Report summary

- Write the summary last, after you have finished the rest of the report.
- Ninety per cent of readers will probably only look at this section. Make sure all important information is here and it is very clear. Diagrams are very useful.
- This section of the report should be short (one or two pages).
- Information should include: the area covered, the date and the objectives of the assessment, the methodology used, the main results and the recommendations.

Report introduction

- The context in which the assessment was carried out should be described. What population was surveyed, over what period and in which geographical area?
- The introduction should set out the context, so that someone who has never been to the area can understand how the surveyed community lives and what has happened to them.
- This information is mainly from secondary sources, or interviews with district officials, etc.

Objectives of the assessment

- The objectives of the assessment should be clearly stated.
- What was measured, in which population and why?

Methodology

- Describe in a straightforward way the methods employed, including area surveyed, population data, and sampling techniques. This is necessary so that readers can be sure of the validity of the assessment and have a clear reference for future comparison.
- Describe selection criteria for inclusion in the survey.
- Describe what measurements were taken, by whom and using what instruments.
- Describe how the training and how the questionnaires were designed and piloted.
- Describe field work including supervision
- Describe the methods for cleaning data, how data were analysed (including definition of acute malnutrition), calculation of Confidence Intervals, which software was used.

Results

- Describe any problems encountered or suspected bias during the survey
- Describe the population surveyed: how many children absent, how many data discarded form the survey
- A table of the distribution of the sample, according to age and sex, is required.
- All nutrition assessments should report the anthropometric statistics tables and analysis of additional variables if any were included

Discussion

- The discussion puts the results into context. The aim of the discussion is to explain the results (prevalence of acute malnutrition and potential additional data) in terms of the determinants of malnutrition – health, care environment and food security.
- Organize your discussion by addressing the questions:
  - Is the level of acute malnutrition typical (referring back to previous surveys or baseline levels)?
  - What are the likely major determinants of malnutrition resulting from the emergency (taking into account determinants already addressed by other interventions)?
  - What are the prospects for the coming months?
  - Who is worst affected?
  - What might be the chronic determinants of malnutrition?
  - What does the community recommend?
  - Do the results seem plausible? Are there any unanswered questions?
- Much of the information for the discussion will come from referring back to the results section and looking at the findings in the light of your causal analysis based on secondary data, key informant interviews, observations, etc.
- A diagram showing the location specific causal framework of malnutrition may be useful.

Conclusions

- This section describes the seriousness of the situation.

Recommendations

- A report must include recommendations based on the findings. When possible, estimates on how the situation is likely to evolve are needed and the recommendations should give a clear indication of the appropriate time line so that they can have the maximum impact.

Annex 6: Nutrition assessment checklist (refer to http://www.cedat.be for latest version of checklist)

Pre-survey preparation and planning

Objective of the survey
1) Nutrition
2) Mortality
3) Vaccination

Population
4) Type of population stated
5) Total population in universe stated

Location
6) Geographical scope of the survey stated
7) Area excluded from sampling frame listed

Time period
8) Survey dates are stated ((dd-)mm-yyyy)

Translation
9) Language of the questionnaire is stated
10) Language of the interview is stated

Questionnaire/tool
11) Pre-testing of questionnaire stated
12) Use of local event calendar stated

Training
13) Training organisation stated

Methods

Sampling design
16-18 only if cluster sampling, ↳ 19 for other sampling designs
14) Type of sampling design stated
15) Rationale for sampling design explained
16) State if PPS was used
17) Number of clusters [ ] x [ ]

Final stage
19 only if mortality module included, otherwise ↳ 20
18) State final stage sampling
19) State if HH without U5 were included
20) Stated whether sample size was increased to account for non-response?

Household
22 only if nutrition/vaccination module included, otherwise ↳ 23
21) State definition of HH
22) State selection of U5 in the HH
23) HH selection in a compound is explained
24) Procedure for choosing respondent stated
25) Procedure for re-visiting absent hh stated

Sample size precision
26-28 only if nutrition module included, ↳ 29 ; 29-31 only if mortality module included, otherwise ↳ 32
26) Expected GAM: [ ] Stated why?
27) Expected Deff for GAM: [ ] Stated why?
28) Desired precision for GAM: [ ] Stated why?
29) Expected CMR: [ ] Stated why?
30) Expected Deff for CMR: [ ] Stated why?
31) Desired precision for CMR: [ ] Stated why?

Nutrition survey
32-36 only if nutrition module included, otherwise ↳ 37
32) GAM includes bilateral oedema
33) Inclusion criteria in terms of age or height described?
34) Weight and height smallest rounding unit described?
35) Cut-off for measuring children lying or standing stated?
36) Questionnaire is provided in Appendix

Methods (Ctd)

Mortality survey
37-40 only if mortality module included, ↳ otherwise 41
37) Recall period stated
38) Denominator calculation indicated
39) Census method indicated
40) Questionnaire is provided in Appendix

Results

Analysis
41) Name, version of the software and statistical procedure stated

Nutritional indicators
module included, otherwise ↳ 50
Definition: 42) Prevalence of GAM based on Weight for Height Z-scores reported?
43) Type of growth ref. used (WHO or NCHS) stated?
Precision: 44) Confidence interval [;]
45) Design effect: [ ]
46) Plausibility checks mentioned
47) Definition of flags stated
48) Flags exclusion from analysis described?
49) Sample size of 6-59 months: [ ]

Mortality indicators
module included, otherwise ↳ 60
Definition: 50) CMR expressed as death per 10,000/day, 1,000/month or 1,000/year
Precision: 51) Confidence interval [;]
52) Design effect: [ ]

Demographic indicators
53) Births: [ ] 54) Deaths: [ ]
55) Persons joined: [ ] 56) Pers. left: [ ]
57) Population at the time of the survey: [ ]
58) n° of households: [ ]
59) n° of U5 (0-59 months): [ ]

Vaccination indicators
60 - 63 only if vaccination module included, otherwise ↳ 64
60) MCV coverage by card and history
61) Confidence interval [;]
62) Age range for inclusion in analysis stated?
63) n° of children in the analysis: [ ]

Discussion

Limitation and bias
65-67 only if cluster sampling, ↳ 67 only if replacement was made, otherwise ↳ 68
64) % non response: [ ]
65) % inaccessible clusters: [ ]
66) Final number of clusters: [ ]
67) Replacement method stated?
68) Potential bias described?

Comparison of results
69) Results are compared to a reference

Interpretation of results
70) Recommendations are given

CRED

CE-DAT Completeness Checklist DRAFT © 21/09/2009

Annex 7: Nutrition assessment checklist

Based on The Sphere Handbook 2011. Chapter 3: *Minimum Standards in Food Security and Nutrition*, Appendix 3.

Below are sample questions for assessments examining the underlying causes of undernutrition, the level of nutrition risk and possibilities for response. The questions are based on the conceptual framework of the causes of undernutrition. The information is likely to be available from a variety of sources and gathering it will require various assessment tools, including key informant interviews, observation and review of secondary data.

Pre emergency situation:

- What information already exists on the nature, scale and causes of undernutrition among the affected population?

The current risk of undernutrition:

1. The risk of undernutrition related to reduced food access: *See Sphere Appendix 1 for food security and livelihoods assessment checklists*.
2. The risk of undernutrition related to infant and young child feeding and care practices:
   a) Is there a change in work and social patterns (e.g. due to migration, displacement or armed conflict) which means that roles and responsibilities in the household have changed?
   b) Is there a change in the normal composition of households? Are there large numbers of separated children?
   c) Has the normal care environment been disrupted (e.g. through displacement), affecting access to secondary caregivers, access to foods for children, access to water, etc?
   d) Are any infants not breastfed? Are there infants who are artificially fed?
   e) Has there been any evidence or suspicion of a decline in infant feeding practices in the emergency, especially any fall in breastfeeding initiation or exclusive breastfeeding rates, any increase in artificial feeding rate, and/or any increase in proportion of infants not breastfed?
   f) Are age-appropriate, nutritionally adequate, safe complementary foods and the means to hygienically prepare them accessible?
   g) Is there any evidence or suspicion of general distribution of breastmilk substitutes such as infant formula, other milk products, bottles and teats, either donated or purchased?
   h) In pastoral communities, have the herds been away from young children for long? Has access to milk changed from normal?
   i) Has HIV/AIDS affected caring practices at household level?

3. The risk of undernutrition related to poor public health:
   a) Are there any reports of disease outbreaks which may affect nutritional status, such as measles or acute diarrhoeal disease? Is there risk that these outbreaks will occur?
   b) What is the estimated measles vaccination coverage of the affected population?
   c) Is Vitamin A routinely given with measles vaccination? What is the estimated Vitamin A supplementation coverage?
   d) Are there any estimates of mortality rates (either crude or under five)? What are they and what method has been used?
   e) Is there, or will there be, a significant decline in ambient temperature which is likely to affect the prevalence of acute respiratory infection or the energy requirements of the affected population?
   f) Is there a high prevalence of HIV?,
   g) Are people already vulnerable to undernutrition due to poverty or ill health?
   h) Is there overcrowding, or a risk of/high prevalence of TB?
   i) Is there a high incidence of malaria?
   j) Have people been in water or wet clothes or exposed to other harsh environmental conditions for long periods of time?

4. What formal and informal local structures are currently in place through which potential interventions could be channelled?
   - What is the capacity of the Ministry of Health, religious organisations, community support groups, breastfeeding support groups, or NGOs with a long- or short-term presence in the area?
   - What nutrition interventions or community-based support were already in place and organised by local communities, individuals, NGOs, government organisations, UN agencies, religious organisations, etc.? What are the nutrition policies (past, ongoing and lapsed), the planned long-term nutrition responses, and programmes that are being implemented or planned in response to the current situation?