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Guidelines for Emergency Nutrition & Mortality Surveys in Somalia

June 2011

Acknowledgements

This document, compiled by UNFAO/Food Security and Nutrition Analysis Unit (FSNAU), with input from partners, builds on the October 2006 Revised Nutrition Survey Guidelines for Somalia. Specific references have been made from :

- The global SMART initiative (SMART methodology, Working papers and minutes from the April 7-8, 2008 SMART meeting in Rome), as well as communications between FSNAU with Oleg Biluka, and input from Grainne Moloney on specific technical issues related to SMART.

  The latest SMART methodology can be downloaded on www.smartindicators.org, and the new delta version released in July 2010 can be downloaded from www.nutrisurvey.net/ena/ena.html.

- The nutrition Survey guidelines developed by: Emergency Nutrition Coordination Unit (ENCU 2008) in Ethiopia, Save the Children and FANTA, as well as the national guidelines developed for Niger and Uganda.

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To all of you, we say,

"Mahad Sanid".

The June 2011 version of the Nutrition Survey Guidelines for Somalia, remains a working document, and will be updated and refined as new information becomes available.
If you have any questions, please contact FSNAU at info@fsnau.org

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Glossary of Acronyms

95% CI	95% Confidence Interval
AAH/ACF	Action Against Hunger/Action Contre la Faim
BCG	Tuberculoses vaccine
CDC	Center for Disease Control, Atlanta, USA
CDR	Crude Death Rate
CMR	Crude Mortality Rate
DHS	Demographic and Health Survey
DPPC	Disaster Prevention and Preparedness Committee
EA	Enumeration Area
ENA	Emergency Nutrition Survey software
ENCU	Emergency Nutrition Coordination Unit
EPI	Expanded Program of Immunization
EWD	Early Warning Department
EWS	Early Warning System
GAM	Global Acute Malnutrition
GPS	Global Positioning System
HFA	Height-For-Age
HH	Household
HMIS	Health Management Information System
ID	Identification number
IDP	Internally Displaced Person/People
LZ	Livelihood Zone
MAM	Moderate Acute Malnutrition
MOARD	Ministry Of Agriculture and Rural Development
MOH	Ministry Of Health
MSF	Médecins Sans Frontières
MUAC	Mid-Upper Arm Circumference
NCHS	National Center for Health Statistics (USA)
NGO	Non-Government Organization
PSU	Primary Sampling Unit
SAM	Severe Acute Malnutrition
SD	Standard Deviation
SMART	Standardized Methodology for Survey in Relief and Transition
TB	Tuberculosis
TFP	Therapeutic Feeding Programme
UN	United Nations
UNFAO	United Nations Food and Agriculture Organization
UNHCR	United Nations High Commission for Refugees
UNICEF	United Nations Children Fund
WFA	Weight-For-Age
WFH	Weight-For-Height
WHO	World Health Organization

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1. Introduction

The Nutrition Cluster for Somalia is the technical unit responsible for coordination of nutrition programming and emergency response. Coordination of the Nutrition Cluster activities is decentralized with monthly meetings conducted at Nairobi level and also in the Northwest, Northeast and South central zones, subject to access. Membership of the Nutrition Cluster includes technical staff from local authorities, Somali national organizations and institutions, donors, non-governmental organisations (NGOs) and United Nations (UN) agencies working in the field of nutrition. One of the Terms of reference for the Nutrition Cluster[1] in 2010 is to develop or update standard protocols for surveys, analysis and response in addition to building the capacity of partners in this regard. The Nutrition Cluster is currently co-chaired by UNICEF and DIAL, a local organization, both of whom are also responsible for the overall attainment of the cluster terms of reference.

The first edition of *Nutrition Survey Guidelines for Somalia* was produced by the Nutrition Cluster in February 1997, and the first revision undertaken in March 1999. The aim was to facilitate the application of fundamental concepts and principles necessary for emergency nutrition surveys[2] and thereby improve the quality of surveys conducted. These included standardization of Survey methodologies to 30 x 30 cluster sampling and the adoption of standard indicators and a standard tool. Nevertheless, with new advances in the field of nutrition surveys, three further revisions have since been conducted[3]. The June 2005 revision was done to accommodate findings from a pilot study conducted by the FSNAU on the SMART recommended mortality questionnaire, and *Nutrisurvey* software in October 2004-April 2005. The March and October 2006 revisions incorporated evolving recommendations from SMART to include the use of segmentation in sampling households rather than the EPI method (spinning of a pen) as previously done, and to use Ena for SMART in analysis of mortality data. The Food Security and Nutrition Analysis Unit of the United Nations Food and Agriculture Organization (FSNAU/UNFAO) has spearheaded these revisions while involving stakeholders at all stages. Lessons learned suggest that quality of nutrition surveys has improved with the SMART methodology, nevertheless, additional guidance remains useful.

In order to make the standard of nutrition surveys in Somalia compatible with the current internationally accepted standards, and to make the methodologies suitable for use in the Somalia context, there was a need to update the October 2006 guidelines. The 2011 version of the guidelines endorsed by the Nutrition Cluster in the December 7th-8th, 2010 special meeting, therefore aim to offer advice on planning, collection, analysis and interpretation of high quality nutrition data in Somalia. In addition, the use of livelihood zoning in planning and conducting nutrition surveys as well as the specific aspects to consider when conducting nutrition surveys in pastoralist areas are addressed in this version.

The guidelines therefore help standardise all emergency nutrition survey efforts and serve as a standard reference against which all nutrition surveys conducted in Somalia are assessed. Following the endorsement, the UNFAO/FSNAU rolled out the nutrition survey guidelines to 17 partners in Nairobi, during a three day training on March 16th – 18th, 2011.

Because SMART is an interative initiative that constantly improves the tools it uses, these guidelines are intended to be updated on a regular basis to ensure that surveys in Somalia maintain high quality and use the most advanced methodologies and tools available. Any ad-hoc update from this guideline can be obtained from the UNFAO/FSNAU office.

[1] currently co-chaired by UNICEF and a local organization, Development Initiatives Access Link (DIAL)
[2] The terms "survey" and "Assessment" are commonly used for the same purpose. In these guidelines, "survey" will be used to avoid confusion with "rapid assessment" that refers to another type of methodology and purpose in Somalia.
[3] The 2nd revision was undertaken in January 2005, the 3rd revision in March 2006 and the fourth revision in October 2006.

2. Planning the Survey

2.1. Procedures to undertake a nutrition survey in Somalia

2.1.1. *Coordination of nutrition surveys in Somalia*

In Somalia, it is the Nutrition Cluster's responsibility to facilitate generation and use of good quality nutrition-related information. Specific roles as relates to nutrition surveys include ensuring good coordination of nutrition surveys across Somalia, review of the quality of surveys and endorsement of the findings. FSNAU/UNFAO, has undertaken the mandate of maintaining a central database of survey data and reports, all of which will be transferred to the Somali authorities, when the situation permits.

All nutrition surveys conducted in Somalia are therefore required to be implemented in collaboration with the Nutrition Cluster. The flowchart detailed in Figure 1 shows the main steps in nutrition Surveys followed in Somalia, which can be grouped as: 1) Decision/justification to conduct a nutrition survey, 2) Survey implementation, and 3) Validation of survey results.

It is important to coordinate the implementation of surveys to avoid duplication and/or to estimate information gaps. Surveys will be much more informative if they are coordinated so that data from several agencies, geographic areas, or population groups can be examined together to give a wider perspective on the situation.

2.1.2. *Decision/justification to conduct a survey*

The flow-chart shows the coordinating process of nutrition survey implementation in Somalia and should be respected by all partners.

2.1.2.1. Trigger mechanism

The responsibility for deciding whether to undertake a nutrition survey ultimately lies with the implementing partner. Due to its role to provide up-to-date nutrition information, FSNAU, in partnership with UNICEF and with involment of local nutrition implementing partners, conducts seasonal nutrition assessments in the vulnerable areas of Somalia. Implementing agencies such as Action Contre La Faim (ACF), Medicines Sans Frontiers (MSF) and International Medical Corps (IMC) also conduct surveys periodically, for baseline, monitoring and/or evaluation purposes. Implementing agencies are required to share their survey plans with the Nutrition Cluster well in advance to enhance participation, technical input, avoid duplication and to enhance a multi-sectoral response to recommendations.

2.1.2.2. Gathering available information

Before starting a nutrition survey, there should be a systematic review of available information at the regional level to justify a survey. The information review should include the routine bulletins and assessments reports from FSNAU (on food security and nutrition), WHO/SHSC (health), UNICEF and UNOCHA (responses on maternal and child health) and any latest available information from an Early Warning System (EWS). It is also important to learn as much about the population as possible from existing sources, including population characteristics and figures (UNHCR IDP population figures, UNDP and WHO population figures), previous surveys and assessments, health statistics (WHO/HMIS), nutrition information (publications from the FSNAU, UNICEF, OCHA etc), food security information (FSNAU), situation reports (security and political situation), maps, anthropological and clan specific information. Only after this data is gathered can judgment be made about any additional information that should be collected.

Figure 1: Flow chart on the Decision making process to undertake a Nutrition Survey in Somalia

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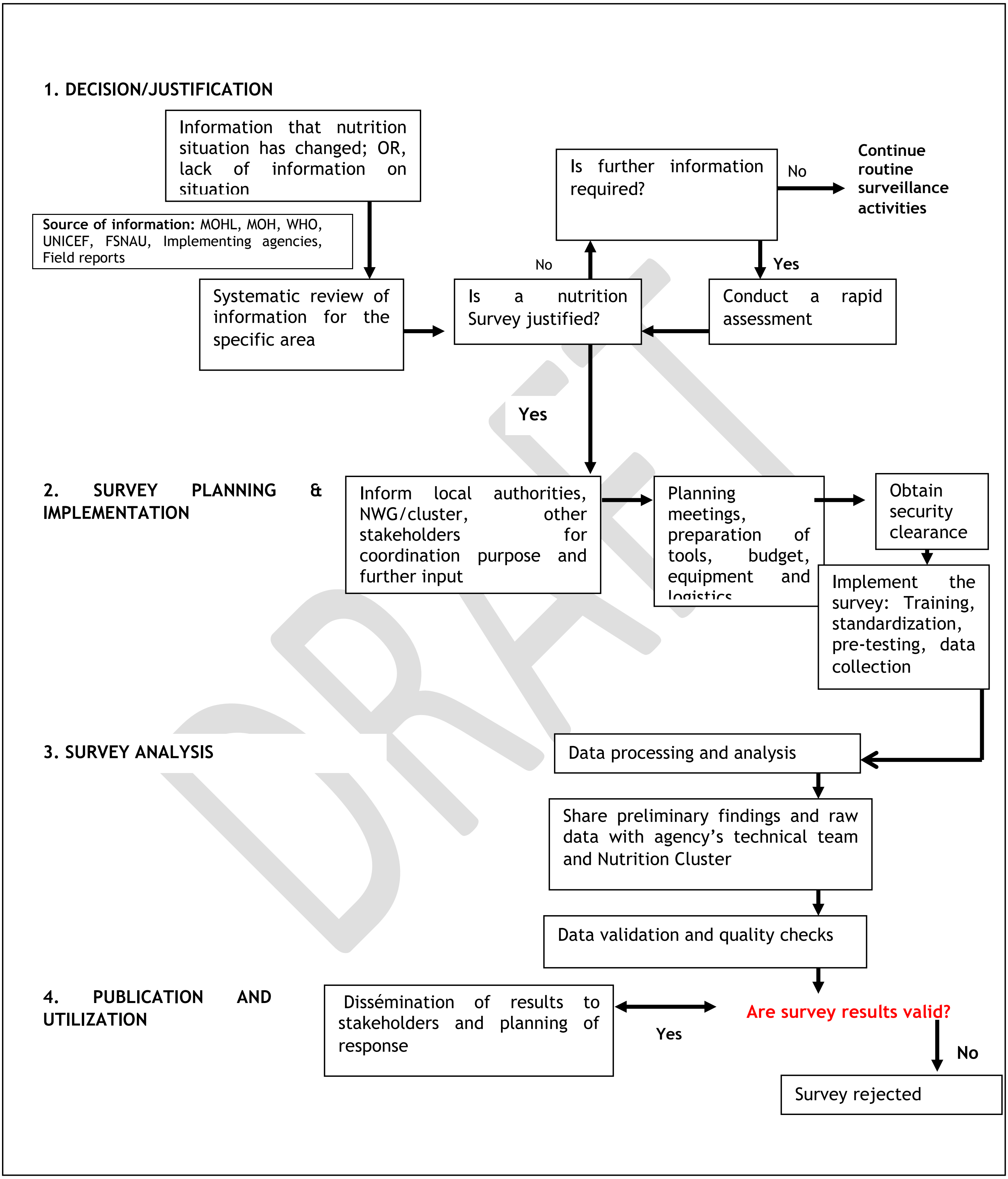
1. DECISION/JUSTIFICATION
Information that nutrition situation has changed; OR, lack of information on situation
Source of information: MOHL, MOH, WHO, UNICEF, FSNAU, Implementing agencies, Field reports
Systematic review of information for the specific area
Is a nutrition Survey justified?
No
Is further information required?
No
Continue routine surveillance activities
Yes
Conduct a rapid assessment
Yes
2. SURVEY PLANNING & IMPLEMENTATION
Inform local authorities, NWG/cluster, other stakeholders for coordination purpose and further input
Planning meetings, preparation of tools, budget, equipment and logistics
Obtain security clearance
Implement the survey: Training, standardization, pre-testing, data collection
3. SURVEY ANALYSIS
Data processing and analysis
Share preliminary findings and raw data with agency's technical team and Nutrition Cluster
Data validation and quality checks
4. PUBLICATION AND UTILIZATION
Dissémination of results to stakeholders and planning of response
Yes
Are survey results valid?
No
Survey rejected

2.1.2.3 Pre-requisite for undertaking a nutrition survey

Conducting a nutrition survey is expensive and time-consuming. Therefore before starting a survey, the following points should be considered:

- Are the results crucial for decision-making?
  If a population's needs are obvious, immediate programme implementation is the first priority. A nutrition survey can be carried out later. For example, if there has been a natural disaster, such as flooding, and it is clear that the population's main food source has been destroyed, it is not necessary to undertake a survey, but a rapid nutrition assessment will be necessary. Similarly, if another agency has recently carried out a nutrition survey in the same area then it should not be necessary to repeat the process. Ideally, there should be collaboration at the planning stage and the survey questionnaire adjusted by an agency conducting the nutrition survey, to accommodate information needs of the stakeholders involved; and therefore negate the need for further surveys. Nevertheless, if a survey conducted scores poorly on data quality, a replacement survey could be considered to provide information that would elicit a response.
- Will results be used to inform action?
  There is no point undertaking a nutrition survey when it is clear that a response will not be possible (unless the data is to be used for baseline information). Before undertaking the survey, it must be ensured that a response is possible, if needed.
- Is the affected population accessible?
  Insecurity or geographical constraints may result in limited access to the population of interest. If this is extreme, a survey cannot be conducted.

Unless these three pre-requisites are fulfilled, a nutrition survey should not be undertaken.

2.1.3. *Survey implementation*

As soon as the decision to undertake a nutrition survey is made, the implementing partner should convey this information to the Nutrition Cluster for the purpose of coordinating nutrition activities. At this stage for example, the implementing partner will be informed if there is any conflicting activity at the proposed time (e.g. vaccination campaigns or food distribution exercise) that would adversely affect presence of the target group and if there is need to reschedule.

At this stage also, the agency should begin to liaise with local authorities in order to get formal approval to conduct a nutrition survey and with other agencies on the ground for the purpose of collaboration.

As much as possible, nutrition surveys should be conducted by multi-agency teams comprising international and national NGOs, relevant local authorities and UN agencies. Liaison with the FSNAU's nutrition technical team has proved helpful in improving the quality of training of the assessment team, data collection where the capacity of partners is limited.

2.1.4. *Validation of survey results*

2.1.4.1. Endorsement of survey results

Where possible debriefing sessions are conducted where preliminary results are shared with the local authorities and community representatives. Until the local institutions and majority of the implementing agencies have the technical capacity to do so, the responsibility of endorsing survey results remains under the Nutrition Cluster, where the FSNAU plays a technical role. In the spirit of collaboration, implementing agencies are required to check for bias in the selection of clusters and children and in the overall quality of survey data within one week before a survey can be officially validated by the Cluster. FSNAU provides technical advice in this regard. Once data is validated, preliminary findings need to be shared with the Cluster within a month after the survey. The raw data is also shared with the FSNAU which is currently the repository for Somali nutrition survey data at Nairobi level.

1.1.4.2 Reporting and dissemination of results and the report

When survey results have been formally approved, finalized reports should be released one month after the completion of data collection. Survey report should follow the standard format of this 2010 manual, which is partly based on SMART reporting format requirement. Survey results should not be disseminated before being reviewed and approved by the Cluster. Once approved, results should be communicated by the implementing agency to their working partners. FSNAU disseminates survey findings through community debriefings, cluster presentations and the Nutrition Update bulletin.

2.2. Defining objectives

Clear objectives make it much easier for the team, the population, the response agencies and donors to understand why the survey is being conducted. These should be clearly stated at the outset.

Emergency nutrition surveys are usually conducted to assess the ***severity*** of the situation by quantifying the acute malnutrition and mortality in a given population at a defined point in time. This is done by estimating the prevalence of wasting and oedema in children aged 6–59 months and the death rate of the entire population. With an estimate of population size, the proportion of malnourished children and the death rate give an estimate of the absolute number of malnourished children in the community and how many have died in the recent past. These figures indicate the ***magnitude*** of the problem. The estimates, together with previous surveys, food security and contextual data, also indicate the ***urgency*** of the situation and how it may evolve in the future.

The general objective of all nutrition surveys is to assess the nutrition situation for a given population and at a given point in time. However, the rationale behind the need to undertake a survey may differ depending of the utilization of survey results:

- The need to obtain **baseline** nutrition information;
- The need to have nutrition information to **monitor an intervention** or assess its impact;
- The need to get hold of nutrition information to **confirm an emergency** and/or advocate for a response;
- The need to have desegregated information to **identify high risk groups**, to estimate the number of beneficiaries, or to better target a response.

Undertaking a nutrition and mortality survey provides an opportunity to collect additional information that can be critical in deciding which interventions are most important. It is however crucial to understand that each additional piece of data collected degrades the accuracy of the whole dataset and prolongs and complicates the survey. Thus, any additional information to be collected 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 could be collected more efficiently in other ways (for example from health facilities, sentinel sites or a surveillance system, or from focus group discussion), or whether it would be better to conduct a separate survey to collect the supplementary information. If additional information is to be included in the survey it must be quickly and reliably obtainable during a short visit to the household.

2.3. Defining geographic areas and population group

2.3.1. *Geographic area: Administrative or Livelihood zone*

In designing the survey, the area and population to be surveyed should be carefully defined.

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When planning a livelihood based survey, each livelihood zone should be surveyed separately. Rural livelihoods (pastoralists, agro-pastoralists, pure farmers - riverine, fishing communities) and the urban population should each be clearly defined and considered separately. The agency conducting the survey is therefore advised to review the livelihood zones contained in the area of interest and decide on the delineation of the survey when the zone extends beyond an administrative boundary (i.e. whether to do the survey in the entire livelihood zone, or confine it to the limits of a region or a district), based on the objective of the survey and the response capacity. If more than one livelihood zones is comprised in the area of interest, then the survey should be stratified (refer to section 0) so that each livelihood zone is assessed independently[4]. Vulnerable groups such as IDPs should also be surveyed separately.

It is also common for implementing agencies to confine the survey to the area of program interest. The purpose is usually either for baseline, monitoring or evaluation, with specific information obtained on various indicators including program coverage and nutrition status.

Generally, a survey should be conducted in an area where the population is expected to have a homogeneous nutritional and mortality level. In general, urban and rural areas, refugee/IDP and resident populations should be assessed separately. Frequently, there are areas that cannot be accessed because of insecurity. These areas need to be defined before the survey, clearly marked upon the map, and reported as having been excluded from the survey.

Data from a survey confined to an area *cannot* be extrapolated to indicate the severity of problems in other areas, because the area has been chosen on the basis of an expectation that it is particularly affected. Survey results are only representative of the area surveyed.

2.3.2. *Population groups*

Anthropometric measurements and oedema surveys are most commonly made among children aged 6–59 months, and a crude mortality rate (CMR, also sometimes called Crude Death Rate-CDR) is assessed for the entire population (*all* deaths within a defined period of time). The 6–59-month-old child is considered the most sensitive to acute nutritional stress. Furthermore, there is often baseline data for this particular age group, in addition to considerable experience in conducting surveys of this age group's nutritional status, and a defined criterion for interpretation. This age group is chosen, therefore, to give an indication of the severity of the situation in the *whole population*.

However, in some situations it may be appropriate to include other age groups, such as less than 6-month-old infants, adolescents, adults, women of reproductive age (15-49 years), or the elderly if it is suspected that their nutritional status differs significantly from that of the 6–59-month-old child.

Although other age groups do not need to be surveyed, it is crucial to emphasize that limiting the survey to the 6–59-month age group cannot be used to justify confining interventions to this age group. If a survey has to be made for each age group before it receives help, the surveys themselves would become extremely cumbersome. Every malnourished individual should be eligible for relief.

2.4. Timing of the Survey

The timing of the survey depends greatly on the survey objectives (baseline survey, response to a nutrition crisis, comparison with previous survey, etc.).

[4] FSNAU undertakes nutrition surveys at regional level, based on livelihood zones.

The period to conduct a survey is determined with input from the Nutrition cluster, community leaders and/or local authorities to avoid market days, local celebrations, food distribution days, vaccination campaigns, or other times when people are likely to be away from home. Women may be in the fields for most of the day during ground preparation, planting, or harvesting. Healthy children are more likely to accompany adults to the fields and are less likely to be in the home than ill or malnourished children. The survey results could be wrong if only children who are at home at the time of the survey team's visit are sampled. Wherever possible, community leaders should inform the villages chosen to be surveyed in advance.

There needs to be sufficient time allocated for preparation and literature review, community mobilization, training, pilot testing, pre-testing, data collection and related logistics, analysis, and reporting.

2.4.1. *Rapid-onset emergency*

In case of a rapid onset emergency (confirm an emergency following report of deterioration of nutrition situation from the EWS, anecdotal reports, district officials, result of rapid assessment, etc.), and provided that the need to conduct a survey is justified, a nutrition survey should be conducted as soon as possible, regardless of the seasonal calendar.

2.4.2. *Slow-onset emergency*

The use of seasonal calendars from the livelihood zoning is always appropriate for determining the appropriate timing of the survey, and to justify the need for conducting a survey, be it during a rapid or slow-onset emergency such as drought. An example of a seasonal calendar is provided in Annex1. Seasonal calendars vary greatly from one livelihood zone to the other. For example, a hungry season in pastoral areas will be during the dry season when milk is not available, whereas in the cropping areas it will be before the main harvest. In the riverine areas, it will be during the rainy season when there is inundation/flooding and destruction of food stores.

2.4.3. *Monitoring or evaluation surveys*

The objective of a nutrition survey can also be to monitor or evaluate a nutrition program (especially for response agencies). The timing of such surveys should be according to needs, keeping in mind the timing of the baseline survey and the seasonal calendar of the LZ in which the survey will be conducted so as to make appropriate conclusions.

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2.5. Meet the local authorities, stakeholders and community leaders

It is absolutely essential to meet the local authorities, stakeholders and community leaders before starting a survey. The meetings should at least cover the following points:

- Obtain ethical approval, both at community/local authority level, and at household level
- Agree with the community about the objectives of the survey, general questions to be asked and types of measurement/activities to be undertaken. If the population does not understand why a survey is done, they may not cooperate during the survey.
- Obtain detailed information on population figures at village level to cross check with the pre-determined sampling frame (for instance based on UNDP district and or WHO village population figures), and to be informed of the locations of the mobile pastoral communities
- Obtain information on security and access to the prospective survey area.
- Agree upon the dates of the survey with the local authorities.
- Agree on how the results will be disseminated. In particular, realistically discuss the how the results will reach the relevant authorities, intervention agencies and prospects for intervention, steps that will be taken, and types of programs that are likely to be implemented if the situation is found to be as poor as expected. Do not make promises that may not be fulfilled.

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3. Methodology

3.1. Fundamentals of sampling

3.1.1. *Why take a sample?*

If all children aged 6-59 months from a given population were measured, the nutrition status would be known precisely. This is called a census or exhaustive survey, and it is possible in a small population. However, an exhaustive survey is normally long, costly and practically impossible to carry out in a large population. Instead of surveying all the children, only a sub-group (sample) of the population is usually surveyed.

3.1.2. *Representative data and randomization*

It is essential that a sample "represents" the larger population, so that the results can be extrapolated to the entire 6-59 months population. The information learnt from the sample can only be generalized to the 6-59 months population if the sample is representative of the population from which it is drawn. In other words, representativeness is the prerequisite for extrapolation of results observed for the sample to the 6-59 months population. The 6-59 month population segment is targeted because it is the most vulnerable group to acute malnutrition. Therefore extrapolation to the entire population can only be an overestimation and provides a good conservative estimate for programming. However, if there is indicaton that another age-group (such as women of the reproductive age, adolescents, elderly, or PLWA) might be at increased risk, it should be surveyed as well.

In order for a sample to be representative of the population, the characteristics of the sample group must be similar to those of the total population, and the subject should be chosen randomly, so that each individual in the population has the same chance of being selected. A sample that does not represent the population is "biased".

The two major issues to remember when taking a sample are:
- A sample is representative if each individual or household in the population has an equal chance of being included in the sample, and if the selection of one individual is independent from another individual.
- The information we learn from the sample group can only be generalized to the whole population if the sample is representative.

When planning the survey and collecting the data, it is crucial that the staff understands the importance of following very carefully the sampling procedures in order to obtain an unbiased sample that can represent the surveyed population.

3.1.3. *Choosing a sampling frame*

Since a sample will represent the population for which data are needed, it is important that the sample is carefully selected before undertaking the survey. If information is needed for a subset of the population (children under 5 years-old for example), the sample has to be taken accordingly so that data can be representative of these categories of the population. For example, if a sample of children is taken from a livelihood zone at regional level, it would not be possible to obtain the results for each district in that livelihood zone and see differences in the prevalence of malnutrition between the districts. If the prevalence by district is needed, then a stratified sample of children in the district must be drawn separately at the planning stage.

Taking a sample does not allow breakdowns or cross-classification of data in the population unless the sample was specifically designed to analyse the groups separately.

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Before conducting a survey, the groups of people of interest must be well identified. The data from which the sample will be chosen, called **sampling frame**, will only include the population of interest for a given survey. This is particularly important if it is suspected that the population is heterogeneous and if more than one survey should be conducted, as previously discussed in section 2.3.

3.2. Calculating the sample size

The calculation of the sample size depends on the study design (random vs. cluster sampling). Although most of the surveys conducted in Somalia will follow a cluster sampling design, discussion in section 0.5 will inform on what is the best study design for a given situation. In addition, calculating a sample size will depend on the following major decisions:

1. What are the expected malnutrition prevalence and death rate?
2. How wide a confidence interval can be tolerated? This determines the minimum precision around the estimate of malnutrition or death rate that will result in a useful result.
3. What is the likely design effect (if the survey is to use cluster sampling)?
4. What is the mean household size for the population, if households are the unit of sampling?
5. What is the expected rate of non-response?

Calculating a sample size is almost always a trade-off between the ideal and the feasible. On the one hand, a sample size that is too small (occasionally population groups in Somalia where access is difficult) gives results with limited precision and therefore limited application. On the other hand, increasing sample size beyond a certain level produces only small improvements in precision, but may imply a disproportionate increase in cost.

ENA software is recommended to calculate sample size for each survey, rather than using a standard sample size for all surveys[5]. Sections below detail how to make appropriate estimates for the calculation on the sample size for both nutrition and mortality surveys, and Box 2 shows the practical steps to follow to calculate a sample size using ENA software.

3.2.1. *Sample size for the nutrition component*

3.2.1.1. Expected malnutrition prevalence

The expected malnutrition prevalence[6] can be estimated from prior surveys, from a survey conducted in a similar adjacent area, from routine/surveillance data, or from the results from a rapid assessment[7]. The Somalia Nutrition Survey database currently under the repository of the FSNAU can be consulted to get ideas of what prevalence to find in a given area and at a given season. Adjustments should be made if it is suspected that the level of malnutrition has gone up or down since a previous survey.

3.2.1.2. Defining the precision level

It is important for the precision of the nutrition survey to be known. This gives an indication on how wide a confidence interval can be tolerated.

A greater precision requires a larger sample size. To determine how much precision is required, the main question that the survey intends to answer must be clear. If a survey is meant to establish a widespread malnutrition problem, a low precision level can be used (5-10%). However, if the survey results are to be compared to a baseline or a follow-up survey, a

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[5] Previous guidelines recommended a sample size of 900 children (30 clusters of 30 children). It is no longer recommended to use this as a norm.

[6] Although these guidelines focus on estimation of acute malnutrition, the same logic can be applied to nutrition survey focussing on assessing the level of chronic malnutrition. ENA software can be used to calculate sample size for other variables of interest.

[7] The more representative (many villages, bigger sample size) the rapid assessment arethe better. However, the methodology used to select children is usually not random and results cannot be extrapolated to the entire area.

higher precision level (2-3%) is necessary in order to ensure that any differences between two or more situations are detected.

In general, the lower the prevalence the greater the precision needed. A survey that gives a prevalence of malnutrition of 7.5%, but with a confidence interval of 0%-15% is not sufficiently precise to decide whether to intervene, as the confidence interval encompasses no malnutrition at all to a substantial proportion of the population. In this situation, such a low precision survey would be useless for making program decisions. On the other hand, if there is a very high prevalence of acute malnutrition—say 40%—the precision does not need to be high to enable agencies to make appropriate decisions. A confidence interval of plus or minus 10% is perfectly acceptable under these circumstances. Table 1 shows examples of the precision needed at various levels of malnutrition prevalence (acute and chronic).

Table 1. Example of precision needed at various levels of malnutrition prevalence

Malnutrition prevalence %	**Confidence Interval** Range	**Desired precision** ± %
5	3 - 7	2.0
7.5	5 - 10	2.5
10	7 - 13	3.0
13	10 - 16	3.0
15	11 - 19	3.0
20	15 - 25	5.0
30	22.5 - 37.5	7.5
40	30 - 50	10.0

3.2.1.3. Defining the design effect

When calculating sample size for cluster sampling, a correction factor accounting for heterogeneity among clusters in the population must be used. This factor is called the "design effect". The design effect is low in homogeneous populations and high in heterogeneous populations. The expected design effect can be estimated from a prior survey, from a survey conducted in a similar area, etc. Table 2 also gives example of design effects that can be used depending on the context.

A design effect of 1.0 means the sampling design is equivalent to simple random sampling. A design effect greater than 1.0 means the sampling design reduces precision of estimate compared to simple random sampling (cluster sampling, for instance, reduces precision). A design effect less than 1.0 means the sampling design increases precision compared to simple random sampling (stratified sampling, for instance, increases precision).

Table 2. Example of design effects

Design effect	**Context**
< 1.0	Population is homogenous, usually found within a small area.
1.0 - 1.5	Slight differences seen between clusters.
1.5 - 2.0	Differences seen between clusters
2.0 - 2.5	High variation between clusters, such as population from different livelihood zones.
2.5 -3.0	Some clusters are not affected and others are severely affected

Although a design effect of 2.0 has been used as a standard under the previous guidelines recommendations in the 30 by 30 cluster surveys, this value is often too conservative (i.e., it gives a too large sample size), especially if surveys are conducted in homogeneous populations, as recommended in section 2.3. A lower design effect may be more applicable in most situations, and will result in smaller estimation of sample sizes.

In cluster sampling, the design effect also varies with the number of clusters. Increasing the number of clusters to be surveyed will reduce the design effect. Please refer to section 3.3.5.1 for discussion on the selection of the number of clusters.

It is not advisable to conduct surveys in highly heterogeneous populations such as populations living in different livelihood zones. If a survey is conducted in more than one livelihood zone in which nutrition status are probably different, the design effect will be high. If the design effect is suspected to be higher than 2.0, it may be worthwhile stratifying the survey (conducting separate surveys with lower design effect and subsequently lower sample size rather than obtaining results that cannot give a proper picture of either area).

3.2.1.4. Defining the household size and percent children under 5

For nutrition survey, the sample size is calculated in number of children. Practically, the nutrition Survey will be conducted along with the mortality survey, so the final sample size should be converted in terms of number of households. This requires an estimate of the average household size and the proportion of children aged 6-59 months in the population. This can be estimated from a previous survey or from national statistics, e.g., in Somalia, FSNAU uses statistics obtained from previous surveys or experience from areas with similar livelihood characteristics.

3.2.1.5. Defining the percent of non-response

After the sample size has been calculated, the number should be increased (by up to 10%) to take into account contingencies such as absence of children, being unable to measure all the children in selected households or having to exclude data from analysis during the data cleaning.

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3.2.2 Sample size for the mortality component

3.2.2.1 Expected Crude Mortality Rate

As for the prevalence of malnutrition, expected CMR can be estimated from previous surveys or from discussion with key informants (bearing in mind that a CMR of 2/10,000/day is the level that is often used to declare an emergency[8]).

3.2.2.2 Defining the precision level

The rationale behind deciding the precision level to use is the same as for the nutrition component. In terms of crude mortality rate, it is generally not possible to achieve a precision much greater than 0.3 deaths/10,000/day with a survey of a reasonable size and a three-month recall period. If higher precision is required, the recall period would need to be lengthened. Table 3 gives examples of precision needed at the various level of estimated CMR.

Table 3. Examples of precision at various levels of CMR

CMR /10,000/day	**Confidence Interval** Range	**Desired precision** ± /10,000/day
0.5	0.2 – 0.8	0.30
1.0	0.6 – 1.4	0.40
1.5	1.0 – 2.0	0.50
2.0	1.25 – 2.75	0.75
3.0	2.0 – 4.0	1.00

3.2.2.3 Define the design effect

As with nutritional status, a correction factor accounting for heterogeneity among clusters in the population must be used.

In emergencies where violence causes a large proportion of deaths, the violence is very rarely evenly distributed in time or place, and the design effect can be very high (up to 10). Such high design effects require very large sample sizes if meaningful data are to be produced.

3.2.2.4 Defining the recall period

The recall period for the mortality survey is the time interval over which deaths are counted. Deaths that occurred before or after the recall period are not included/ recorded as deaths. The length of the recall period is thus a critical factor in determining the mortality rate.

In determining what the appropriate recall period would be for a given mortality survey, the first question for the survey team should be: "what is the period most relevant to the purposes of the survey, the risk of mortality being measured, and the context of the study?"

In rapid-onset emergencies, shorter recall period are advised to capture the change in mortality that would have happened from this particular emergency. In slow-onset emergencies, recall period can be longer. A recall period of about 90 days represents a compromise between the number of households to be visited, the precision of the data generated and the estimation of the death rate that is close enough to the current situation to allow for planning health and nutrition interventions.

[8] Based on the WHO 1995 categorization

Having a clear starting date is one of the most important aspects in defining a recall period in order to reduce recall error. The beginning of the recall period should always be a date that everyone in the population area can remember, e.g., a local event, a major holiday or festival (e.g. the beginning/end of Ramadan), an episode of catastrophic weather, a political event (election, political decree, etc.), or similar memorable event. The beginning of the recall period should be the same for all the population in the survey area, so care should be taken for events that may have occurred at different times in various parts of the survey area, such as onset of the rainy season or taking in the harvest.

The same event should be used as the beginning of the recall period throughout a survey. **The exact number of days of the recall period therefore needs to be calculated for each survey**, and used in the calculation of mortality results. For each individual interview, the endpoint of the recall period is the night before the interview. However, the endpoint to calculate the number of days used for the recall period is the mid-point of the time period required for the survey fieldwork (see example in Box 1).

Box 1. Example: calculation of recall period

If the beginning of the recall period is 1 January 2008 for example, and the interviews take place during the period 10-22 March, then the end-date used to calculate a recall period for purposes of mortality estimation would be 16 March. The recall period used for data analysis would then be 76 days (the period between 1 January and 16 March comprises 76 days).

3.2.2.5 Defining the average household size

ENA calculates the sample size in numbers of individuals but the sampling unit used is the household and the mortality questionnaire is administered to the household. Therefore the sample size of individuals must be converted to number of households. This is done by dividing the sample size by average household size.

Average household size can be obtained from past surveys, population data or discussion with key informants. It is advisable to use the most conservative estimate in order to ensure that the sample size is achieved.

3.2.2.6 Defining the percent of non-response

As for the nutrition component, the sample size should be increased slightly to allow for contingencies such as being unable to interview a household or having to exclude data from analysis during the "cleaning". Normally, the sample size (in this case the number of households) is increased by up to 10% to allow for these and other unforeseen contingencies.

Box 2. Using ENA to calculate the sample size for the nutrition and mortality components

In the Planning screen of ENA use the sample size calculation features.

1: Select the type of sampling (random or cluster)
2: Indicate the estimated parameters values for the nutrition component. The sample size is automatically calculated both in terms of children and households.
3: Indicate the estimated parameters values for the mortality component. The sample size is automatically calculated both in terms of population and households.

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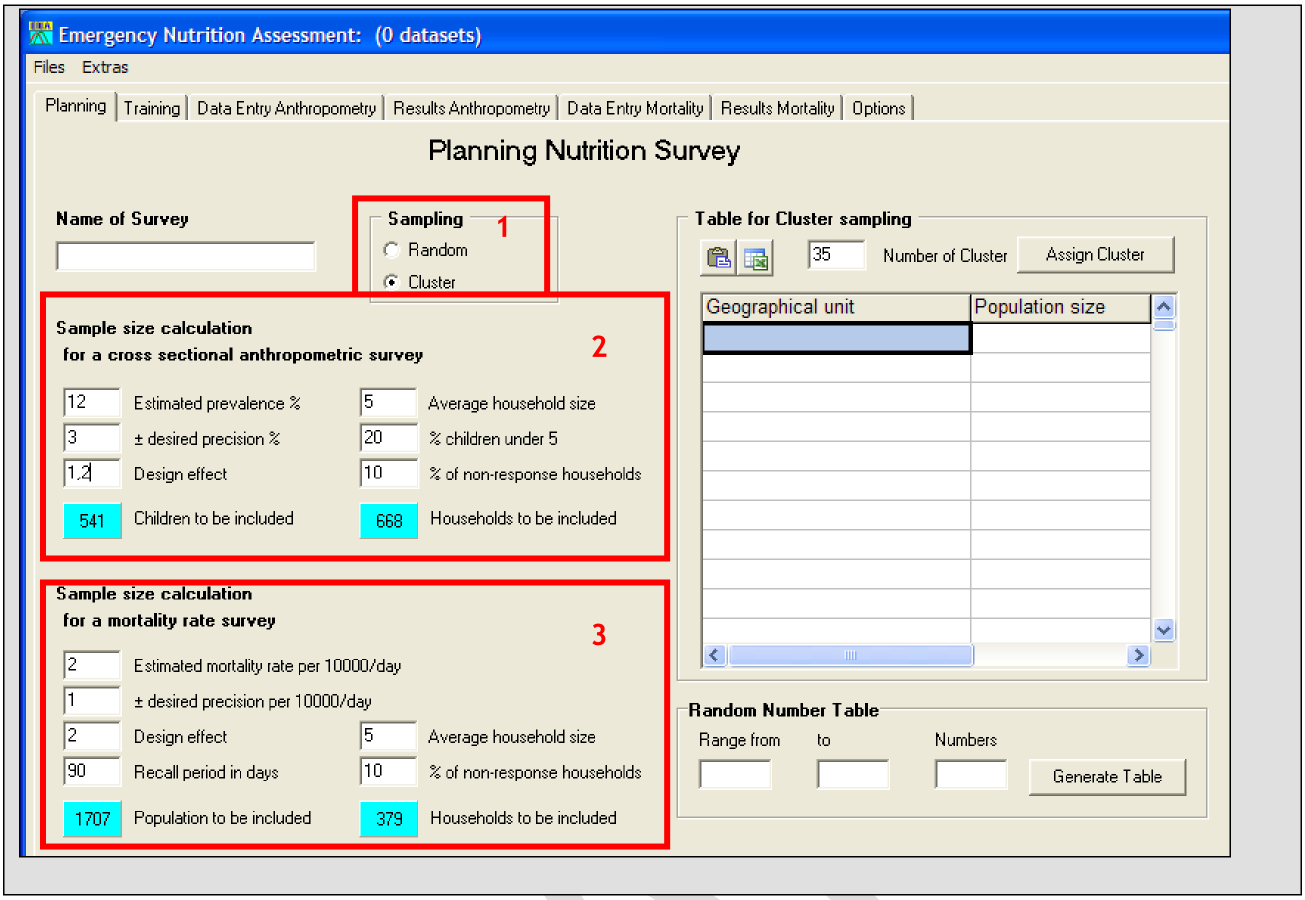

3.2.3 Sample sizes in practice

3.2.3.1 What to do when nutrition and mortality sample size differ?

Calculations of sample size for nutrition and or mortality components will most probably return different number of households. When nutrition and mortality components of the survey are conducted simultaneously and by the same survey team, the larger sample size should be considered. However, in situation where the sample sizes are dramatically different, e.g., the sample size for nutrition is 400 households while the sample size for mortality is 600 households, conducting a nutrition survey in all the households would unnecessarily increase the length and cost of the survey. Practically, this could be solved by conducting the mortality survey in all the 600 households while conducting the nutrition component only in 2 out of 3 households, i.e. in 400 households. Note that to be representative, the nutrition component survey should be conducted in 2 consecutive houses and then not conducted in the following third house rather than conducting the nutrition component in the first 400 households and leaving out the last 200 households. This second option will bias the sample and should never be conducted.

3.2.3.2 Implications of basing sampling on households

Sampling is based on the number of households and not on number of children (with the exception of surveys that have a nutrition component only and that use the EPI method). When implementing the survey, the pre-determined number of households should be visited in each cluster. Although the number of eligible children can be estimated, the actual number of children that will be included in the survey cannot be known in advance. Each cluster will include a different number of children. At the end of the survey, if the estimated number of eligible children per household was correct, the sample size should be more or less equal to what was planned. It is important to make sure that the final sample size is at least equal to the sample size calculated before the % of non-response was added.

3.3. Sampling methodologies

3.3.1. *Selecting a sampling method*

There are two main sampling methods traditionally used in nutrition and mortality surveys: 1) random sampling (simple or systematic), and 2) cluster sampling. The sampling method should be determined mainly by the size of the population and the physical organization of the households.

In surveys in which the primary sampling units (PSU) consist of individual elements each of which is listed in the sampling frame, a simple or systematic random sampling is appropriate. This situation might happen in camps (refugees or IDPs) or in very small populations. Because of the impossibility of obtaining a complete list of the households and because of the high costs associated with obtaining a complete list, most surveys use PSUs that are not individuals but are aggregates, each containing a cluster of individual elements. This is called cluster sampling.

The flowchart given in Figure 2 shows the steps to follow in order to decide which sampling method to use.

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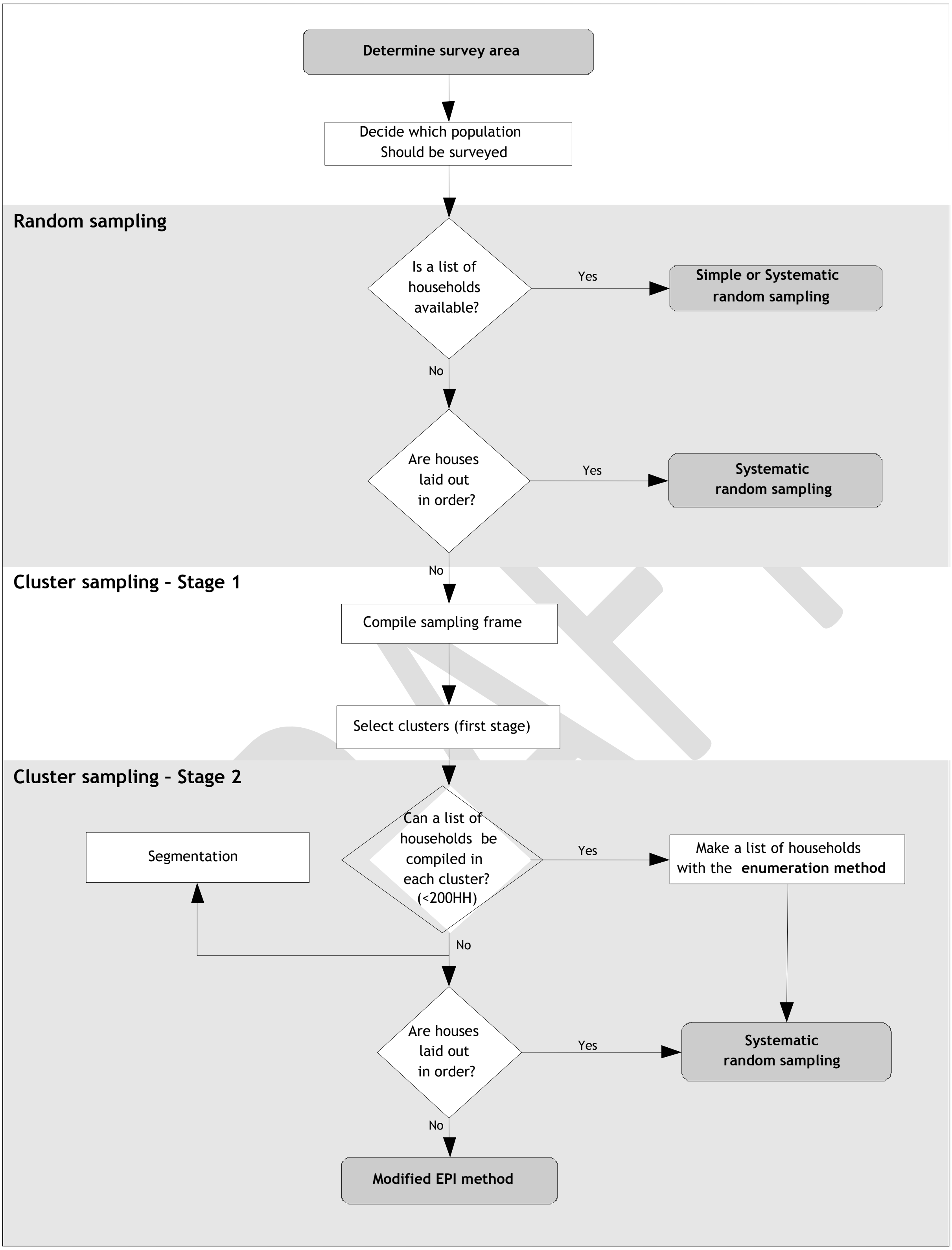

Figure 2. Flowchart for decision-making on which sampling method to use.

3.3.2. *Setting up a sampling frame*

In order to set up a sampling frame, the population for which an estimation of the prevalence of malnutrition and mortality rates are needed should be defined. This might be children living in an IDP camp, a district, a livelihood zone, a region, or particular location.

For random sampling, the sampling frame should be a list of households. In IDP/refugee camps, population data currently used are obtained from the WHO 2005 NIDs figures. If no population data are available, for example for newly displaced populations, a rough population estimate should be made by consulting the local authorities, counting dwellings and estimating the number of people in each dwelling.

For cluster sampling, population data should be obtained for the smallest sampling unit possible, and should never be above the village level. Data should be obtained from official sources. Until settlement level population figures from the UNDP are released, the sampling frame should be based on updated lists of settlements from agencies such as the WHO (NIDs figures).

3.3.3. *Stratified sampling*

When sub-populations in a given region vary considerably, such as in two livelihood zones, each subpopulation (stratum) should be sampled independently. In order to stratify a sample, the sampling frame is divided into non-overlapping groups of homogeneous population, e.g. pastoralists vs agro-pastoralists. The strata should be mutually exclusive: every element in the population must be assigned to only one stratum. Then random or systematic sampling is applied within each stratum. The size of the sample in each stratum should be determined using ENA software planning as if two different surveys were planned.

3.3.4. *Random sampling*

3.3.4.1. Simple random sampling

Simple random sampling is used where there is an up-to-date list of all individuals or households in the population, with enough information to allow them to be located. Households (individuals) are randomly chosen by using the random number procedure in the planning sheet of the ENA software. In practice, a reliable population list is rarely available. In a very small population, all the houses can sometimes be enumerated and given numbers by the survey team. The sample is then chosen from these houses using ENA software.

Steps for choosing households using simple random sampling

1. Determine the number of households that need to be visited from the estimated sample size (refer to section 3.1).
2. Make a list of all households, numbering them from 1 to N.
3. Determine which households will be visited using ENA (see Box 1). ENA will select the required house numbers at random.
4. Measure all the children in each selected house and record their measurements on the datasheet.
5. Complete the mortality questionnaire for each household, even if the household has no children.

Although this is the best statistical method, this is an uncommon situation and is rarely used. It can be used as the second stage sampling procedure of sample surveys. Box 3 shows the practical steps to follow to select a random sample using the ENA software.

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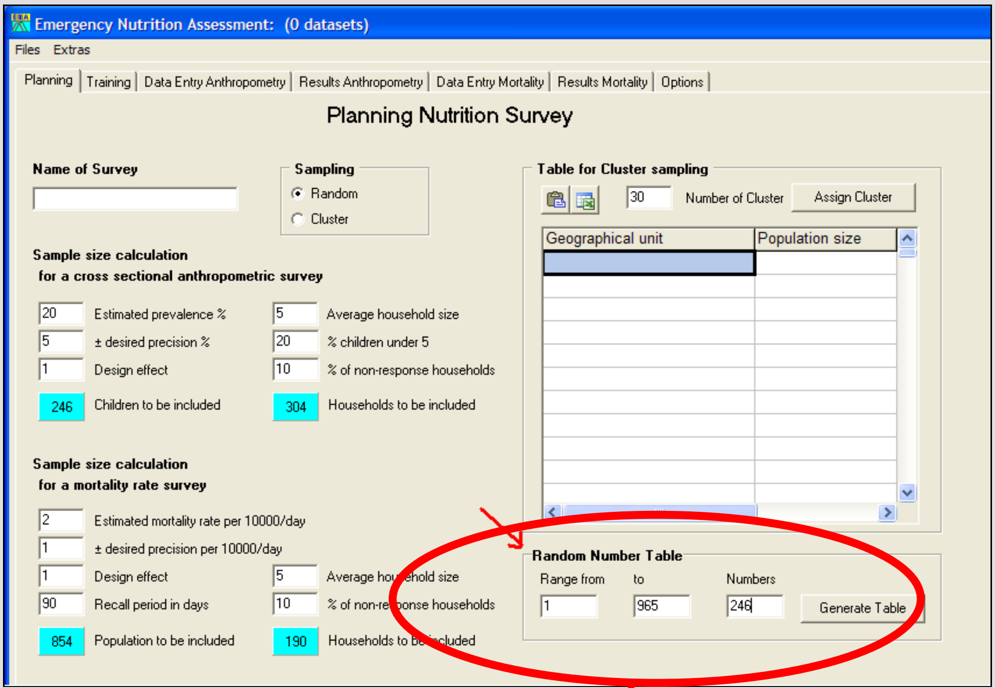
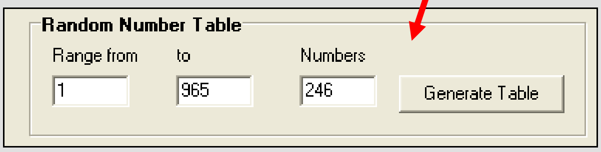
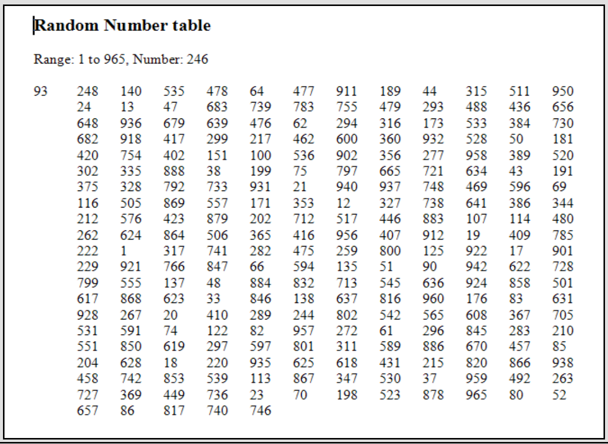
Box 3. Using ENA to select a random sample

In the Planning screen of ENA use the Random Number Table section. Include the number of households listed (for example Range from 1 to 965) and the number of households that must be visited (for example 246). Click on "Generate Table".





ENA will generate a random number table in a separate Word document. Each number represents the identification number of a household to be visited.



Random Number table

Range: 1 to 965, Number: 246

93	248	140	535	478	64	477	911	189	44	315	511	950
	24	13	47	683	739	783	755	479	293	488	436	656
	648	936	679	639	476	62	294	316	173	533	384	730
	682	918	417	299	217	462	600	360	932	528	50	181
	420	754	402	151	100	536	902	356	277	958	389	520
	302	335	888	38	199	75	797	665	721	634	43	191
	375	328	792	733	931	21	940	937	748	469	596	69
	116	505	869	557	171	353	12	327	738	641	386	344
	212	576	423	879	202	712	517	446	883	107	114	480
	262	624	864	506	365	416	956	407	912	19	409	785
	222	1	317	741	282	475	259	800	125	922	17	901
	229	921	766	847	66	594	135	51	90	942	622	728
	799	555	137	48	884	832	713	545	636	924	858	501
	617	868	623	33	846	138	637	816	960	176	83	631
	928	267	20	410	289	244	802	542	565	608	367	705
	531	591	74	122	82	957	272	61	296	845	283	210
	551	850	619	297	597	801	311	589	886	670	457	85
	204	628	18	220	935	625	618	431	215	820	866	938
	458	742	853	539	113	867	347	530	37	959	492	263
	727	369	449	736	23	70	198	523	878	965	80	52
	657	86	817	740	746							

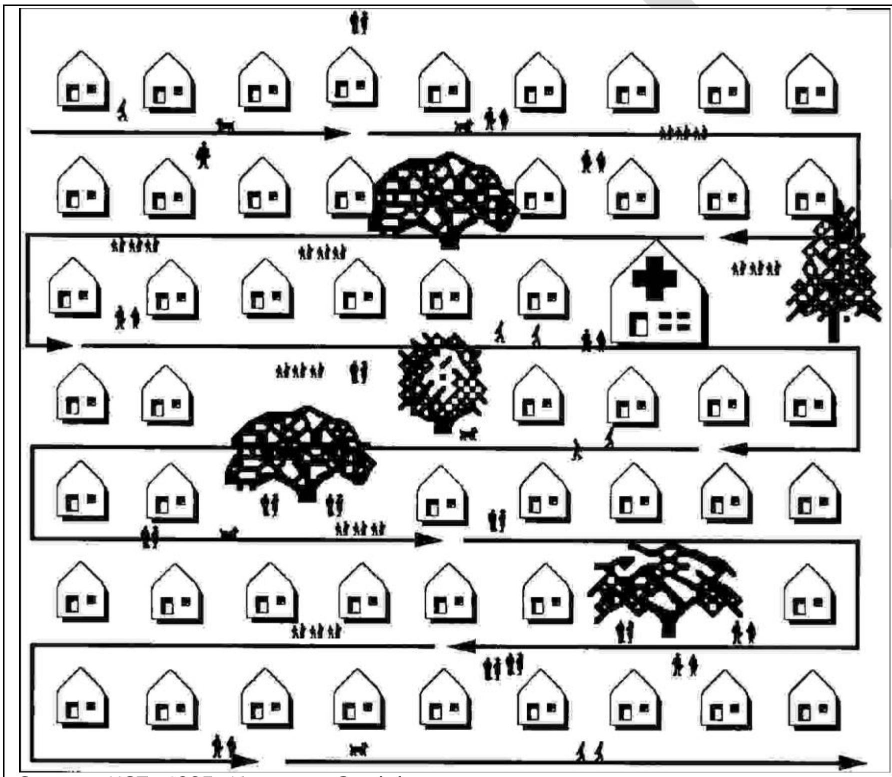
3.3.4.2. Systematic random sampling

Systematic random sampling is used in relatively small geographic areas when an exhasustive list of households exists with precise physical address or locations, or where there is an orderly layout of the houses that make it possible to go systematically from one house to another, in order, without omitting any of the houses or when an exhaustive list of households exists with precise physical address or location. Such a situation may occur in a camp where shelters are erected row after row, or where the houses are all along the edge of a river, coast, road, or other major feature. The first household is chosen at random. The subsequent households are visited systematically using a "sampling interval"; this is determined by dividing the total number of households by the number needed to give an adequate sample. Every house should have an equal chance of being chosen before the first house is selected.

Accurate population data are not needed for systematic sampling. However, if the houses are mapped and can be numbered, simple random sampling can be used.

Steps for choosing households using systematic sampling

1. Determine the number of households that need to be visited from the estimated sample size (refer to section 3.1).
2. On the map of the site, trace a continuous route that passes in front of every household (Figure)[9].
3. List or estimate the number of households.
4. Determine the "sampling interval" by dividing the total number of households by the number that must be visited. If the total number of households is 11,000 and 463 households need to be visited, the sample interval = 11,000/463 = 23.7, rounded to 24 (you may need to add 5%–10% of the needed households for contingency purposes as explained in section 3.1).



Source: MSF, 1995. Nutrition Guideline.

Figure 3. Example of a community where systematic sampling is possible

5. Select the first household to be visited. The first household is randomly selected within the sampling interval (1–24) by drawing a random number that is smaller than the sampling interval[10]. For example, if the random number drawn is 5, start with the fifth house.

[9] If the households are in neat rows, such as shelters in an IDP camp, it is not necessary to draw a map.

[10] This can either be done with ENA software (using the function described in Box 3, using the Range from 1 to 24 and Numbers =1), or by using a table of random number as shown in Annex .

6. The next household to be visited is found by adding the sampling interval to the first household selected (or counting the number of households along the prescribed route). In the example, 5 + 23.7 = 28.7, rounded to 29. The next household will be 28.7 + 23.7 = 52.4 rounded to 52. Continue in this way so that you visit house number 5, 29, 52, 76, 100 and so on, until all selected households have been visited. Both mortality and nutrition survey should be completed in all the pre-selected households, even if this means that more children/subjects are included than are needed from the calculations of sample size[11].
7. Measure all children in each selected house and record their measurements on the datasheet. Complete the mortality questionnaire for each household, even if the household has no children.

This method is usually used for small-scale surveys of limited areas (say a few hundred households). It is also used to select the households in the second stage sampling (see section 3.3.5).

3.3.5. *Cluster sampling*

Cluster sampling is used in large populations where no accurate population register is available and households cannot be visited systematically. This is the most common situation when conducting a survey at livelihood zone level in Somalia. Cluster sampling usually reduces the distances the survey team has to walk. However, the sample size is always greater than in random sampling so that more households need to be visited.

This most common form of sampling is done in two stages. First, the whole population is divided, on paper, into smaller discrete geographical areas, such as villages[12] whose population is known or can be estimated. Clusters are then randomly selected from these villages with the chance of any village being selected being proportional to the size of its population. This is called sampling with "probability proportional to population size (PPS)". In the second stage, the individuals (or households) are chosen at random from within each cluster area or village. This means that each person in the whole area has an equal chance of being selected[13]. The methodologies that can be used to select households are detailed below.

3.3.5.1. Determining the number of clusters

The design effect is smaller with a larger numbers of clusters, meaning that although there may be more clusters, fewer total numbers of children are likely to be needed. Thus, sampling 45 clusters of 20 children is more efficient than 30 clusters of 30 children. (Please refer to the discussion on design effect in section 3.2.1.3.). Each survey should have at least 25 clusters. As the number of clusters decreases, the design effect increases rapidly. Fewer than 25 clusters can yield unreliable results and should not be intended. However precision gained while sampling more than 30 -35 clusters is generally outweighed by the increased logistical and time-related costs.

The number of households to survey in each cluster should be chosen so that one team can complete one cluster per day, i.e., that the team can complete both mortality and anthropometry components in one day. If it is anticipated that the teams can only survey 20

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[11] If the households are in neat rows, such as tents in a refugee camp, it is not necessary to draw a map.

[12] The term "village" is used throughout the manual for convenience. It is used here to denote any area, where people live that has been given a name by the local authorities or population. This may be a settlement, traditional village, and enumeration area (EA), part of a town or city, sub-district, or even a rural area bounded by geographical features such as a stream or river. When the area is named, the population knows the boundaries of the area, and the authorities either know or can estimate the population of the area.

[13] Although larger villages are more likely to be selected to contain a cluster than smaller villages, individual households within the larger village are less likely to be sampled than a household from a small village. These effects balance each other so that each household in the whole population has an equal chance of being selected.

households per day, then the number of clusters should be determined accordingly. To determine the number of households that can be surveyed in a day, it should be considered the time needed to travel back and forth the survey area, the time to conduct the sampling, the time to travel from one house to the next, etc. Some houses will have to be revisited at the end of the day to measure children that were missing during the first visit. An example is given in Box 4.

Box 4. Example: determining number of household that can be surveyed per day

If the team leaves base at 8 am, takes one hour to reach the cluster site and another hour to introduce itself and select the first house, then measurements will start at 10 am. The team will need two refreshment breaks of 15 minutes each, one hour for lunch, and will need to leave to get back to base before dark, say about 4pm. This means that the team will have 4.5 hours to measure children and interview household heads.

If the survey takes around 7 minutes in each household, plus 2 minutes to reach the next house and introduce the team to the new household, 30 households can be visited in a day. If 13.5 minutes are necessary in each household (including walking to the next house), then 20 households can be visited. With 18 minutes spent in each household plus walking to the next house, 15 households can be visited per day.

The average time necessary to administer the survey questionnaire and take anthropometric measurements should be assessed during training and pre-testing. The time necessary to walk from one house to the next should also be estimated depending on the terrain (presence of hills) and the organization of the houses (how spread houses are).

These practical points should be considered when designing the survey. If the distances between houses are not great and there is no insecurity, more children can be included in a cluster. This is one reason why sample size should always be calculated to have the minimum number of visits that is compatible with the desired survey precision.

In most households the mother/caregiver will need to be interviewed and she should also be with her children when they are measured if they are not to be frightened by the team. Thus, the two components of the survey will often need to take place consecutively even if there are additional team members. The household interview should always take place before the anthropometric measurements. During the interview, the children will "settle down", see that the mother interacts with the team harmoniously and be more amenable to being measured.

If the time scale simply cannot be kept, there are two choices. The team could either use two days to survey one cluster, which will double the time taken to collect the data. This is undesirable. Or, the number of households in each cluster could be reduced and the total number of clusters increased, affording more time to carefully collect data. This is a far better option. Thus, if data from 30 households, for example, cannot be collected in one day during the field test at the end of the training session, the number of clusters should be increased and the number of households in each cluster correspondingly reduced. To avoid "shortcut" bias, it is better to measure fewer children accurately than overstress the team so that the measurements are not made accurately.

3.3.5.2. Stage one: selecting the clusters

Cluster sampling requires the grouping of the population into smaller geographical units called primary sampling units (PSU). PSU should be the smallest possible unit, provided population data is available and geographical unit has a name to locate it. Considering the data bases available in Somalia, the ideal PSU should be a settlement.

Each settlement or village should have at least the number of households required to form a complete cluster. If there are insufficient (e.g. <100) households in a village, two adjacent villages should be combined at the planning stage. The selection of clusters will be done with a probability proportional to population size.

In a stable population, such as protracted IDPs or a drought-affected region with little in- and out-migration, a census that is several years old may still be acceptable as a base for population proportionate sampling. However, in refugee situations where influx continues, reliable up-to-date counts are important for a valid sample. Alternatively, if no population data are available, estimate the relative size of the population living in each section of the map using a key informant.

Additional guidance on conducting a survey in pastoralist areas, are provided in Annex 1 of this manual.

Steps in choosing the clusters

1. Determine the sample size using ENA.
2. Obtain the best available census data for each village. Either data for total population or population under-five can be used, as far as the count used is consistent for the entire sampling frame.
3. Select the clusters using ENA software as detailed in Box 5.

You will not be able to change a cluster site once it is selected. If the survey is to be unbiased, the selected site must be visited. Thus, it is important to define your geographical area in the planning stage very realistically, taking travel, security, and any other factor that could influence your ability to get to the cluster site into account before listing the sites in the planning table. Nevertheless, ENA also samples replacement clusters for those that cannot be reached due, for example, to insecurity and inaccess. *Refer to section 3.4 for more information of replacement clusters.*

Large villages may be selected for more than one cluster. If this happens, the village should be divided into equal sections geographically (say North and South) and one sample taken at random from each division. To prevent the selection of more than one cluster per PSU, it is important to get the smallest PSU possible.

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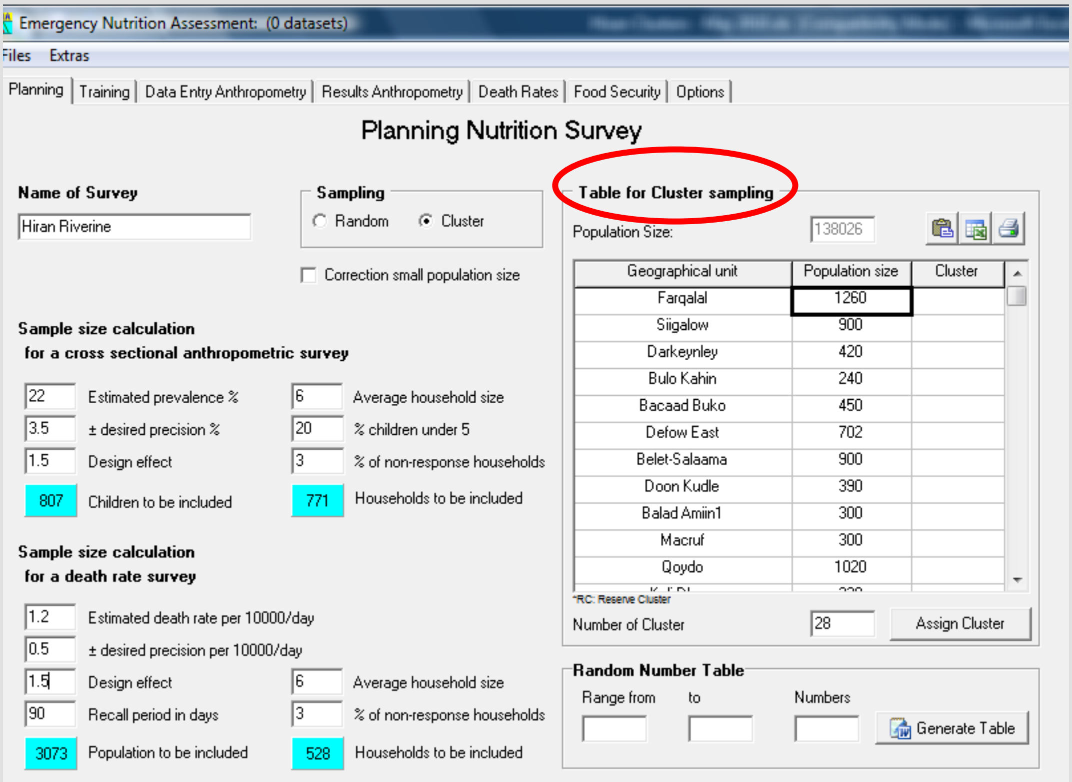
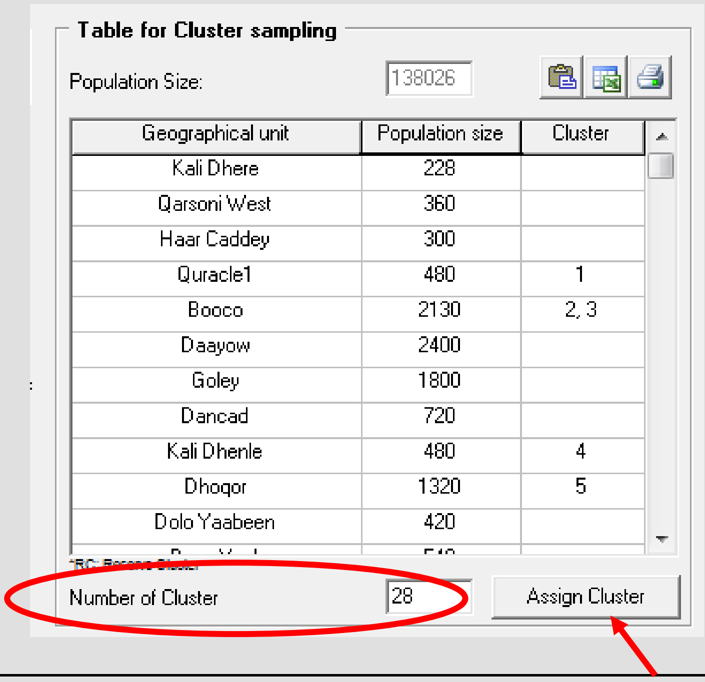
Box 5. Using ENA to generate clusters

In the Planning screen of ENA use the Table for Cluster Sampling section.



Enter the names of all the villages into the left column ("Geographical Unit") and their population size into the right-hand column ("Population size"). This can be done by Copy/Paste from Excel. Enter the number of clusters needed. The order of the villages is not important, but it is important that they all be included.



Click on "Assign Cluster". In a separate Word document, ENA will assign numbers to the clusters to be visited:

Assignment of clusters

Geographical unit	Population size	Cluster
Farqalal	1260	
Quracle1	480	1
Booco	2130	2, 3
Daayow	2400	
Goley	1800	
Dancad	720	
Kali Dhenle	480	4
Dhoqor	1320	5
Dolo Yaabeen	420	
Baac Yar I	540	
Hilo Kelyo	1050	

3.3.5.3. Stage two: selection of households within each clusters

Once clusters have been selected, households have to be selected. 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.

Definition of a household
In order to select households to include in the survey, it is important to carefully define a household. A household is defined by one or more individuals who live in the same dwelling and share at least one meal per day.

Survey teams have to be clear on who is, and who is not, part of a household. The definition has to be clarified at the planning stage, and the same definition applied consistently by all teams and throughout the survey.

Segmentation
If the clusters correspond to a large 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 at random (number each segment and select one with a table of random numbers, as described in Annex). In this way the "village" is reduced to an area containing up to, say, 250 households. These households can then be listed using the enumeration method, and the required households selected from the list by simple or—if they are arranged in some logical order—systematic random sampling.

Mapping

- Where available scaled maps are used to select houdeholdss
- Draw random numbers from the X and Y axis of the map to identify the 1 km grid square from where the cluster is to be selected.
- This same square or grid is further subdivided into equal squares using a smaller overlay grid of squared paper.
- Select random numbers again to identify values for the X and Y axis of the grid and where these intersect the square is selected.
- The mid point of the selected small square is then estimated by using major landmarks like roads, junctions to identify the centre house (first hh) in the selected area.
- NB. The use of local staff was important in the identification of the actual area on the map.

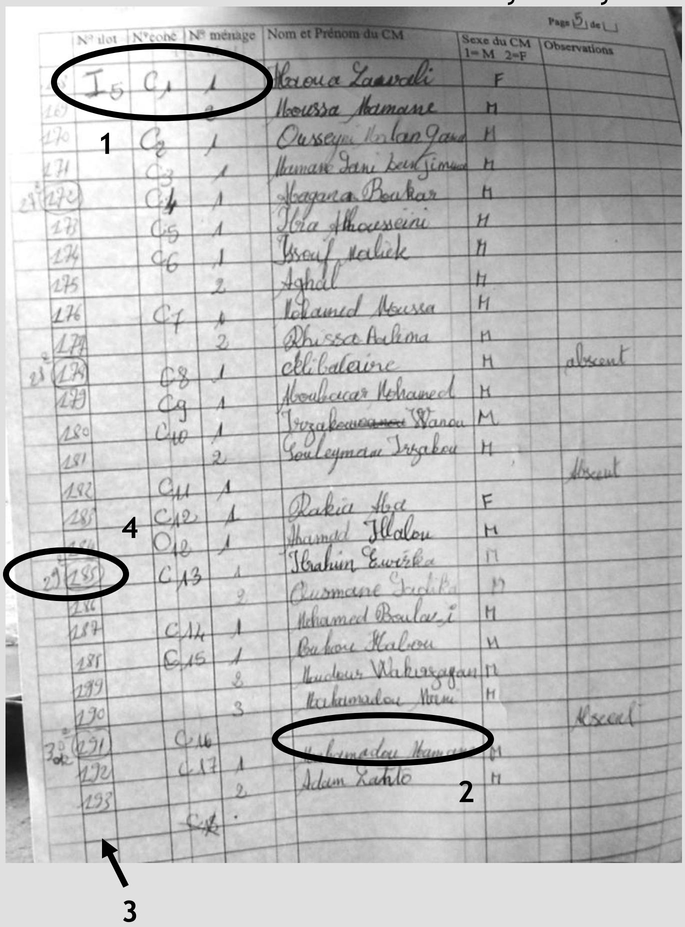
Enumeration method

When a cluster is reduced to an area containing around 200 households through segmentation, all households in the area can be listed[14].

1. The survey team members together delimitate the boundaries of the cluster (enumeration area, EA) by walking or driving along the delimitations set on the maps. Delimitating the EA is crucial to ensure appropriate sampling.
2. Once delimitated, the EA is split in "blocks" of houses.
3. Each team member is assigned to a block, in which he/she goes from door to door in a systematic manner to list every head of household living in the block (see Box 6). A number is given to each habitation and written on the door/wall in order to find the household if it is selected.
4. Lists of households from all survey team members are compiled, and households numbered from 1 to N.

Box 6. Enumeration method: Example of compiled list with selected households.

The following document shows an abstract of the household listing conducted in order to select household for a nutrition and mortality survey.



1: HH identification. The codes are the same as the ones written on the door.
2: Name of the head of HH.
3: Order number assigned after compilation of the list of each surveyor.
4: Households selected using a systematic sampling with equal probability.

5. Select household using a systematic sampling with equal probability procedure:

[14] This is the method used by CSA for household surveys such as DHS. Expertise can be sought from CSA staff.

a. Determine the "sampling interval" by dividing the total number of households (N) by the number that must be visited in the cluster. If the total number of households is 210 and 18 households need to be visited, the sample interval = 210/18 = 11.67. The numbers should be rounded to the closer whole number.
b. The first household is randomly selected within the sampling interval (1–12) by drawing a random number that is smaller than the sampling interval. For example, if the random number drawn is 5, start with the fifth household on the compiled list.
c. The next household to be visited is found by adding the sampling interval to the first household selected. In the example, 5 + 11.67 = 16.67, rounded to 17. The next household will be 16.67 + 11.67 = 28.34 rounded to 28. Continue in this way so that you visit house number 5, 17, 28, 40, 52 and so on, until all selected households have been visited. Both mortality and nutrition survey should be completed in all the selected households, even if this means that more children/subjects are included than are needed from the calculations of sample size[15].

6. Measure all children in each selected house and record their measurements on the datasheet. Complete the mortality questionnaire for each household, even if the household has no children.
7. Households should never be replaced, even in the case of a prolonged absence, rejection to take part in the survey, or absence of children.

"EPI" method

If it is not possible to select the households by a more random sampling method, the "EPI" method can be used as a last resort. Although this method is simple, widely known, easy to train, and rapid, it results in a somewhat biased sample[16]. In order to improve the representativeness of the sample, it is advised to prefer the "improved EPI" method described here[17] and illustrated in Figure 4.

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 centre of the selected cluster area.
2. Randomly choose a direction by spinning a 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.
4. At the edge of the village, spin the pen again until it points into the body of the village.
5. Walk along this second line counting each house on the way (both left and right side) until you reach the other edge of the village.
6. Using a random list of random numbers (Annex), 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.
7. If the number 5 was chosen, go back to the fifth household counted along the walking line. This is the first house that should be visited. Go to the first household selected and complete the mortality questionnaire and examine all children aged 6–59 months in the household for the nutritional survey.
8. The subsequent households are chosen by proximity.

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[15] If the survey is halted as soon as sufficient subjects are included, the people in the households at the “end” of the village are less likely to be sampled than those sampled at the beginning.

[16] This is because households closer to the centre are more likely to be selected. Consider a village with houses arranged in concentric circles around the centre. If each house occupies the same area, the number of houses in each circle will be about six times as many as in the circle closer to the centre. If a direction is selected, a particular house on the peripheral circle has a much lower chance of being selected than one near the centre. Second, because “proximity” sampling is used, all households selected for the cluster are more likely to resemble each other than more remote houses in the village. Because of this inherent bias, this method is not recommended. However, there are many situations where using random sampling methods is not feasible.

[17] As the houses closer to the centre are more likely to be on the walking line from the centre, this modification of the standard EPI method is suggested to reduce bias when the walk started from the centre of the village.

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a. In a village where the houses are closely packed together, choose the next house to the right[18].
b. 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 out.
c. The same method should be used for all the clusters.

9. Continue in this direction until the required number of households has been visited.

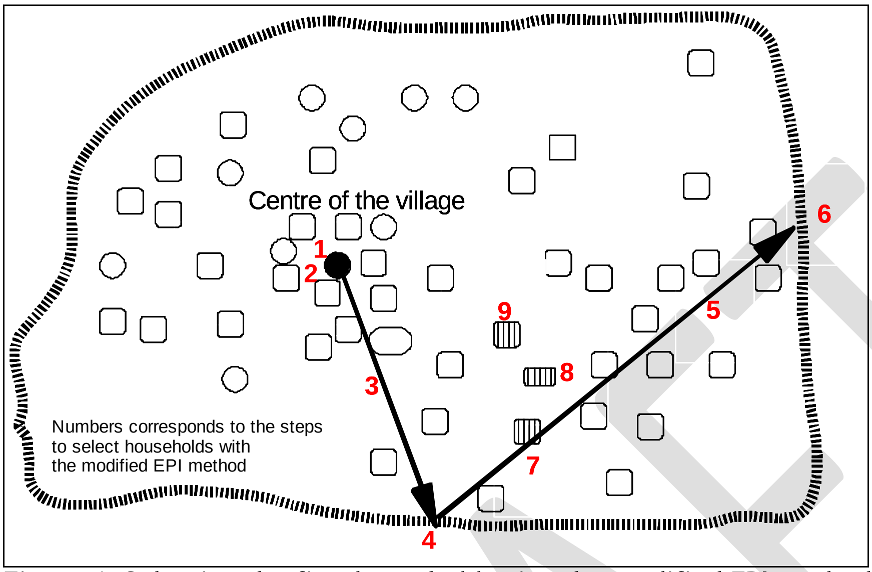

Figure 4. Selecting the first household using the modified EPI method.

Note on sampling unit: house vs. household
According to the local definition of a household, there can be more than one household living in the same house/compound. Selection should be based on households, not on houses. With the EPI method, within a compound, households should be selected according to the same rule as for other households. With the enumeration method, surveyors compile a list of households. If more than one household live in the compound, all of them would be listed. Only one household may be selected in a given house/compound.

3.4. Contingency/Replacement clusters

In case certain clusters cannot be accessed by the survey team (because of insecurity, movement of pastoralist populations, road conditions, etc), it is necessary to plan for their replacement at the initial planning stage.

If it can be anticipated that some clusters will be "lost", more clusters should be selected (e.g. 35 clusters instead of 32) in one "draw" from the original sampling frame. In that case, all selected clusters must be surveyed, even if there was no loss and the sample size is bigger than what was expected.

If it cannot be anticipated that some clusters will be inaccessible, at the planning stage, using the same sampling frame as was used for the selection of the initial clusters, select 10% (round up to the higher whole value) replacement clusters, and retain those clusters in reserve. When the survey teams finish surveying their clusters, the number of clusters from the entire survey that were not able to be visited should be counted.

- If less than 10% of the clusters were not surveyed, then there is no need to visit the replacement clusters.

[18] Or left, but this should be decided during the planning stage and the same rule should be used by all the teams. It is more convenient to always go to the right for every survey.

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- If 10% or more of the clusters were not surveyed, then all the replacement clusters must be surveyed.

It is not acceptable to just visit a neighbouring, similar cluster if one cannot be accessed, because it violates the principle of equal probability of selection.

3.5. Important considerations when selecting subjects

3.5.1. *No substitution*

In each of the sampling method, whenever a household is selected according to the rules, there should not be a substitution for this household for any reason. House occupants sometimes refuse to be measured, local people may try to direct the team to include particular houses and omit others, or houses may be deserted or physically difficult to reach (up a steep hill for example). If, for any reason, the selected household is not included, the team must make a note and go to the next household according to the rules. Another household should never be substituted for the properly selected household. This is not usually a problem with the EPI method, because the rules say that the nearest house to the right should be the next selected. (In this case, however, a house to the left should not be substituted.)

3.5.2. *Measure all the children*

Before the household is visited, it is not known how many children are present, or whether there are any children at all. All the children part of the household in the correct age range should be included in the sample and measured. If two eligible children are found in a household, both are included, even if they are twins. This is extremely important, as it ensures that every child has the same chance of being selected, which is a basic principle of the survey design. Detailed analysis has shown that there is little correlation between the nutrition status of children living in the same household. Individuals, rather than households, seem to become malnourished.

3.5.3. *No children*

When there are no children under age 5 in a household, the selected household should remain a part of the sample that contributes zero children to the nutritional part of the survey. However, it is very important to include this house for the mortality survey. Collect the data on mortality and any other data that forms part of the survey, record the household on the nutritional data sheet as having no eligible children, and proceed to the next house according to the rules. With systematic sampling, go to the next selected house according to the plan (in the example, if there are no children in house 23, then collect the mortality data and go to house 41, but never to house 22 or 24).

3.5.4. *Empty houses*

If the house is empty, the neighbours should be asked about the family that lives in that house. On the data collection form, record why the house is empty (if this can be determined). If the residents are likely to return before the team leaves that cluster, the team should return to the house to include the residents in the survey. If the house is permanently empty or the residents will not return before the team must leave, this house can be skipped and a note made. If the house is empty because all the members are dead, the neighbour should be interviewed and all the residents recorded as having died. Again, a house that is not in the original sample should never be a substitute for the empty house.

3.5.5. *Absent children*

If a child lives in the house but is not present at the time of the survey, this child is recorded on the datasheet when the house is visited. The weight and height of course cannot be entered at that stage. The team should inform the mother that they will come back to the house later in the day, after all the other houses have been visited in the cluster. The team should go back to the house to find the child. The team should continue to look for missing children until they leave the survey area. There are always some children who cannot be weighed or measured, and this needs to be recorded and reported. The team should not simply take another child and forget about the child that is missing. If more than 5% of the children in a survey are not found, the teams should revisit the area at another time to see if they can complete the sample.

3.5.6. *Disabled children*

Disabled children that would otherwise be eligible should be included where possible. If it is not possible to measure height and weight due to deformity or other abnormality, the child should be given an ID number and the data recorded as missing (and a note taken). Of course, with missing height, they will not be included in the final sample unless they have oedema.

3.5.7. *Child in a centre*

If a child has been admitted to a hospital or feeding centre, the team must go to the centre and measure the child. This is crucial as such a child is very likely to be severely or moderately malnourished. If it is impossible to visit the centre (it may be many miles away), the child should be included in the datasheet and a note added that the child was in a feeding centre and probably acutely malnourished. In reality, the child may or may not be malnourished. If there are a large number of such children, and the centres cannot be visited to complete the measurements, then two rates of acute malnutrition can be calculated, one assuming that these children are all severely malnourished, and the other excluding these children from the survey.

3.5.8. *Limited access to some areas*

If access is completely impossible, because of insecurity or inadequate roads, then a random sample of the area cannot be taken. The alternative is to take a sample of people who have recently left the area, for example, to attend a food distribution or health clinic, or a market day. If displaced people are arriving from a certain area then it is possible to assess them as they arrive, giving an indication of what the rate of malnutrition is in the area they have left. This type of surveying will give a biased (unrepresentative) sample, and only a very rough indication of the true picture. Conducting a rapid survey might be more appropriate in that situation.

If access is possible only in some areas, the choice of sampling only from the secure areas can be made. This would mean that population estimates from insecure area would not be included when you the sample is originally selected. If this is the case, a clear description of who was excluded from the sample should be included in the report of the survey. The report might also include a discussion of what the nutritional situation is like in the areas that were not sampled (if any information is available on this).

4. Measurement techniques

4.1. Anthropometric measurements

Accurate anthropometric measurement is a skill requiring specific training. Step-by-step procedures and standardizing methods are necessary to ensure that the measurements will be correct, which makes comparisons possible. This section covers the necessary field equipment and methods for taking measurements. Please refer to the FANTA Guide (2003) for additional information on types and source of equipments for nutrition Surveys. UNICEF can also be contacted for model of scales and height-boards.

4.1.1. *Inclusion criteria*

Nutrition surveys should be carried out on children age 6 to 59 months. Before a child's measurement is taken, the team should ensure that the child fits in the age criteria for being included in the survey, either by converting his date of birth into months with the help of the local calendar of events or by estimating his age, as described below.

In case the child's age cannot be estimated, children measuring between 65 and 110 cm should be included in the survey. However, children from malnourished population are often stunted, and height criterion for inclusion may bias the sample towards older children. Age should therefore be preferred as an inclusion criterion and determination of age should be a major component of training.

4.1.2. *Specifications for weighing and measuring equipment*

4.1.3. *Estimating age*

The age of children is needed to calculate nutrition indices as well as to know whether a child is between 6 and 59 months and should be included or not in a nutrition survey.

In estimating the age, two situations can be found:

1. The child **has a growth monitoring or immunization card** stating his date of birth. In that case, the surveyors should verify that the child is above 6 months and below 60 months and **record the exact date of birth on the survey questionnaire**. This is the ideal situation, but it is rarely found in Somalia.
2. If the child **does not have an official document** mentioning his date of birth, the age of the child should be estimated in months with the help of a local calendar of events (see Annex 3). If the age is estimated without an official document, the **estimated age should be recorded on the questionnaire**. The following methods can be useful:
   a. If the mother knows the age or the date of birth but does not have an official document to verify, estimate the age in months with the calendar of events, verifying at the same time the plausibility of the information given.
   b. If the age of a neighbour's child is known, ask other women whether their child was born before or after the "reference" child. The younger the child, the more accurate estimate of his or age.
   c. In this absence of any of the above, the local event calendar will be used to make and estimate of the age of the child by asking the mother whether her child was born before or after a certain event, and repeating the same procedure until reaching a fairly accurate age estimate.

For any given child, only record either the date of birth or the estimated age, so that the proportion of children with an exact age can be computed.

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What calendar should be used?
In order to reduce data collection error, all dates should be collected and reported. At data entry level, dates can be converted to the Gregorian calendar either manually using the calendar of events. Alternatively, the cut and paste function in ENA software can be used to import converted dates into the software for automatic calculation of age (see section 6.1).

Calendar of local events and age converter
A local events calendar shows all the dates on which important events took place during the past 5 years. In addition to seasonal patterns (rainy season, harvest time, etc…) and major festivals/holidays, the local calendar can show local events that will be known by the population of the area, such as: the opening of a nearby clinic and political event, etc. It is used to estimate the age of the child based on proximity with event of known dates. It also serves as an "age-converter", giving the age in months when either the date of birth or a reference event around the birth of the child is known. An example of a local events calendar is given in Annex 3.

4.1.4. *Measuring weight*
The electronic scale with double-weighing function (such as the UNISCALE from UNICEF) is the recommended equipment for weighing. Although fairly expensive and fragile, this type of scale has the advantage of allowing easy but precise measurement of children who can stand on their own. Additionally, it has the “double-weighing" function for younger children who cannot stand on their own and need to be weighed in the arms of their caregiver, simultaneously. The measurement is made at the closer 100g. It is recommended to make some wooden board of the size of the scale to use for stabilization of the scale.

Calibration of the scales should be checked each morning using a standard weight (standard 5-10kg weight).

Steps in weighing with an electronic mother/child scale
1. Minimize the clothing on the child. If a child is measured with clothes on, this should be corrected by activating the icon in the Ena for SMART software for correcting weight of children with excessful clothing
2. Ensure the scale is not over-heated in the sun and is on an even surface enabling the reading to be clear.
3. The caregiver or assistant measurer stands on the scale.
4. The measurer presses the "double-weighing" button (or briefly covers the captor in a solar scale).
5. The assistant takes the child to be weighed and holds him tightly, as shown on Figure 5.
6. The measurer reads and records the reading with one decimal point (e.g. 5.5 kg).

Refer to the manual of the scale since there might be some slight differences depending on the model of the scale.

Source: Cogill, 2003

Figure 5. Weighing a child with an electronic mother/child weighing scale

4.1.5. *Measuring length and height*

Every effort should be made to measure children's height accurately, to the nearest 0.1cm. Measurement errors of 2-3cm can easily occur and cause significant errors in classifying nutrition status.

4.1.5.1. Height vs. length

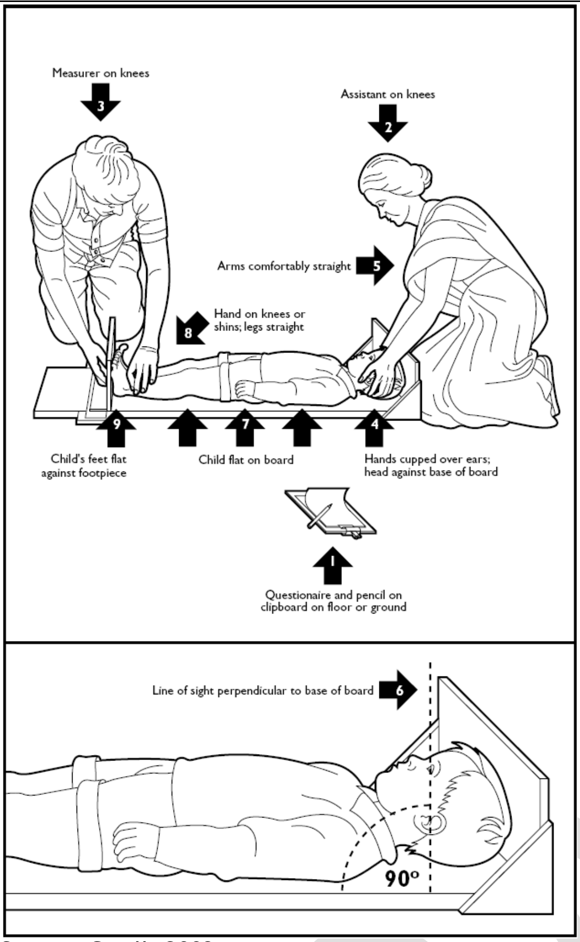
Children <24 months should be measured lying down, and children >=24 months should be measured standing up.

For cases where age cannot be estimated, a standing height should be measured for children >=87 cm, and the length should be taken for children <87 cm. The position in which children are measured (standing up or lying down) is important because it correspond to how reference children in the 2006 WHO standards were measured.

4.1.5.2. Equipment for measuring height and length

A measuring board used for children aged 6-59 months is at least 130cm long, is made of hardwood and has a hard water resistant finish. The board should have a metal tape-measure attached to it, which should be marked out in 0.1cm graduations. The head-board must be movable and the foot-board must be large enough for a child to stand on it.

If height is used as inclusion criteria (see section 4.1.1), a height stick can be used for selecting children taller than 65 cm and shorter than 110cm, and for deciding whether the child should be measured standing up or lying down. This should consist of a simple stick measuring exactly 110cm, with a mark at 65cm and 87cm against which the child is set standing. In case the age of the child cannot be estimated, children measuring between 65 and 110 cm should be included in the survey.



Source: Cogill, 2003.

Figure 6. Measuring the length of a child

4.1.5.3. Length

Children <24 months (or measuring less than 87 cm) should be measured lying down, as shown on Figure 6.

Steps to measure the length of a child

1. Explain the procedure to the child's mother or carer.
2. Remove the child's shoes and hair accessories.
3. Place the child gently onto the board, with the head against the fixed vertical part, and the soles of the feet near the cursor (moving part). The child should lie straight in the middle of the board, looking directly up.
4. The assistant should hold the child's head firmly against the base of the board, while the measurer places one hand on the knees (to keep the legs straight) and places the child's feet flat against the cursor with the other hand.
5. The measurer checks the child's position, reads and announces the length to the nearest 0.1cm.

Note: in some cultures, to measure a child lying down is related to death (measurement of the coffin). Where this occurs, information and education sessions may be held to prepare the mothers for this kind of procedure.

4.1.5.4. Standing height

Figure 7 shows the correct procedure for measuring the height of a child aged 24 months or more (or 87 cm or more if age cannot be estimated).

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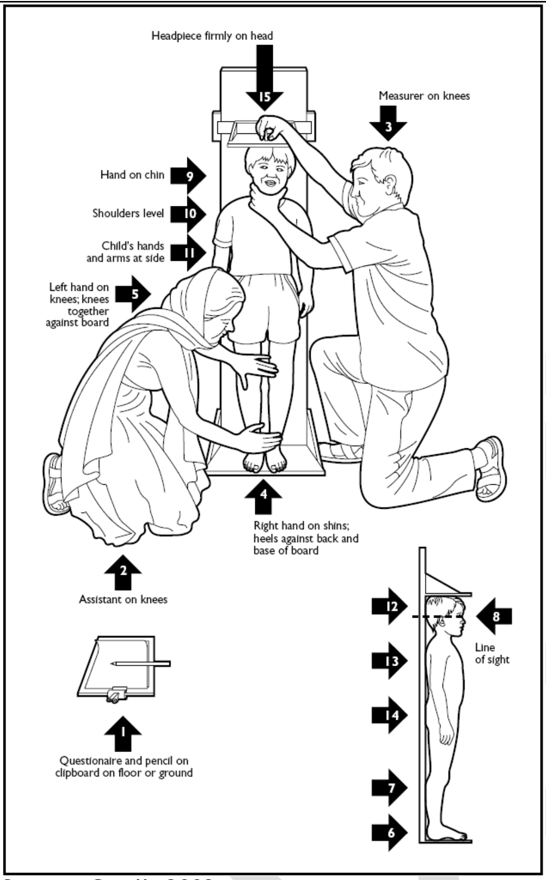
Steps to measure the standing height of a child

1. Explain the procedure to the child’s mother or carer.
2. Place the measuring board upright in a location where there is room for movement around the board.
3. Remove the child’s shoes and hair accessories.
4. Stand the child on the middle of the measuring board.
5. The assistant hold the child’s ankles and knees against the board.
6. Ensure that the child’s head, shoulders, buttocks, knees and heals touch the board.
7. The measurer should hold the chin to position the head of the child.
8. The measurer should position the head and the cursor at right angles — the mid-ear and eye socket should be in line and hair should be compressed by the cursor.
9. The measurer checks the child's position, reads and announces the height to the nearest 0.1cm.



Source: Cogill, 2003.

Figure 7. Measuring the standing height of a child

4.1.6. *Nutritional oedema*

Oedema is the retention of water in the tissues of the body. Bilateral oedema is a sign of kwashiorkor, a form of severe acute malnutrition. Children presenting oedema must be referred to the closest health centre.

To diagnose oedema, normal thumb pressure is applied to the tops of both feet for about three seconds (if you count “one thousand and one, one thousand and two, one thousand and three” in English, pronouncing the words carefully, this takes about three seconds). If there is oedema, an impression remains for some time (at least a few seconds) where the oedema fluid has been pressed out of the tissue (see Figure 8).

The child should only be recorded as oedematous if both feet present pitting oedema.

In order to determine the presence of oedema, normal thumb pressure is applied to the both feet for three seconds.

If a shallow print persists on the both feet, then the child presents oedema.

Figure 8. Checking for oedema.

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4.1.7. *Mid-upper arm circumference (MUAC)*

4.1.7.1. Equipment for measuring mid-upper arm circumference

Mid-upper arm circumference measurements should be made using a flexible, non-stretch tape. Only special MUAC tapes with appropriate graduation and colours should be used.

4.1.7.2. Measuring MUAC

MUAC should be measured on the left arm, using a flexible non-elastic tape, at the mid-point of the upper arm, with the arm hanging freely by the child's side. Measurements should be made to the nearest millimetre. MUAC should be measured for all children aged 6-59 months.

The decision to include MUAC in SMART (as an independent indicator for wasting) is based on the recognition that agencies frequently collect and use MUAC to estimate selective feeding program needs as it is a recommended indicator for admission into management of acute malnutrition. MUAC is also a better predictor for risk of death then weight for height. To date, there is no universal recommendation to use MUAC to estimate the prevalence of acute malnutrition, however in Somalia MUAC is used to predict the nutrition situation, the prevalence usually indicating a severity phase behind that predicted by GAM and SAM rates.

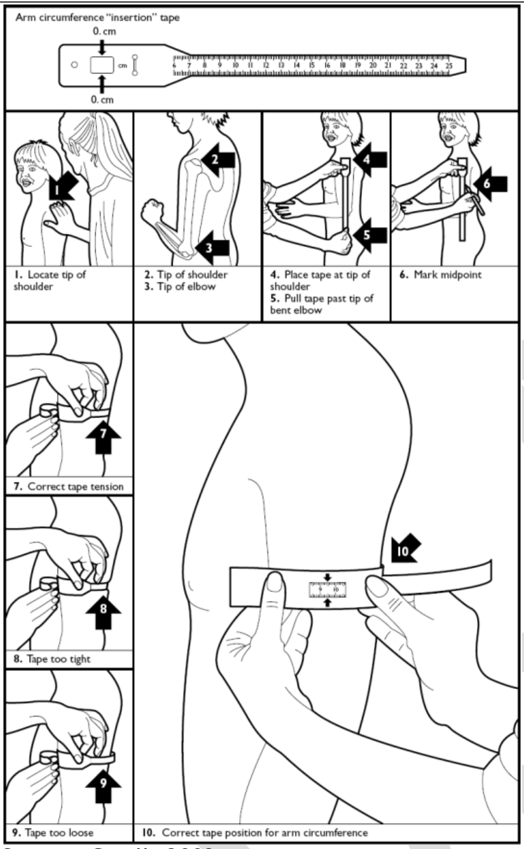
Steps in measuring MUAC

1. Explain the procedure to the child's mother or carer.
2. Keep your work at eye level. Ask the mother to remove clothing that may cover the left arm of the child.
3. Calculate the midpoint of the child's left upper arm by first locating the tip of the child's shoulder (Arrows 1 and 2) with your finger tips. Bend the child's elbow to make a right angle (Arrow 3). Place the tape at zero, which is indicated by two arrows, on the tip of the

shoulder (Arrow 4) and pull the tape straight down past the tip of the elbow (Arrow 5). Read the number at the tip of the elbow to the nearest centimetre. Divide this number by two to estimate the midpoint. As an alternative, bend the tape up to the middle length to estimate the midpoint. A piece of string can also be used for this purpose.

4. Mark the mid-upper arm point with a pen (Arrow 6).
5. Straighten the child's arm and wrap the tape around the arm at midpoint. Make sure the numbers are right side up. Make sure the tape is flat around the skin (Arrow 7).
6. Read the measurement at the window of the tape measure.
7. Record the measurement to the nearest 0.1cm.

Note: MUAC measurement is fast and simple, but not easy, and variations in measurements often occur between different measurers. This is mainly related to how the tape is pulled or "squeezed" around the arm.



Source: Cogill, 2003.

Figure 9. Measuring MUAC

4.1.8. *Estimating the nutrition status (for referral)*

When measurements are taken, the weight-for-height in percent of the median should be calculated for each individual child in order to refer children who need nutrition care. Annex 4 gives an example of weight-or-height table and example of using it.

Steps to calculate the WFH z-score

1. In the first column of the table, locate the height of the child rounded to the nearest 0.5cm (see Annex 4 for rounding principles).
2. Place a ruler or piece of paper under all the values on the same line as the height of the child.
3. Find the corresponding weight of the child.
4. Look to see what column this figure is in.

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5. If the child falls into the "-2 z-score (moderate malnutrition) or "-3 z-score" (severe malnutrition, he should be referred to the closest health or nutrition centre by the team leader, if he not already enrolled in a nutrition program.

4.1.9. *Recording anthropometric information*

An example of anthropometric questionnaire is given in Annex 5. In order to ease data entry, the data should be recorded in the order they appear in the ENA data entry pane, and with the conventional units.

4.2. Mortality interview

4.2.1. *Mortality data: household census (entered at individual level)*

To estimate a mortality rate from a survey, the total number of people at risk and the length of time over which they were at risk need to be known. However, the composition of some of the households will have changed during the recall period (due to death, birth, migration into and out of the household). Thus, the number of people within each household will not have been constant during the recall period.

Figure 10 diagrams an example recall period. At the beginning of the recall period, the household had three members, and at the end of the recall period the household also had three members but only one person was in the household during the entire interval. At one time, the household had six members.

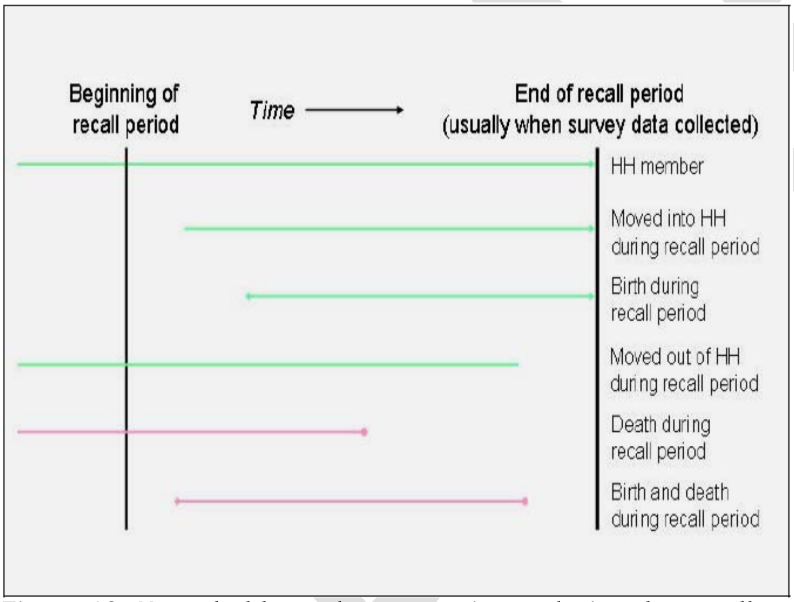

Figure 10. Household members experience during the recall period

In calculating a denominator for this household, people joining or leaving the household during the recall period should be taken into account. In an emergency, it is likely that people will both leave and join households at an increased rate. If the in-migration and out-migration are significantly different from each other, this will have an effect upon the calculated death rates.

Sometimes in mortality surveys, the respondent is simply asked to state how many people are in the household. Although this is quicker, it is much less accurate than asking the respondent to list all household members. It is recommended that the household members be enumerated through a household census.

To calculate the mortality rate the respondent is asked to:

1. List all the household members at the time of the survey and indicated whether each of these household members were present at the start of the recall period
2. List all members of the household that were present at the start of the recall period but have left the household during the recall period
3. Indicate whether the individual is above or below age 5 (to derive 0–5MR) and whether young children were born during the recall period
4. Indicate all deaths that occurred in the household during the recall period

Two additional questions are usually asked

5. The age of each member (to confirm if an individual is above or below age 5 and allow a demographic pyramid of the population to be constructed)
6. The sex of each member (only necessary if sex-specific death rates are required)

Two additional optional questions are sometimes asked[19]

7. The date of any death (usually unreliable)
8. The cause of death (often unreliable)

These data are collected on a form, using a separate sheet for each household. An example of the form is given in Annex 5.

4.2.2. *Summary table (entered at household level)*

Although a household census should be made, data are entered in ENA software in a summary form for each household. Data from each household should therefore be summarized for the following information:

1. Current household members – total
2. Current household members - < 5 years
3. Current household members who arrived during recall (exclude births)
4. Current household members who arrived during recall - <5 years
5. Past household members who left during recall (exclude deaths)
6. Past household members who left during recall - < 5 years
7. Births during recall
8. Total deaths
9. Deaths < 5 years

4.2.3. *Optional household data*

10. Age and sex of each household member
11. Information about cause of death

Although these data are not analyzed automatically by ENA software, they will probably be in the near future.

4.2.4. *Common problems in recording individual information for mortality*

4.2.4.1. Mass migration

In a rapid-onset emergency situation, there are likely to be whole families that arrive in the survey area during the recall period. Part of their experience will have been in the study area,

[19] Where there have been an unusual number of deaths due to a single event, such as a natural disaster or a violent attack, it is inappropriate to calculate a mortality rate (deaths per unit time) to estimate the effect that happened at a single point in time. In these circumstances, deaths at the time of the event or shortly thereafter (the time interval needs to be defined) are recorded and expressed as a proportion of the population that died associated specifically with the event itself. It is also very important to record whether the death was directly due to the disaster/war/violence. When examining such an episode, we also want to estimate the CMR and 0–5MR before and after the event as well as the proportion who died during the event.

and part in the area from which they migrated. The mortality rate in the camp itself is likely to be very different from the mortality rate before arrival in the camp. In addition, the various households will have arrived at different times.

Under these circumstances, if we take a fixed recall period, some of the respondent households will have been in the camp for the whole period and some will be new arrivals that have spent most of the recall period elsewhere or on the journey.

It is therefore desirable to derive separate mortality rates: one for the time that the population was in the camp, and another one for the time before the displaced households reached the camp.

Mortality rate since arrival in the camp
To calculate the mortality rate in the camp, the number of person-day at risk has to be determined. Since families will have arrived at different times, the recall period (or "period considered at risk") is different for each household. The date of arrival should be recorded for each household, and the time period used in the equation should be the average number of days each household has spent in the camp.

Mortality rate before arrival in the camp
To derive the separate mortality rate for the time before arrival, the fixed recall period is used, as in the standard method, and the average time spent in the camp subtracted from this time. Deaths are recorded as occurring in the camp or before arrival but after the start of the recall period. The "before arrival" mortality rate is much more susceptible to serious sampling error because the households are self-selected in terms of those that have the means, opportunity, and composition that enable them to migrate, and the households may have arrived from a wide variety of different geographical areas. The "rate before arrival" in the camp only applies to the migrants who have reached the camp and should not be extrapolated to the area of origin.

It is much more difficult to calculate the sample size needed to separate CMR into two components—before and after arrival. There is an added variable in the calculation: the average length of time households have spent in the camp. If the average length of time in the camp can be obtained from the camp's administrators, this is used as one of the "recall periods" in the calculation.

4.2.4.2. Neo-natal deaths
In keeping with basic protocols for registering vital events, a live birth should be recorded as a birth and a death that follows during the recall period should be recorded as a death - they are two separate events and should be recorded as such in the household enumeration tables. In the summary table, for purposes of entry into ENA, however, it is important that an infant birth and death should be recorded only as a death and not as a birth and a death.

If a birth and death were entered for the same person, the two events would cancel each other out in terms of contributions of "person-time" of exposure.

4.2.4.3. In- and out-migration
In many societies, even under ordinary circumstances, movements in and out of the household are routine occurrences. While it is important to measure migration into and out of the household, however, it is also reasonable, under most circumstances, to assume that short-term movements in and out of the household will not significantly affect the mortality estimates.

Thus, for purposes of simplification, it is recommended that:

- In-migration only measures those who entered the household during the recall period and stayed (either up to the current time or until time of death).
- Out-migration only measures those who left the household and stayed away (if they died while away from the household, that would not be counted as a household death).

As with neo-natal death, for in-migration, a person who enters the household and subsequently dies during the recall period should have both events recorded but for purposes of entry into ENA, it is important that is recorded only as a death.

4.3. Non-anthropometric data

4.3.1. *Deciding what additional information to collect*

The data collected must correspond to the survey objectives. Before adding any other indicator in the survey, the objectives of the survey need to be carefully considered.

It is critical to understand that each additional piece of data collected degrades the accuracy of the whole dataset and prolongs and complicates the survey. Any additional information to be collected should be justified in the objectives and have a realistic prospect of leading to a meaningful intervention or be useful for advocacy purposes. If such data are definitely needed, consideration has to be given to whether the information could be collected more efficiently in other ways (for example from health clinics, sentinel sites or a surveillance system, or from focus group discussion), or whether it would be better to conduct a separate survey to collect the supplementary information.

If additional information is to be included in the survey it must be quickly and reliably obtainable during a short visit to the household, and should be asked on the entire sample of children.

4.3.2. *Food security data*

In order to explain malnutrition levels and plan for appropriate interventions, food security information available from different sources in Somalia should be used. Monthly food security updates and seasonal prospects reports (Post Gu and Post Deyr assessment reports) can be obtained from the FSNAU. Early Warning reports provide regular information on major food security indicators. They provide consistent information and helps monitor trends of changes. Livelihood profiles provide a wealth of baseline information that is relevant and recent for all livelihood zones in each region of the country. Other source of data such as WFP Emergency Food Security Assessments (EFSA) should be looked at.

Minimal data on food security situation (e.g. main source of food and/or income) should be collected through interviews at household level and the rest through key informant interviews and focus group discussions with people or groups from the same community. Those data should be collected at the same time from the same population, but by separate teams using different methods. Food security data comes mainly from key informant interviews, market surveys and observations. The training and skills required to collect these data are different from those required for nutritional and mortality surveys. A Food Security module, based on the Household Economy Approach (HEA), is integrated in the new delta ENA version which helps to find out why nutritional status in a certain area may be good or bad.

4.3.3 Health data

4.3.2.1. Morbidity data

Even during famines, people rarely die as a direct result of famine — people die because they catch infectious diseases (measles, acute respiratory infections, diarrhoea and malaria). These diseases may spread more rapidly because of conditions found during famine, and also may be more severe or of longer duration because people are malnourished. Of most immediate importance are recent or current outbreaks of disease that may be contributing to excess mortality and/or malnutrition. Information on which diseases are most common will help you to plan an intervention.

Unfortunately, good data on morbidity is difficult to obtain. Different people understand different things by diarrhoea or fever, so standardised case definitions should be used. Also, some symptoms (like diarrhoea and fever) are associated with more than one disease (like malaria and measles).

Probably the best way to get information on morbidity is from the WHO, UNICEF, the Somalia Health Cluster, Partners and MoH staff and through discussions with women or community leaders. They can provide information on recent outbreaks and the major illnesses at the time of the survey.

Data on morbidity of children can also be collected during a nutrition survey, but the interpretation of this data should be done very carefully. It is most useful to collect information only on very common diseases, or very well-known diseases (like for mortality). Thus, questions about suspected measles, pneumonia, diarrhoea, and fever are commonly included. This type of information should always be crosschecked with the WHO, MoH staff and key informants.

4.3.2.2. Measles immunisation

Measles and malnutrition are closely associated: poor nutrition makes children more susceptible to measles and makes the attack of measles worse. In turn, measles leads to increases in malnutrition because of diarrhoea and fever. Information on previous measles immunization campaigns or routine vaccination can be found from the WHO, UNICEF, MoH staff and discussion with community leaders.

It is however common to add questions about measles vaccination to nutrition surveys for children aged 9-59 months. Information should be collected from 1) the record on the immunization card, and 2) the recall of the carer.

If the rates of vaccination status are low (<80%, based on the WHO cut offs), then a measles vaccination campaign is always advisable.

4.3.2.3. Vitamin A supplementation

Vitamin A deficiency is associated with increased mortality, especially when children have low WFH. Low WFH is usually associated with low vitamin A body stores and often with vitamin A deficiency. Furthermore, vitamin A requirements are greatly increased during nutritional rehabilitation.

Vitamin A deficiency is difficult to detect without special training. However, information on supplementation rates can determine whether or not a vitamin A (usually given every 6 months) distribution is necessary. When asking a mother about vitamin A supplementation, it is normally easier to bring a capsule along. Show the mother the capsule and ask her if her child has taken one of the capsules in the past six months (the capsules are normally distributed in conjunction with vaccination campaigns).

4.3.3. *Infant and young child feeding data*

Appropriate infant and young child feeding (IYCF) is essential for survival, growth and development. In particular, breastfeeding presents clear short-term benefits for child health,

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mainly protection against morbidity and mortality from infectious diseases. IYCF practices can be inadequate or disrupted during emergencies.

Data should be obtained on children aged 0 – <12 months. Because the age group is different from anthropometric surveys, information might require to be collected in an individual questionnaire rather than on a cluster recording sheet. Annex 7 gives an example of data collection sheet in order to evaluate these practices.

4.3.3.1. Timely initiation of breastfeeding

This is the percentage of infants born in the last 24 hours who were put to the breast within one hour of birth

4.3.3.2. Exclusive Breastfeeding

The practice of exclusive breastfeeding in a population should be assessed by the percentage of infants under 6 months (0-5 months, i.e., until the day before completing their sixth month) who were exclusively breastfed in the previous 24 hours. An infant is considered to be exclusively breastfed if he/she receives only breast milk with no other liquids or solids, even water, with the exception of drops or syrups consisting of vitamins, mineral supplements, or medicines. Make sure to include in the denominator children who have never been breastfed.

4.3.3.3. Timely introduction of complementary feeding

Percentage of infants aged 6 to 8 months (from the first day of the sixth month until the day before completing the nineth month) who are still breastfed and who have received semi-solid and/or solid foods in the previous 24 hours. For further details on indicators for assessing infant and young child feeding refer to the reference given at the last page (104).

4.3.4. *Programme coverage data*

Nutrition surveys are also a useful time to measure the coverage of a special feeding programme. For example, if a targeted supplementary feeding programme for all malnourished children has already started when the nutrition survey is undertaken, it may be useful to find out what the coverage of the programme is. This can help in the adjusting of the programme if necessary.

A simple question about whether or not each child measured is enrolled in the feeding programme can be added to the questionnaire. The coverage rate is calculated as:

$$\text{Coverage rate} = \frac{\text{number of malnourished children who are registered in the programme}}{\text{total number of malnourished children}}$$

4.3.5. **Water*, Sanitation and Hiegine (WASH)***

During the nutrition surveys, FSNAU also collects information on Water quality and access, sanitation facilities and access as well as on hygiene practice. Important indicators assessed on water are access to protected water source, treatment of drinking water, method of storage and time taken to collect water. Access to, type, ground position and sharing of sanitation facility as well as handwashing practices are other key indicators assessed under WASH data. Analysis of such data is conducted through simple frequencies at the household level.

5. Conducting the survey

5.1. Preparing for data collection

During the preparatory phase of the survey, an inventory of all the material resources required and available should be completed. Measuring instruments, questionnaires, means of transport, safety equipment, and other material necessary for the proper functioning of the teams should be clearly identified and budgeted for before the start of a nutrition survey.

Measuring material, scales, and height boards should be in good condition. During the survey, scales should be checked each day against a known weight (standard weight). If the measure cannot be made to match the standard weight the equipment should not be used. Spare equipment is needed to allow for damage or loss. Equipment and supplies needed for the survey include transport, fuel, paper and pens, per diem, and recording forms. Copies of questionnaires, absentee forms and forms for referral of malnourished cases should be prepared.

A list of inventory of common materials needed for a nutrition survey is given in Table 4.

Table 4. Example of equipments and materials needed for a nutrition and mortality Survey

	Item	**Quantity Per team**
Weighing	UNISCALES	1 (2 for teams overnighting in the field)
	Standard weight	1
	Support board (for UNISCALE)	1
	Batteries (for UNISCALE)	Tbd
Measuring	Height board	1
MUAC	MUAC tapes	10
Recording	Household questionnaires	Tbd
	Mortality questionnaires	
	Enumeration forms (depending on sampling method)	Tbd
	Folders/file box	1 per cluster
	Laptop/Charger (if data entered in the field)	Tbd
	Clipboard	1
	Pen	3
	Notebook	1
	Document bag	1
Reference documents	Calendar of events	1
	WFH reference tables	1
	Referral forms	Tbd
	Map of the area (if available)	1 per cluster
Logistics	Vehicle with fuel	1 (2 if with UN staff)

Tbd= to be determined depending on sample size and number of clusters.

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5.2. Selecting and training the survey team

5.2.1. *Selecting the survey teams*

The importance of competent enumerators is emphasized since all surveys are prone to errors arising from improper data collection. Proper screening of enumerators who are fluent in English and the local Somali dialect of the target area, but who are also physically fit (there is usually a lot of walking), is essential. Enumerators can be from the same community as long as they are able to comprehend the nutrition issues and grasp the main concepts behind nutrition surveys.

The survey should be made up of at least 1 coordinator and the survey teams. The number of survey teams required to conduct the survey will depend on the sample size, the time available and the logistical and material resources for implementing the survey. Each survey team should be made up of 4 people: 1 supervisor (normally an agency staff), 1 team leader (usually a nurse who also provides support to the supervisor) and 2 enumerators. If the questionnaire section of the survey is carried out separately, a fourth enumerator may be needed.

The Survey Coordinator has the overall responsibility for training team members, visiting teams in the field, ensuring that households are selected properly, and ensuring the equipment is functioning and calibrated and that measurements are taken and recorded accurately

The team supervisor is responsible for the quality and reliability of the data collected, including appropriate sampling procedure. The team leader is responsible for correct recording of data, administering of health questionnaires where these are incorporated (i.e. the rapid diagnostic tests for malaria). The enumerators are responsible for taking and recording anthropometric measurements. A team of four is also comfortably accommodated in one vehicle thereby enhancing efficiency in logistical arrangements.

Depending on the size of the questionnaire and on the repartition of tasks, the assessment teams are trained in administering the questionnaires.

In addition to the four members of the team, a respected community elder/guide identified by the community leader, joins the team at the cluster level. This person introduces the survey team to the community and survey households, and guides the team around the cluster.

Based on FSNAU's experience in nutrition surveys in Somalia, six teams is ideal to conduct a nutrition survey as it is easy to train, organize (logistically) and manage. Nevertheless, based on security constraints that occasionally necessitate spending the minimum possible time on the ground, a maximum of ten teams have been used in surveys. It is however note-worthy that the more the number of teams, the more complex it is to train, organise (logistically), supervise and manage, and may result in increasing the variation in the precision of the results.

5.2.2. *Training survey team members*

The training of enumerators is important in ensuring that accurate data are collected. Such training should be organized and well coordinated before each survey. Every team member should undergo exactly the same training, whatever their former experience, to ensure standardization of methods. In large-scale surveys with a great number of team, it is beneficial to split enumerators in groups of 10-15 people to increase the effectiveness of training.

The training should be tailored down to the level of tasks expected of the field staff, but normally takes four days. The duration of each aspect of the training depends on the experience of the staff, and the design of the survey. The following should at least be included in designing a training program for nutrition survey enumerators:

- Theoretical sessions (2 days)
  - A clear explanation of the objectives of the Survey.
  - A clear explanation of roles and responsibilities of each team member.
  - An explanation of the sampling method that stresses the reasoning behind and importance of each child and household member having an equal chance of being selected (including households without children for the mortality survey).
  - Background to nutrition, all forms of malnutrition and its causes, and measurement techniques.
  - Training on using a calendar of event.
  - Training on filling out the mortality and household questionnaires.
  - An emphasis on the importance of data quality with reference to plausibility check based on ENA software, to verify quality of data collected using ENA.

- Practical sessions (2 days)

  A cumulative period of 2 days is required for demonstrations on survey ethics, anthropometric measurements, administering of questionnaires, standardization and a pre-test

  Demonstrations (0.5 day)
  - Taking of anthropometric measurements including quality control checks.
  - Use of weight-for-height tables for identification of acute malnutrition and referral to the nearest appropriate facility for nutrition care.
  - Role plays on survey ethics, administration of questionnaires and other survey tools at household level

  Standardization of measurements (0.5 day)
  - To ensure that enumerators take measurements of good quality
  - To be conducted with all the enumerators with 10 children, as described below.

  Pre-test (1 day)
  - To ensure proper organisation of the team and of the material
  - To ensure good understanding of the sampling method
  - To estimate the time spent in each household
  - To ensure that teams are properly organized
  - To fine tune the calendar of events and the household questionnaire
  - To ensure equitable and balanced distribution of staff depending on the capacity of the staff. If need be teams should be reconstituted after pre-test
  - Constructive feedback should be given to each team at the end of the pre-test to correct any mistakes or errors noted at this stage

5.2.3. *Standardization of weight and height measurements*

The objective of a standardization test is to assess whether or not the enumerators are taking the measurements in a standard and accurate way, and to test their precision in taking measurements. This test must be conducted with 10 children before each survey.

A standardisation test involves repeating a measurement twice on 10 different children, with a time interval between measurements on the same child. For each enumerator, the difference between the two measurements is calculated to assess the precision, and a mean of the measurement is calculated to assess the accuracy.

The equipment used in the exercise should be the same equipment used to measure children in the survey itself. The team members will rotate but the equipment should not, so that each child is always measured with the same equipment (the team is being tested not the equipment).

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ENA software should be used to calculate precision and accuracy of height and weight measurements.

Steps for conducting standardization test:

1. Select 10 children whose ages fall within the range for the study (6–59 months), and give them an ID number.
2. The supervisor carefully weighs and measures each child without allowing the trainees to see the values.
3. Each child, with his/her mother, remains at a fixed location with the ID number clearly marked. The distance between each child should be far enough to prevent the trainee from seeing or hearing each other's results.
4. Each pair of trainees starts with a different child. The trainees should carefully conduct the measurements and clearly record the height and weight on their form.
5. When each member of the pair has done the measurement, they should move on to the next child.
6. After a break, the process should be started again. Without seeing the measurements they previously made, each enumerator measures each child a second time.

Example of data collection forms for the standardization test is given in Box 5 and obtained in ENA under the Training menu. Standardization should also be conducted on MUAC measurements.

5.2.3.1. Outputs of the standardization test

The test of standardization allows survey coordinator to identify enumerators that take good measurements. If some enumerators performed poorly, a number of actions can be taken:

- When extra enumerators are trained, the standardization test can be used for the final selection of enumerators, only the best performer being included in final survey team.
- Enumerators who performed poorly can be given tasks within the survey team that are not related to the measurement, such as data recording or measurer-assistant.
- Additional training can also be provided to enumerators who performed poorly. A subsequent test should then be administered to them to make sure that their performance reached an acceptable level.

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Box 7. Using ENA to assess the outcome of the standardization test

In the Training screen of ENA, enter the data obtained for each child, measure 1 and 2, starting with the supervisor and then with each enumerator.

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Planning | Training | Data Entry Anthropometry | Results Anthropometry | Data Entry Mortality | Results Mortality | Options

Evaluation of Enumerators

Please enter for the supervisor and all enumerators the traininng measurements (10 children measured twice for weight and height)
After entering the data press the report button to get an evaluation for each enumerator.

	Supervisor				Enumerator 1				Enumerator 2		
Subjects	Weight 1	Weight 2	Height 1	Height 2	Weight 1	Weight 2	Height 1	Height 2	Weight 1	Weight 2	Height '
1	5.7	5.6	62.2	62.0	5.6	5.5	62.0	62.3	5.7	5.7	62.7
2	5.0	4.9	62.0	61.8	5.0	5.0	62.4	62.5	5.0	5.0	61.6
3	13.2	13.1	92.3	91.9	13.3	13.2	92.1	92.1	13.1	13.1	92.4
4	16.5	16.5	110	109.5	16.5	16.4	110.3	110.1	16.5	16.5	110.1
5	7.4	7.5	64.6	64.5	7.5	7.5	66.4	66.4	7.4	7.5	66.0
6	10.8	10.8	87.9	87.5	10.7	10.7	87.2	87.4	10.7	10.8	87.4
7	9.2	9.1	78.9	78.6	9.2	9.2	78.3	78.5	9.2	9.1	78.5
8	17.9	17.8	104.3	104.0	17.9	17.9	104.2	103.9	17.9	17.8	104.5
9	8.1	8.1	69.5	70.1	8.1	8.1	69.7	70.0	8.0	8.1	69.8
10	7.8	7.8	66.7	66.1	7.8	7.8	66.6	66.3	7.8	7.8	66.8

Report

Click on "Report" to get evaluation of each enumerator. ENA will generate an evaluation report in a separate Word document.

Report for Evaluation of Enumerators

Weight:

	Precision: Sum of Square [W2-W1]	Accuracy: Sum of Square [Superv.(W1+W2)-Enum.(W1+W2]	No. +/- Precision	No. +/- Accuracy
Supervisor	0,05		3/2	
Enumerator 1	0,06 OK	0,07 OK	3/0	3/1
Enumerator 2	0,02 OK	0,03 OK	0/2	2/1
Enumerator 3	0,11 POOR	0,42 POOR	1/2	3/2
Enumerator 4	0,09 OK	0,12 OK	3/0	3/1
Enumerator 5	0,11 POOR	0,30 POOR	3/2	2/2
Enumerator 6	0,10 OK	0,03 OK	1/3	2/1
Enumerator 7	0,02 OK	0,03 OK	1/1	2/1

Height:

	Precision: Sum of Square [H2-H1]	Accuracy: Sum of Square [Superv.(H1+H2)-Enum.(H1+H2]	No. +/- Precision	No. +/- Accuracy
Supervisor	0,51		3/2	
Enumerator 1	0,13 OK	0,54 OK	3/1	2/3
Enumerator 2	0,20 OK	0,71 OK	2/0	4/1
Enumerator 3	1,33 POOR	2,38 POOR	4/1	1/3
Enumerator 4	0,50 OK	1,51 OK	1/2	2/3
Enumerator 5	0,94 OK	1,71 POOR	3/1	1/4
Enumerator 6	0,02 OK	1,47 OK	2/0	2/3
Enumerator 7	0,22 OK	0,73 OK	2/3	1/3

For evaluating the enumerators the precision and the accuracy of their measurements is calculated.
For precision the sum of the square of the differences for the double measurements is calculated.
This value should be less than two times the value of the supervisor.

Standardization should also be conducted on MUAC measurements.

5.2.3.2. Practical tips to conduct the standardization test

This exercise is very difficult to conduct in practice, but is it extremely important. In order to facilitate its implementation, it is recommended to plan the standardization in a location where there is enough space. Open-air area might be more appropriate than a closed room. Since many children need to be involved, conducting the test in a community rather than bringing children to a training centre might ease the availability of children and reduce the noise/stress resulting from a confined space with many people/children.

In order to reduce the burden on children (who each have to be measured twice by the supervisor and then twice by each enumerator), children can be taken into "batches". A batch of 10 children can be taken for 3 or 4 enumerators. The number of measurements made by the supervisor will be higher. However, although more children will be involved overall, taking batches will considerably reduce the pressure on each individual child for whom this exercise is very unpleasant.

5.2.4. *Pre-testing*

Field training is practical and not confined to the classroom. It takes place after the teams are able to make accurate and precise measurements, have "passed" the standardization test, and have formed teams that have practiced working together. For field testing the teams go to a convenient, local village that has *not* been chosen to contain a cluster. The teams should go through all the steps in conducting the survey. They practice selecting the houses that will form the cluster, approaching mothers and explaining the purpose of the survey, making the measurements, and conducting the mortality interview. This step is essential for the teams to feel confident when they begin conducting the actual survey.

The field training data from each of the teams should be entered into ENA and analyzed. The teams should each have selected different households from the village (otherwise it is likely that the selection was not random). Each team's results will be slightly different; this is used as a practical demonstration of the effect of sampling error and the importance of taking a random sample.

5.3. Implementing the survey

5.3.1. *Managing the survey*

The coordinating supervisor or coordinator has the overall responsibility for training team members, visiting teams in the field, ensuring that households are selected properly, and ensuring the equipment is checked and calibrated each morning during the survey and that measurements are taken and recorded accurately.

Unexpected problems nearly always arise during a survey, and the supervisor is responsible for deciding how to overcome them. Each problem encountered and decision made must be promptly recorded and included in the final report. The survey coordinator is also responsible for overseeing data entry and for the analysis and report writing.

Where possible, the survey supervisor should organize an evening wrap-up session with all the teams together to discuss any problems that have arisen during the day[20].

[20] This may not be possible if the survey area is large and teams are widely separated or remain in the field for several days. Communication with teams in the field is often very difficult. In such circumstances, team leaders must be sufficiently trained to make decisions independently.

5.3.2. *Enhancing the accuracy of the data collected*

There are several ways to improve the quality of the data collected in a nutrition survey:

- Ensure errors in the field are minimised by using good quality equipment that is regularly calibrated.
- Check the forms for blank entries at the end of each day to make sure no data is left out. The team leader should review all questionnaires before leaving an area in order to make sure no pieces of data have been left out. If there are any problems the team can return to the household and correct any identified error.
- Check for data collected. Each evening, or during the next day while the teams are in the field, the supervisor should arrange for data to be entered into the computer. Recording errors, unlikely results, and other problems with the data may become clear at this stage. ENA software will automatically flag abnormal values as data are entered. Each morning, before the teams set out for the day, there should be a short feedback session. If any team is getting a large number of "flagged" results, the supervisor should accompany that team the next day. If the results are very different from those obtained by the other teams, it may be necessary to repeat the cluster from the day before. Also refer to chapter 6.3 for additional guidance.

Apart from the evening and morning meetings, survey team members should be encouraged to regularly discuss their experiences and findings together. This often brings out important points, and sometimes shows where survey methods need to be modified.

5.3.3. *Supervising data collection team*

Field supervision is important in ensuring valid data collection and minimising bias. The coordinating supervisor should:

- Make frequent unannounced spot checks on the teams in the field.
- Ensure that the methodology is closely followed and document any deviations.
- Check all forms to ensure that all sections are accurately completed.
- Ensure that all instruments to be used the survey teams are calibrated every day.

It is particularly important to check cases of oedema, as there are often no cases seen during the training and some team members may therefore be prone to mistaking a fat child for one with oedema (particularly with younger children). The supervisor should note teams that report a lot of oedema, and visit some of these children to verify their status.

5.3.4. *Minimising Bias*

Bias is anything other than sampling error that causes the results of the survey to be different from the actual population prevalence. Bias cannot be calculated nor its effect upon the result assessed. It is the main reason for inaccurate survey results.

As bias cannot usually be calculated or corrected by the computer after data collection is finished, it is critical to avoid bias during sampling and data collection. Bias is minimized by adequate training and use of good technique.

Quantitative data can be examined using ENA to see if there is likely to be some form of systematic bias. The teams should be aware that such techniques will be applied during the analysis to discourage their succumbing to the temptation to take shortcuts.

Examples of bias

1. Because the foot piece of a length-board was loose, one team systematically measured the height of each child 1 cm taller than he or she really was. Even though weight was accurately measured, each child's WFH z-score was lower than it should, be and the prevalence of wasting was exaggerated. Any inaccuracy in the equipment or measurement technique will lead to systematic bias.

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2. Inaccurately taken weight and height—even when the inaccuracy is random and evenly distributed between over- and under-measurement—results in systematic overestimation of the prevalence of wasting. This overestimate is greater for severe malnutrition than for moderate malnutrition, and relatively greater when the true prevalence is low than when it is high.

Shortcuts are likely to be taken if the survey teams are required to work too hard, if there is inadequate time allocated to rest periods and refreshments, or if the time that can be spent in a particular household to administer the mortality questionnaire and measure the children properly is insufficient. Therefore, the data may be much more accurate if there are fewer, rather than more, households in each cluster. This tends to be more common in rough terrain or when there are long distances to walk.

The following are some of the sources of bias that occur during the interview.

- Recall error: Respondents often fail to recall all deaths during a given recall period. Infant deaths, in particular those within a short time after birth, are particularly under-reported. Respondents may also misreport ages, dates, and salient events.
- "Calendar" error: Respondents may report events as happening within the recall period when they did not (or vice versa) due to lack of clarity about dates.
- “Age heaping”/digit preference: Respondents may round ages to the nearest year i.e. 12, 24, 36 and 48 months.
- Sensitivity/taboos about death: In general, the death of a household member is not a subject discussed readily with strangers.
- Deliberate misleading: In some populations, with experience of relief operations, some respondents may deliberately give incorrect answers in the expectation of continuing or increased aid.
- Interviewer error: Enumerators may ask questions or write down answers incorrectly, skip questions, assume answers, or rush respondents in an effort to complete the interview quickly.

Bias and errors can be avoided by adherence to procedures explained in section 4.0 in taking measurements, thourough training and close field supervision.

5.3.5. *Ethical considerations*

Although nutrition Surveys would not qualify for research, data should still be collected in an ethical manner. Some ethical issues are highlighted here:

1. Provide sufficient information to local authorities about the survey. Such information includes the purpose and objectives of the survey, the nature of the data collection procedures, the targeted subgroups in the community. Where possible, survey procedures and copies of survey questionnaires should be available to the community leaders for their comments prior to the survey.
2. Verbal consent must be obtained from all adult participants and parents/ guardians for children in the survey. Every individual has the right to refuse to participate in the survey. Such a decision should be respected.
3. The confidentiality of survey data should be protected by ensuring that information leading to identification of individuals is not shared, especially in the communities.
4. Referrals for the malnourished or sick. Although a nutrition survey differs from a nutritional screening, children who show signs or symptoms that require immediate clinical attention should be referred to the closest health centre or nutrition programs. Team leaders should refer children if:
    a. They have bilateral oedema;
    b. Their weight-for-height is below -2.0 z-score.
    c. Their MUAC is less than 12.5 cm.

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6. Data analysis and data quality check

6.1. Data entry

Nutrition and mortality data can be entered directly into ENA software. Other data can either be entered in ENA (in the "Data Entry Anthropometry" screen), or in any other appropriate software.

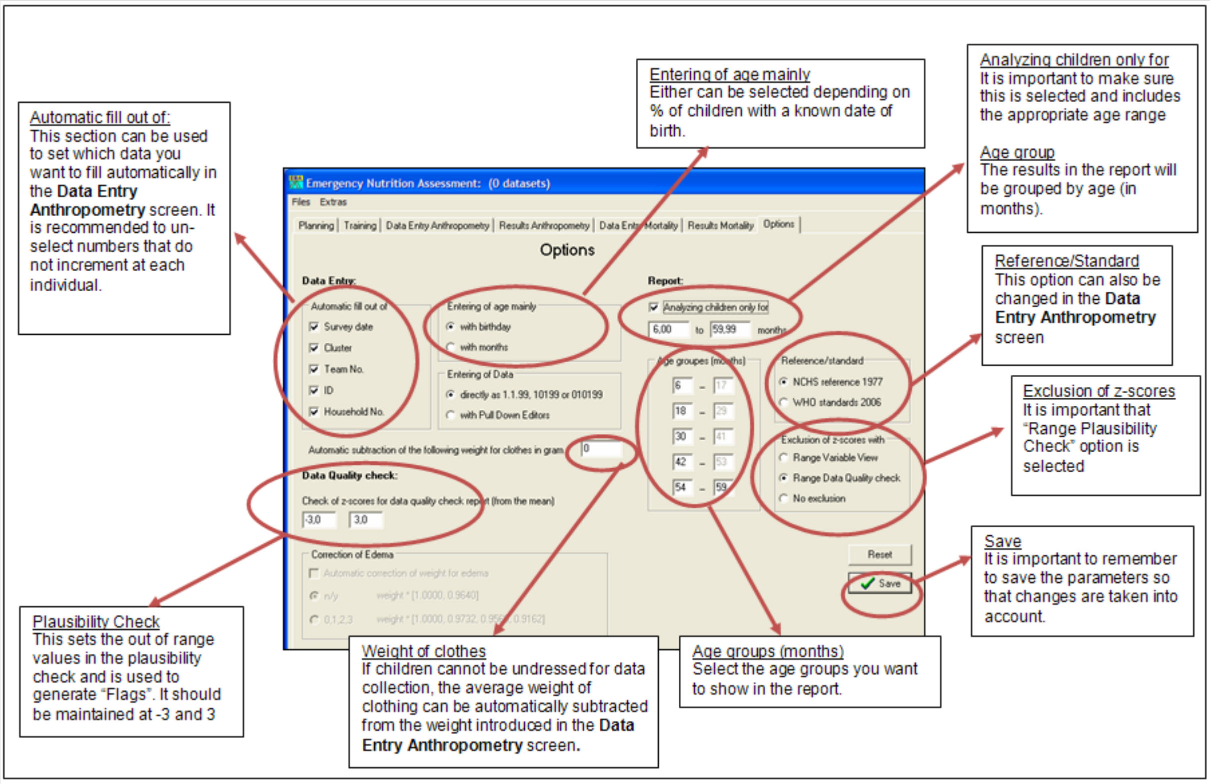
6.1.1. *Using ENA to enter the anthropometric data*

6.1.1.1. Preparing for data entry

If there are more than one data entry clerk, parameters should be set identically for all of them prior starting data entry. Before starting data entry in ENA, it is important to make sure that all the sections on the "Option" screen are correctly set, as shown in the following Box 8.

Box 8. Setting ENA options for data entry

In the "Options" screen of ENA select the appropriate parameters.



6.1.1.2. Defining variables

In order to limit data entry errors, it is advised to set adequate limits and "checks" before starting data entry (see Box 9), especially if additional data are being entered in ENA. During data entry, values that do not match the variable type or range will be highlighted. Defaults values are already set for the required data, but can be modified if needed.

Range values for weight intend to highlight values that are abnormal for children aged between 6 and 59 months. Data are therefore highlighted to check for data collection or data entry error, and allow for easy identification of data that should be verified.

When children are included in the survey on the basis of their age, range values for height follow the same logic as for weight, i.e., the purpose is to identify extreme values that are highly impossible for a population of children aged 6 to 59 months. In case height is used as an inclusion criterion (instead of age, as detailed in section 4.1.1), limits for height range can be modified to 65 (lower range) and 110 cm (higher range) so that children that do not fit with the inclusion criterion can be identified.

Default values for the ranges of nutrition indices allows for identification and verification of measurements that are extreme and probably result from measurement errors:

WHZ <-5 SD or >+5 SD
HAZ <-6 SD or >+6 SD
WAZ <-5 SD or >+5 SD

Those values correspond to the values of flags in EpiiInfo 6.0 software but can be adjusted.

6.1.1.3. Entering anthropometric data

In the Data Entry Anthropometry screen of ENA, the first 11 columns are required data to allow for individual calculation of nutrition indices. The nutrition indices are automatically calculated and filled in the grey cells as data are entered.

Survey date, cluster number and team number are already entered in the first row (the village that has been chosen for the cluster is already in the database in the planning stage—the same cluster number should be used in this panel). As the data are entered, these fields will default to the last entered information so that the data do not have to be entered for each subject.

The identification number will increment automatically by one for each new record. The household number will not be incremented, as there is often more than one child in the same house. The household number needs to be entered. These must be the same household numbers as those used for entering mortality data.

Either the birth date or the age in months should be entered in the age fields. If the birth date is entered, the age will be automatically calculated. If age is entered the birth date field will be left blank. It is not necessary to enter an age to proceed. If age is not entered, it is assumed the child was selected on the basis of height and that the age is not known with sufficient accuracy to be recorded. In this case, WFA and HFA will not be calculated or entered into the database.

Weight should be entered in kg, height in cm. Sex should be filled in with "m" for male and "f" for female, and oedema must be filled in "y" for presence of oedema and "n" for absence of oedema. If the oedema field is not entered, it defaults to oedema being absent during analysis. ENA does not calculate WHZ and WAZ for children with oedema. The type of measurement (standing or lying) can be entered and the data is automatically corrected (using a correction factor) when it is not done the standard way, for instance if a child was measured standing when the age is < 2 years.

If there appears to be an error in the data entered, the field will turn red/pink. The cut-off points to alert the person entering the data can be set in the options screen/variable view as discussed previously in this chapter. When a field turns red, the first thing to do should be to check whether it is not due to data entry. If data is entered as recorded on the questionnaire, and if the team is still in the area, the team can return to the household to retake the measurements.

Box 9. Setting ENA variable settings for data entry

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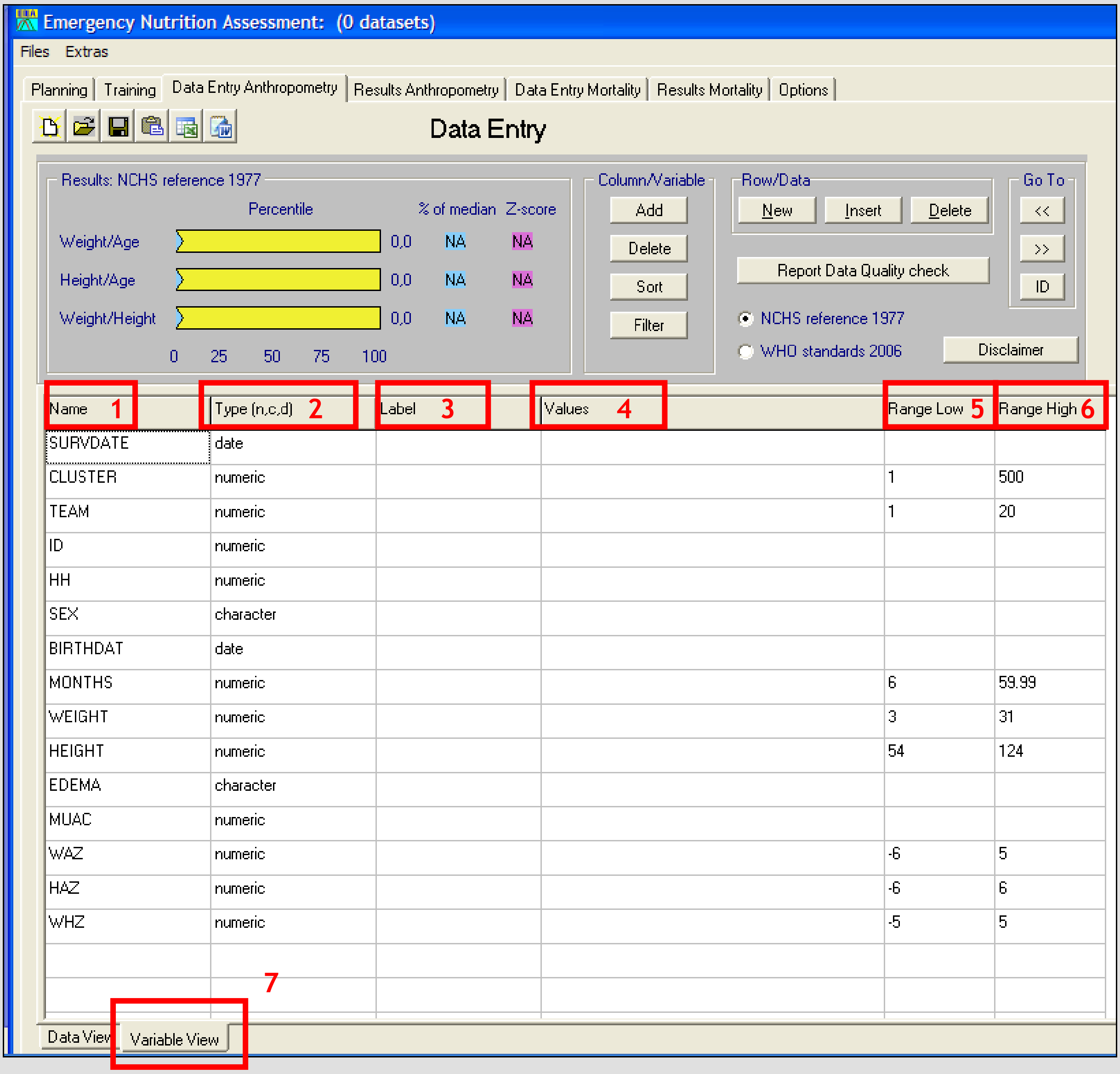
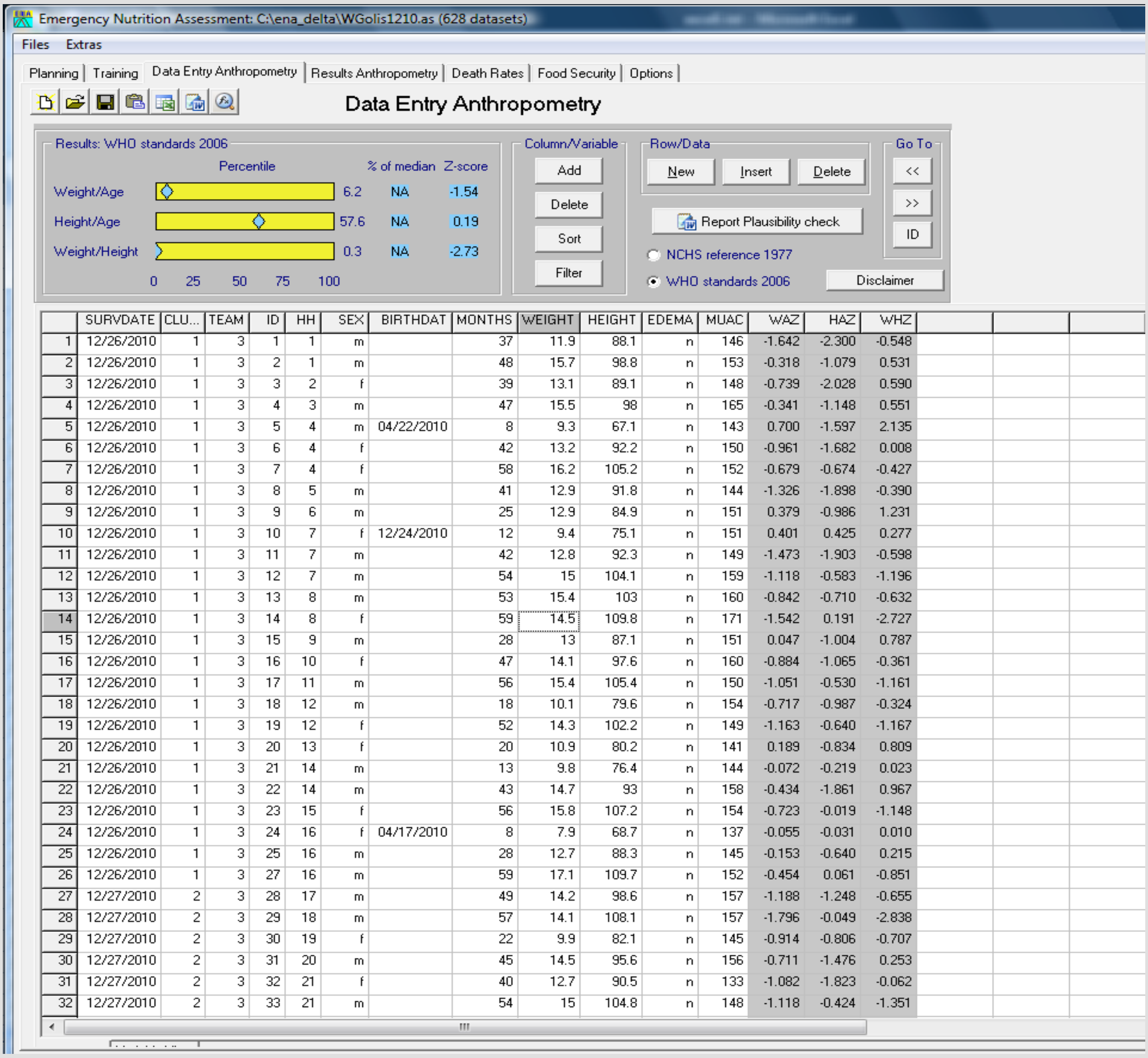
In the "Data Entry Anthropometry" screen of ENA select the "variable view" tab (7).

For each data, select the appropriate parameters:

1. Name of variables. Additional variables can be added by simply entering the name of the data.
2. Type (n: numerical, c: character, d: date).
3. Label
4. Values
5. Range Low
6. Range High



Box 10. Using ENA for data entry—data entry anthropometry



	SURVDATE	CLU...	TEAM	ID	HH	SEX	BIRTHDAT	MONTHS	WEIGHT	HEIGHT	EDEMA	MUAC	WAZ	HAZ	WHZ
1	12/26/2010	1	3	1	1	m		37	11.9	88.1	n	146	-1.642	-2.300	-0.548
2	12/26/2010	1	3	2	1	m		48	15.7	98.8	n	153	-0.318	-1.079	0.531
3	12/26/2010	1	3	3	2	f		39	13.1	89.1	n	148	-0.739	-2.028	0.590
4	12/26/2010	1	3	4	3	m		47	15.5	98	n	165	-0.341	-1.148	0.551
5	12/26/2010	1	3	5	4	m	04/22/2010	8	9.3	67.1	n	143	0.700	-1.597	2.135
6	12/26/2010	1	3	6	4	f		42	13.2	92.2	n	150	-0.961	-1.682	0.008
7	12/26/2010	1	3	7	4	f		58	16.2	105.2	n	152	-0.679	-0.674	-0.427
8	12/26/2010	1	3	8	5	m		41	12.9	91.8	n	144	-1.326	-1.898	-0.390
9	12/26/2010	1	3	9	6	m		25	12.9	84.9	n	151	0.379	-0.986	1.231
10	12/26/2010	1	3	10	7	f	12/24/2010	12	9.4	75.1	n	151	0.401	0.425	0.277
11	12/26/2010	1	3	11	7	m		42	12.8	92.3	n	149	-1.473	-1.903	-0.598
12	12/26/2010	1	3	12	7	m		54	15	104.1	n	159	-1.118	-0.583	-1.196
13	12/26/2010	1	3	13	8	m		53	15.4	103	n	160	-0.842	-0.710	-0.632
14	12/26/2010	1	3	14	8	f		59	14.5	109.8	n	171	-1.542	0.191	-2.727
15	12/26/2010	1	3	15	9	m		28	13	87.1	n	151	0.047	-1.004	0.787
16	12/26/2010	1	3	16	10	f		47	14.1	97.6	n	160	-0.884	-1.065	-0.361
17	12/26/2010	1	3	17	11	m		56	15.4	105.4	n	150	-1.051	-0.530	-1.161
18	12/26/2010	1	3	18	12	m		18	10.1	79.6	n	154	-0.717	-0.987	-0.324
19	12/26/2010	1	3	19	12	f		52	14.3	102.2	n	149	-1.163	-0.640	-1.167
20	12/26/2010	1	3	20	13	f		20	10.9	80.2	n	141	0.189	-0.834	0.809
21	12/26/2010	1	3	21	14	m		13	9.8	76.4	n	144	-0.072	-0.219	0.023
22	12/26/2010	1	3	22	14	m		43	14.7	93	n	158	-0.434	-1.861	0.967
23	12/26/2010	1	3	23	15	f		56	15.8	107.2	n	154	-0.723	-0.019	-1.148
24	12/26/2010	1	3	24	16	f	04/17/2010	8	7.9	68.7	n	137	-0.055	-0.031	0.010
25	12/26/2010	1	3	25	16	m		28	12.7	88.3	n	145	-0.153	-0.640	0.215
26	12/26/2010	1	3	27	16	m		59	17.1	109.7	n	152	-0.454	0.061	-0.851
27	12/27/2010	2	3	28	17	m		49	14.2	98.6	n	157	-1.188	-1.248	-0.655
28	12/27/2010	2	3	29	18	m		57	14.1	108.1	n	157	-1.796	-0.049	-2.838
29	12/27/2010	2	3	30	19	f		22	9.9	82.1	n	145	-0.914	-0.806	-0.707
30	12/27/2010	2	3	31	20	m		45	14.5	95.6	n	156	-0.711	-1.476	0.253
31	12/27/2010	2	3	32	21	f		40	12.7	90.5	n	133	-1.082	-1.823	-0.062
32	12/27/2010	2	3	33	21	m		54	15	104.8	n	148	-1.118	-0.424	-1.351

6.1.1.4. Missing data

If certain critical pieces of information are missing from a child's survey record, it will not be possible to include the child in some of the anthropometric data analyses:

- <u>Age</u>: If information on age is missing, the child can still be included in the Survey of wasting and oedema, because these do not require age. However, you will need to be sure the child is eligible to be in the survey (i.e., in the required height range of 65cm–110cm).
- <u>Sex</u>: If information on sex is missing you should still include the child in the Survey of wasting and oedema. The reference population information on height and weight is sex specific. However, the difference between the sexes in terms of the WFH reference standards is small, and irrelevant for oedema.
- <u>Height</u>: If information on height is missing you cannot include the child in the Survey of wasting. However, the child can still be included in an analysis of oedema, because any child with oedema is severely malnourished.
- <u>Weight</u>: If information on weight is missing you cannot include the child in the Survey of wasting. However, the child can still be included in an analysis of oedema.

6.1.1.5. Data outside the required range

Most nutrition surveys measure children aged 6–59 months, or, if age cannot be estimated, children who are 65cm–110cm tall. Children outside these ranges should not be included in the results. These values depend upon the defaults that have been set in the variable view panel of the software. The default is to accept any child who is in the correct age range, even if the height is out of range. Any child outside the age range will be marked by the program.

If height data are missing, the anthropometric indices of interest cannot be calculated. However, if the age is within range, the child can be included if there is oedema. The accepted height range can be altered in the variable view sheet, for example, to change the range to 60cm–100cm if the population is very stunted. These choices must be included in the report.

Thus, by default, if a child is 55 months old and 112cm the child will be included. However, if the child is 65 months old, it should not be included and the computer will automatically exclude the child in the results.

6.1.2. *Using ENA to enter the mortality data*

Although a household census is conducted during the mortality interview, data should be entered by household (and not by individual), using a summary of information. In addition to identification data (household and cluster numbers), 9 variables need to be entered per household, as shown in Box 11. Plausibility checks for mortality data are not yet available in ENA. It is also possible to collect mortality data on the individual level (as opposed to the household level) and to obtain more specific (e.g. sex-specific, age-specific, or cause-specific) death rate results.

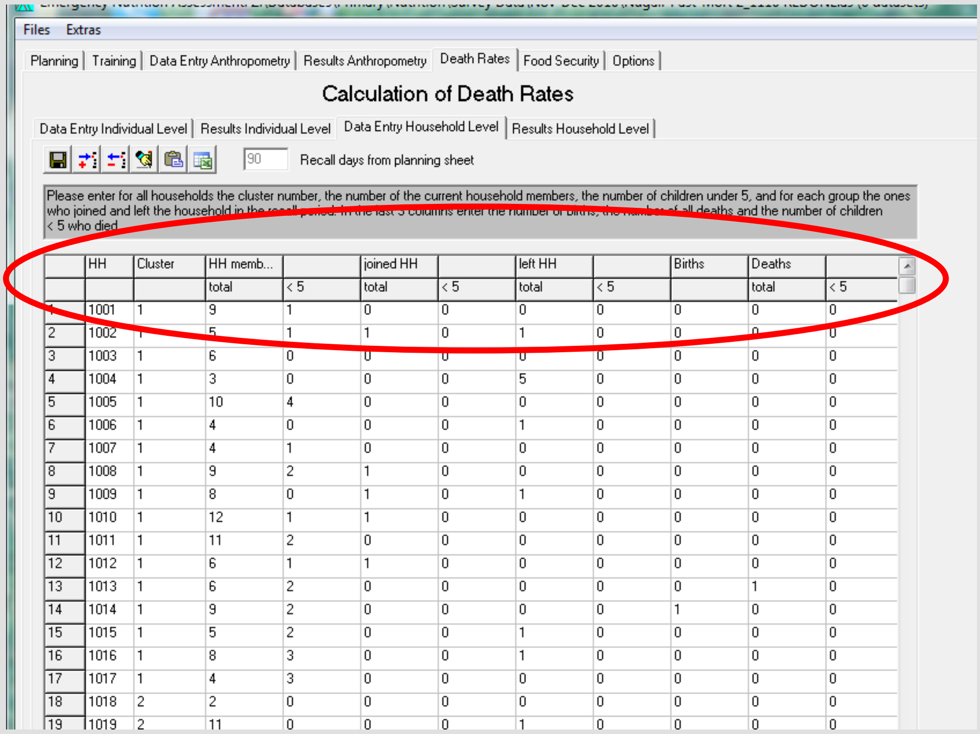
Box 11. Using ENA for data entry—data entry mortality

Mortality data summarized by household should be entered in the Data Entry Mortality screen of ENA on a single line. The cluster and household numbers should be the same as the ones entered for the anthropometry data.

The following 11 variables should be entered for each household:

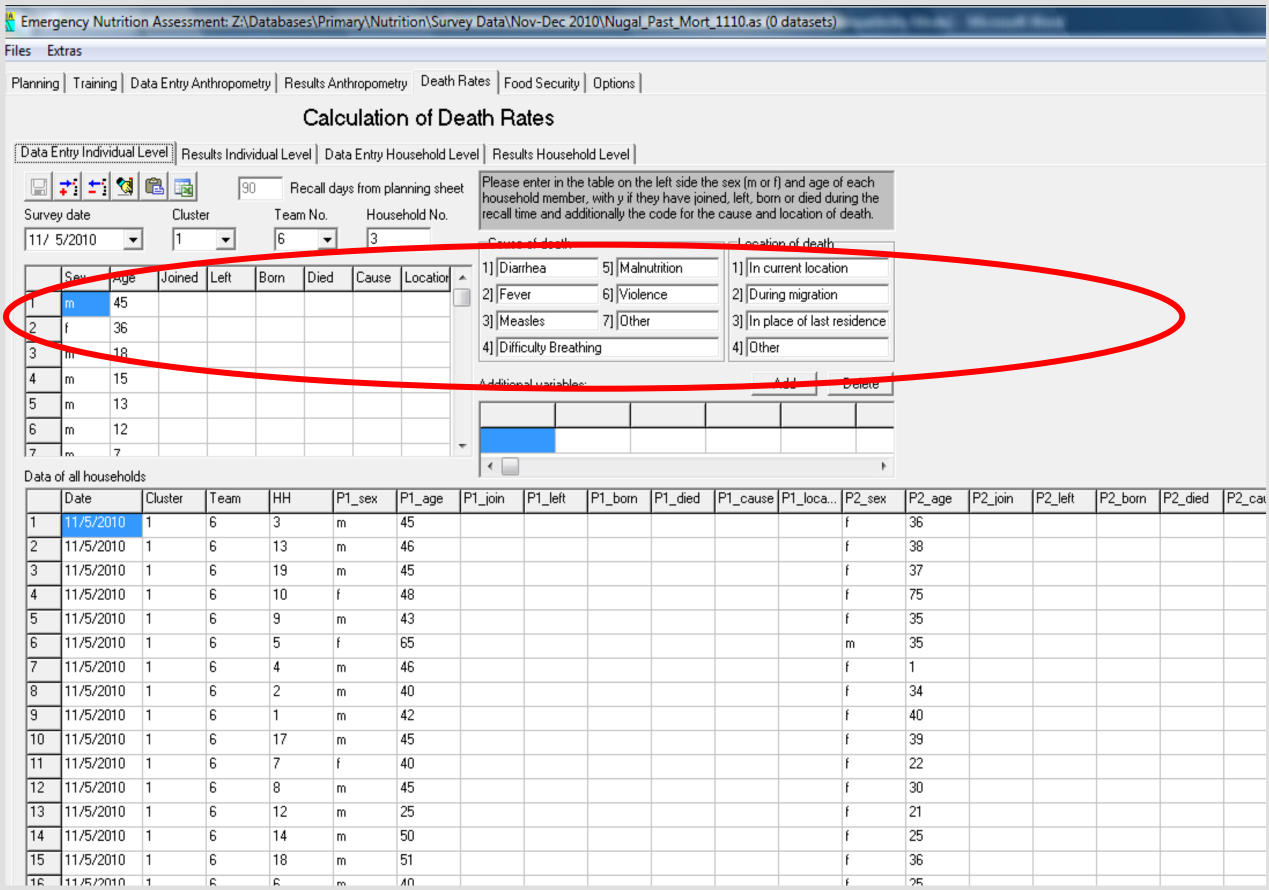
HH		Household number (same as anthropometry)
Cluster		Cluster number (same as anthropometry)
HH member	Total	Current household members – total
	< 5	Current household members – < 5 years
Join HH	Total	Current household members who arrived during recall (do not count births)
	< 5	Current household members who arrived during recall – <5 years
Leave HH	Total	Past household members who left during recall
	< 5	Past household members who left during recall – < 5 years
Births		Births during recall (do not count if died)
Deaths	Total	Total deaths during recall
	< 5	Deaths during recall – < 5 years

Household Level



	HH	Cluster	HH memb...		joined HH		left HH		Births	Deaths	
			total	< 5	total	< 5	total	< 5		total	< 5
1	1001	1	9	1	0	0	0	0	0	0	0
2	1002	1	5	1	1	0	1	0	0	0	0
3	1003	1	6	0	0	0	0	0	0	0	0
4	1004	1	3	0	0	0	5	0	0	0	0
5	1005	1	10	4	0	0	0	0	0	0	0
6	1006	1	4	0	0	0	1	0	0	0	0
7	1007	1	4	1	0	0	0	0	0	0	0
8	1008	1	9	2	1	0	0	0	0	0	0
9	1009	1	8	0	1	0	1	0	0	0	0
10	1010	1	12	1	1	0	0	0	0	0	0
11	1011	1	11	2	0	0	0	0	0	0	0
12	1012	1	6	1	1	0	0	0	0	0	0
13	1013	1	6	2	0	0	0	0	0	1	0
14	1014	1	9	2	0	0	0	0	1	0	0
15	1015	1	5	2	0	0	1	0	0	0	0
16	1016	1	8	3	0	0	1	0	0	0	0
17	1017	1	4	3	0	0	0	0	0	0	0
18	1018	2	2	0	0	0	0	0	0	0	0
19	1019	2	11	0	0	0	1	0	0	0	0

Individual Level



	Sex	Age	Joined	Left	Born	Died	Cause	Location
1	m	45						
2	f	36						
3	m	18						
4	m	15						
5	m	13						
6	m	12						
7	m	7						

Data of all households

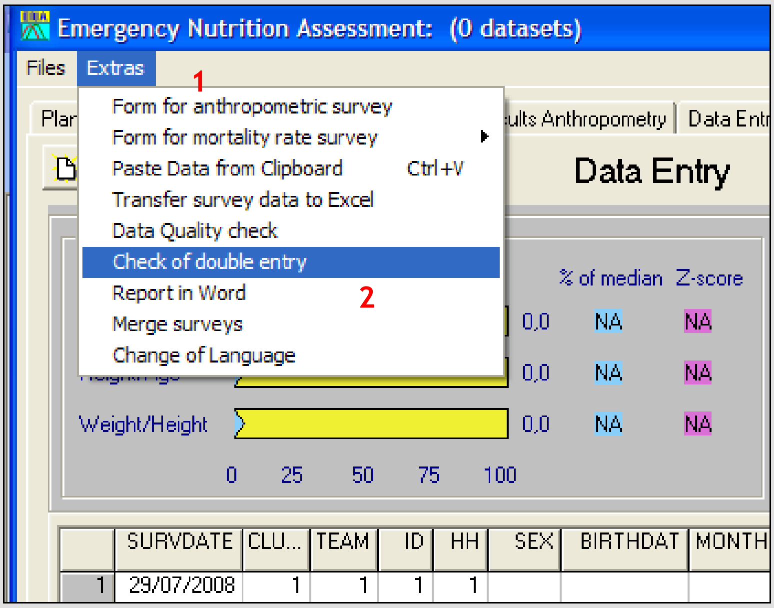
	Date	Cluster	Team	HH	P1_sex	P1_age	P1_join	P1_left	P1_born	P1_died	P1_cause	P1_loca...	P2_sex	P2_age	P2_join	P2_left	P2_born	P2_died	P2_cau
1	11/5/2010	1	6	3	m	45							f	36					
2	11/5/2010	1	6	13	m	46							f	38					
3	11/5/2010	1	6	19	m	45							f	37					
4	11/5/2010	1	6	10	f	48							f	75					
5	11/5/2010	1	6	9	m	43							f	35					
6	11/5/2010	1	6	5	f	65							m	35					
7	11/5/2010	1	6	4	m	46							f	1					
8	11/5/2010	1	6	2	m	40							f	34					
9	11/5/2010	1	6	1	m	42							f	40					
10	11/5/2010	1	6	17	m	45							f	39					
11	11/5/2010	1	6	7	f	40							f	22					
12	11/5/2010	1	6	8	m	45							f	30					
13	11/5/2010	1	6	12	m	25							f	21					
14	11/5/2010	1	6	14	m	50							f	25					
15	11/5/2010	1	6	18	m	51							f	36					
16	11/5/2010	1	6	6	m	40							f	25					

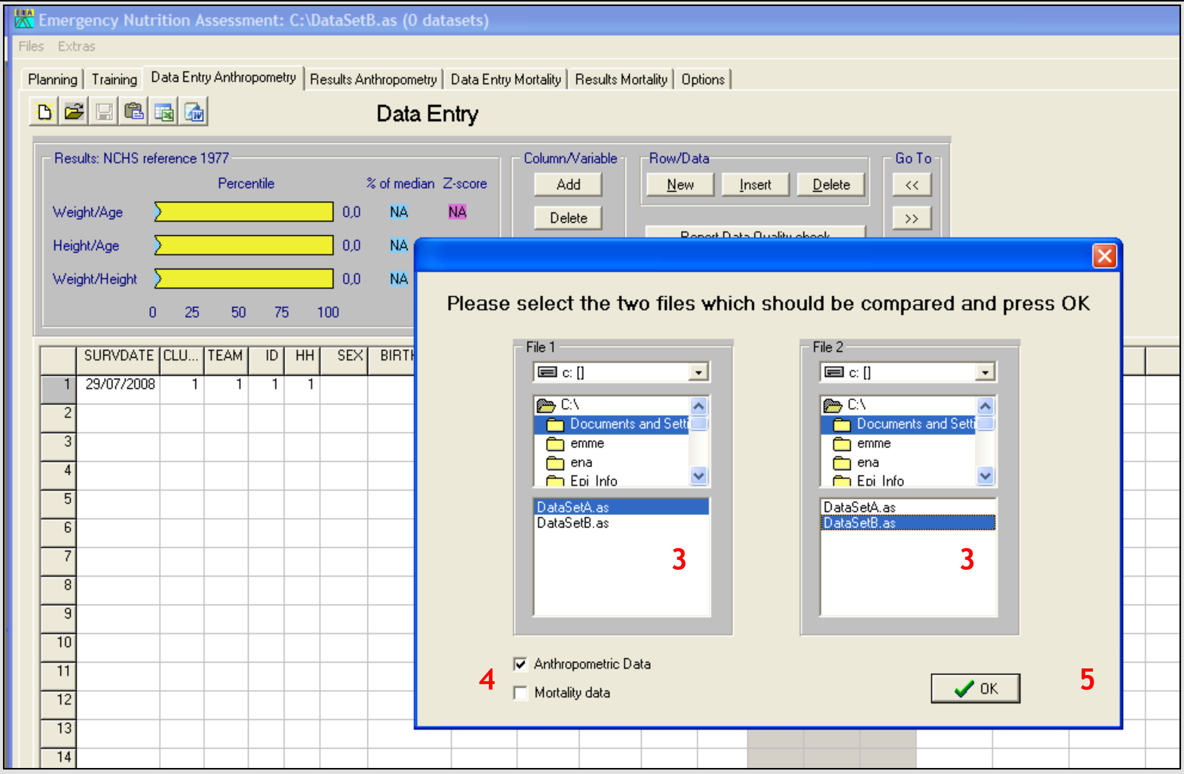
6.1.3. *Using ENA for double-entry*

It is common practice, where the results of the survey are critical and there is sufficient time available to enter all the data twice and compare the two resulting datasets. The data should be saved in two separately named files. The data can then be compared automatically using the "check for double entry" in the extras menu of ENA, as shown in Box 12. When there are discrepancies in data, the questionnaire should be verified to decide which data to maintain in the final database.

Box 12. Using ENA for double-entry

1. Select the "Extras" menu of the "Data Entry Anthropometry" screen.
2. Select "Check of double entry".
3. Select the 2 datasets to compare.
4. Check whether anthropometry or mortality data should be compared.
5. Click "ok".
6. The double entry report will allow you to see discrepancies in data entry.
7. Refer to the original questionnaires to identify the actual value.
8. Make the corrections in only one dataset that will be used for data analysis.





Check of double entry 6

Anthropometric Data

Difference in Line: 1

Dataset A .as	25/4/2007	23	4	6	6	f	31	14.1
Dataset B as	27/4/2007	23	4	6	6	m	31	141

Difference in Line: 6

Dataset A .as	26/4/2007	16	4	15	13	m	12	9
Dataset B.as	26/4/2007	16	4	13	13	m	13	9

6.2. Calculation of nutrition indices

6.2.1. *Nutrition indices*

To determine the nutrition status of an individual, the weight, height, age, and presence of oedema are needed. The relationship of these measurements to each other is compared to international reference standards. The nutrition surveys are designed with respect to three indices: height-for-age (HFA), weight-for-height (WFH), and weight-for-age (WFA). WFH, HFA, and WFA are calculated for individuals and groups using ENA software[21]. Users of this manual are not expected to have to calculate these values without the aid of a computer.

6.2.1.1. Height-for-age (HFA)

Growing children get taller, and the height of a child in relation to a "standard" child of the same age gives an indication of whether the growth has been normal or not. This index of growth is called height-for-age. Children who have a low HFA are referred to as **stunted**. Growth is a relatively slow process, and if a child of normal height stops growing it takes a long

[21] The software EpiInfo can also be used to calculate the nutritional variables.

time for that child to fall below the cut-off point for stunting[22]. For this reason, HFA is often used to indicate long-standing or chronic malnutrition. If the insult that led to stunting is in the past, it is possible that the current growth rate is actually normal (although this is unusual without a change in the family circumstances). Stunting may also be due to intrauterine growth retardation followed by normal postnatal growth.

6.2.1.2. Weight-for-height (WFH)

A child getting taller will also gain weight if body proportions remain normal. A thin child will weigh less than a normal child of the same height. Weight-for-height is a measure of how thin (or fat) the child is. Because weight gain or loss is much more responsive to the present situation, WFH is usually taken to reflect recent nutritional conditions. Being excessively thin is called wasting. It is also often termed "acute malnutrition", although individual children may have been thin for a long time. An advantage of using WFH to assess the nutritional state is that it does not involve age; in many poor populations, age is not known and is difficult to estimate reliably, especially in emergency situations.

6.2.1.3. Weight-for-age (WFA)

Neither stunted nor wasted children weigh as much as normal children of the same age. Weight-for-age is thus a composite index, which reflects both wasting and stunting, or any combination of both. In practice about 80% of the variation in WFA is related to stunting and about 20% to wasting. It is not a good indication of recent nutritional stress. It is used because it is an easy measurement to take in practice, and can be used to follow individual children longitudinally in the community.

6.2.1.4. Mid-upper arm circumference (MUAC)

Mid-upper arm circumference (MUAC) is also often measured. It directly assesses the amount of soft tissue in the arm and is another measure of thinness (or fatness), like WFH. Although it is easier to measure MUAC than WFH, it is more difficult to make a precise measurement, it is not standardized for age, and the cut-off points are not universally accepted. Nevertheless, MUAC is the best index to use in the community (for screening) to identify individual children in need of referral for further Survey or treatment. Because MUAC is used in this way in the community, it is useful to know the relationship between WFH and MUAC in a particular community to establish a full nutrition program including screening. This is why MUAC is often included in the data collected in a survey. MUAC data are often not emphasized in a report, and decisions are not usually based upon these data alone. The new delta version released in July 2010, fully integrates MUAC (which must be entered in mm and not cm) in the training, results and plausibility and plausibility part of ENA and the MUAC Z scores from the new WHO standards are automatically added when the data of the survey is exported to excel.

6.2.2. *The reference population curves*

To assess malnutrition as determined by WFH, WFA, and HFA, individual measurements are compared to an international reference standard. Some countries still use the two standards simultaneously, but many countries including Somalia have switched to the new WHO standards. The "WHO standards" (WHO Child Growth Standards, 2006) are derived from the Multicenter Growth Reference Study conducted on populations from 6 different ethnic backgrounds and cultural settings (Brazil, Ghana, India, Norway, Oman and the USA). The "NCHS reference" is derived from surveys undertaken in the United States (NCHS/WHO/CDC reference table, 1977).

[22] A child who is 100% of normal growth who falters to 70% of normal will take up to half his life to fall below the usual cut-off point and be labelled as moderately stunted. Thus, a 1-year-old child who is gaining height at 70% of normal will not be designated as stunted for six months.

The reference values are used as a standard to compare nutritional status in different regions, and in populations over time. All survey results must be reported at least using the WHO standards, although using both is to date still recommended.

6.2.3. *Expression of nutrition indices*

Anthropometric indices are usually expressed in two ways: as z-scores derived from the reference standard and as the percentage of the median value of the reference standard. However, with the new WHO standards, only z-scores should be reported.

6.2.3.1. The z-score

A z-score is a measure of how far a child is from the median WFH of the reference (often written WHZ). In the reference population, all children of the same height are distributed about the median weight, some heavier and some lighter. For each height group, there is a standard deviation among the children of the reference population. This standard deviation is expressed as a certain number of kilograms at each height. The z-score of a child being measured is the number of standard deviations (of the reference population) the child is away from the median weight of the reference population at that age group.

The WHZ is based upon the child's weight, the median weight of children of the same height and sex in the reference population, and the standard deviation of the distribution of weights in the reference population for children of the same height and sex.

WHZ = (child's weight - reference median weight) / standard deviation of weight for the reference population.

For example, consider a male child who measures 84 cm and weighs 9.9kg. As shown in the Annex 3, the reference median weight for boys of height 84 cm is 11.3kg. The standard deviation from the reference distribution for boys of height 84 cm is 0.908 kg. This child's WHZ = (9.9 – 11.3) / 0.908 = -1.54 z-score.

These calculations should all be done by computer using ENA software, but it is useful to understand the basis for the calculation.

6.2.3.2. The percentage of the median

The percentage of the median WFH[23] (often written WHM), compares the weight of the child to the median weight of children of the same height in the reference population. The calculation of WHM for each child is based on the child's weight and the median weight for children of the same height (and sex) in the reference population:

WHM = child's weight / reference median weight × 100.

For example, consider a male child who measures 92 cm and weighs 12.1 kg. The median weight for boys in the NCHS reference population who are 92 cm tall is 13.4 kg. This child's WHM = 12.1/13.4 × 100 = 90.3%.

Nutrition indices using % of median should not be reported when using WHO standards.

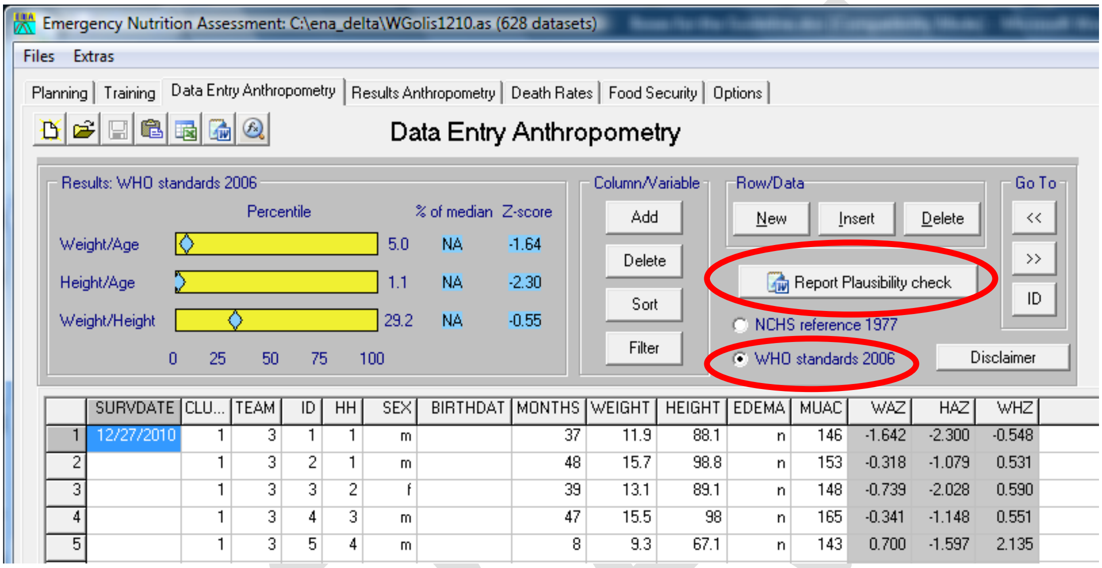
[23] The median is a type of average. It is used instead of the mean because the standard population is not normally distributed. This was a problem with bottle feeding making some of these children obese so that the upper half of the distribution is slightly more "spread out" than the lower half. The median is simply the middle value that has half the population above and half below a given value.

6.3. Assessing data quality and data cleaning

Measurement bias occurs when the team has not been adequately trained or supervised or when the measuring equipment is faulty. Rigorous training and supervision, as well as careful checks to assure the quality of the equipment should therefore be put in place.

There are several data quality checks that are automated in ENA and reported in the data quality check report. The plausibility check ensures that the quality of the data is sufficient to be used for planning interventions.

To obtain the plausibility report, click on the "Report Data Quality check" button in the Data Entry Anthropometry screen.



6.3.1. *Outliers (flags)*

In SMART there are two methods of identifying results from children that are unlikely to be correct measurements. If flagged values or indices cannot be corrected, they should be excluded from the analysis, but never removed from the database.

6.3.1.1. Exclusion of z-scores in Variable view (Epi Info 6 flags)

In the data entry screen, ENA flags (coloured red) are by default the following resulting z-score in relation to the <u>reference mean</u>:

WHZ <-5 SD or >+5 SD
HAZ <-6 SD or >+6 SD
WAZ <-5 SD or >+5 SD

Those values are defined in the Variable view of the Data Entry panel and excluded automatically in all the calculations by selecting the "range variable view" button. This is the same "flagging system" that the one used in Epi-Info software. These flags identify the values that are absolute abnormalities for individuals as the data are being entered. The absolute values have been chosen because they are so extremely abnormal that they are very unlikely to be correct – indeed some are hardly compatible with life.

The purpose of these flags is to enable correction in data entry or re-measurement while still in the field. If there has been a recording error, it should be corrected. If it is a measurement error, the team should go back to the household to correct the measurement or the estimation of age.

Any uncorrected values should definitely NOT be used for the analysis – and the number of exclusions recorded in the report (they should not be simply eliminated from the data-base).

6.3.1.2. Exclusion of z-scores in Data Quality check (SMART flags)

In the plausibility report, the program will list and query any value that is (by default) ± 3 standard deviations of the observed mean. The default values can be changed in the "Options" screen and excluded automatically in all the calculations by selecting the "range plausibility check" button.

The purpose of these flags is to allow additional data cleaning before running analysis and to exclude from analysis cases that are not plausible (i.e., cases that probably resulted from data collection errors). The computer examines the data to see if there are values outside the expected range to exclude from the analysis data that are "more likely to be errors than real values".

For the final analysis it is recommended that the exclusions based upon the Plausibility Check should be used and the numbers excluded reported. The values should not be removed from the database. This "cleaning" is done automatically during the analysis.

6.3.2. *Distribution*

Most children with wrongly measured data give values that are within the plausible range. Inclusion of such errors can be suspected from examination of the distribution of the data.

6.3.2.1. Mean

The mean value is robust to random measurement errors. It is affected by non-random errors. Note that even a small systematic error can have a surprising effect.

If children are routinely weighted in underclothes that weigh about 30 grams, even though this is less than the precision of the scale, it will make a difference. This is because it changes the rounding of the numbers being read on the scale – more of the children will be rounded up to a higher figure than the lower figure.

There are other systematic errors that cannot be discerned from examination of the data unless there are marked differences between the teams (e.g., one team has a scale that has not been properly zeroed – see below).

6.3.2.2. Standard Deviation

The standard deviation of the z-scores for WFH and HFA should be examined. As explained in the section on outliers, this tells 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 and values more than ±3 z-scores of the mean.
The SD of WFH should not exceed 1.2 in a good survey (there is no lower limit, although it is generally above 0.8[24]).

When the SD is below 1.2, then the data can be analyzed the conventional way and the counted prevalence should be reported.

[24] Experience shows that in some countries the SD is consistently less than 1.0 and is frequently around 0.8. It is not clear why this happens. There are two plausible explanations. First, that the teams have taken their measurements much more carefully than the teams that collected the data that were used to derive the standards themselves. Second, the population may be substantially more homogeneous (so that children are very similar to each other) than those coming from the population that formed the standards.

6.3.3. *Sex ratio*

The sex ratio should be approximately 1.0, i.e., 50% male and 50% female[25]. If it deviates markedly from 0.9 – 1.1, either overall or within age groups, then there has either been a sampling problem or there is a social problem.

For example, when house-to-house visits are not made, but the mothers asked to bring their children to a centre for measurement (this is a short-cut unsupervised teams sometimes employ), then the mothers can bring their boys rather than their girls and this can show as an abnormal sex ratio. If there is an excess of girls this is often due to failure of the teams to warn the village of their arrival or failure to get the children outside the household to come for measurement. Boys are more likely to be out of the house on other errands or playing than girls.

As another example, if the sex ratio is near equality in the younger age groups but deviates in the older age groups then this is sometimes due to the 4 and 5 years old children being occupied in the fields or outside the house.

6.3.4. *Digit preference for height and weight*

A common mistake when recording measurements is to round them to the nearest round number – usually a zero or five as the last figure with weight and height and 12, 24, 36, 48 for age in months.

A large digit preference can have a large effect upon the result – but minor degrees of "rounding" will not affect the result even though it might be statistically significant.

6.3.5. *Skewness*

Skewness is a measure of the direction and degree of any asymmetry that there is in the data. A value of zero means that the distribution is symmetrical distribution. A positive value indicates skewness (long tail) to the right. A negative value indicates skewness to the left, as shown in Figure 1.

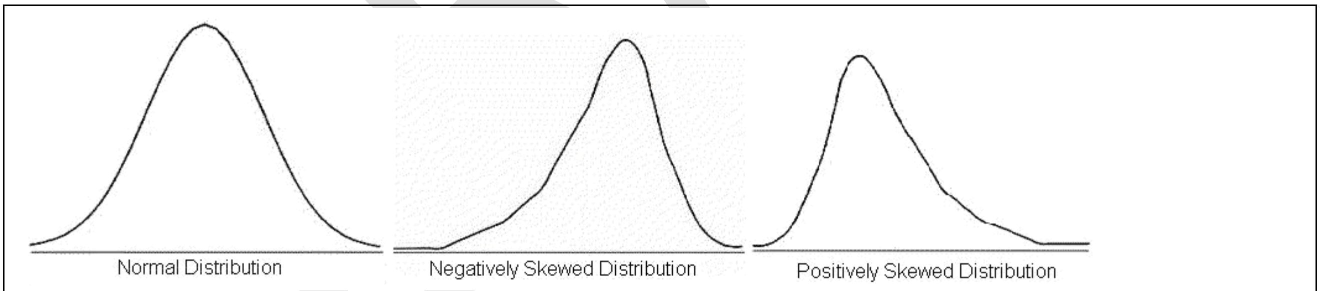


Figure 1. Example of skewness in distribution of data

The values of the statistic increase as the distribution becomes more and more skewed. There is no general agreement at what level one would declare the results to be sufficiently skewed to cause a problem in analysis. It is however recommended that values below ± 1.0 always be accepted as normal, that up to ±3.0 the data are probably not sufficiently skewed to cause concern. As the vales increase above ±3.0 the data can be said to be skewed.

Skewed data are not necessarily due to poor quality of data collection. Skewness can be generated if there are subgroups within the population that are sufficiently different from the rest of the population to form a distinct subgroup. When the populations are almost equal in

[25] At birth the sex ratio is such that there are slightly more boys – 51 to 53% - there is a higher mortality for boys so that by the time the children reach 6 months the ratio falls to about 50-52% boys. Within the age groups the sample sizes are not sufficiently large to give values that are significantly different from equality.

size and markedly different this can result in a bimodal distribution (a curve that has two peaks and a wide SD). If the subgroup is smaller in size than the main population and sufficiently similar so that a bimodal distribution is not generated, then the distribution is likely to be skewed (depending upon whether the subgroup is better or worse than the general population.)

If the data are greatly skewed then great care needs to be taken with interpretation. It is likely that there are distinct subgroups within the population that should have been identified and surveyed separately during the planning phase of the survey.

6.3.6. *Kurtosis*

Kurtosis is a measure of the "peakedness" of a distribution. When there is a Kurtosis problem, although the distribution is symmetrical and can appear like a bell shaped curve – it is still not normal. This statistic measures whether there are too many values in the tails and not enough in the shoulders of the distribution or conversely whether the shoulders of the curve have too many children and the tails are missing, as shown on Figure 2.

A Normal distribution with a bell-shaped curve has kurtosis of zero. A positive kurtosis indicates a sharper peak with longer/fatter tails – like a Mexican hat - and relatively more variability due to extreme deviations. A negative kurtosis coefficient indicates broader rounded shoulders with shorter/thinner tails – like a pudding.

A positive kurtosis is often generated by large numbers of outlying values – this can occur from errors in reading the scales or length board, recording the measurement, transferring the recordings or entering them into the computer. If there are large numbers of flags it is likely that there will be a high positive Kurtosis. Frequently, the kurtosis falls as one cleans the data from the raw values to the Epi-Info style flags to the plausibility check flags. If, after applying the plausibility check cut-offs, the kurtosis remains high then the data are flawed.

A negative kurtosis is less common. It usually indicates that the data have been "over-cleaned" or that the teams have not taken values that they themselves think might be extreme – so that there are far too many values clustered around the mean value.

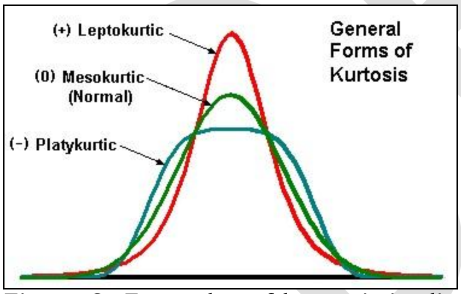


Figure 2. Examples of kurtosis in distribution of data

Again there is no general agreement about the values where one would reject survey data. The same authorities give the same cut-off values for Kurtosis as they do for skewness. Thus <±1.0 is always acceptable. From ±1.0 to ±3.0 the data are probably normal but should be taken with some caution. Above 3.0 the data are not normally distributed.

6.3.7. *Analysis by team*

The problems with measurement usually do not involve all the teams. Often it is due to one poorly trained team or team member that can affect the overall results of the survey. Even if the overall analysis is acceptable, there may be an aberrant values arising from a particular team – this may go unobserved if there are a large number of teams so that the contribution of an individual team to the overall result is diluted.

All the tests that are applied to the overall results are also applied to each individual team.

If any particular team has obtained data that is very different from the other teams, it is likely that this team's technique has created a systematic bias. If there is time, the aberrant team's clusters should be re-sampled using a different team and the new data substituted for the aberrant data. If re-sampling is not feasible within a reasonable time, the data should be analyzed with and without the aberrant clusters, and both results reported with a recommendation from the survey supervisor indicating which result is likely to be more reliable. There has to be a full report of such occurrences and how they are resolved (e.g., perhaps the team's equipment is faulty or their training has been inadequate).

6.3.8. *Overall data quality*

It is very difficult for a non-mathematician without electronic equipment to fabricate data that forms a normal distribution without Skewness, Kurtosis, an acceptable SD, and without digit preference for weight, height and MUAC measurements. If these values are all within acceptable limits it can be assumed that the data have been well taken and entered into the computer, and the analysis acceptable.

From the statistics that are generated from the data and from each of the teams, SMART version 2.0 intends to generate an overall Score for the survey quality. In the meantime, a summary of data quality tests available to date is given in Table 5 along with acceptable ranges.

6.3.9. *Cleaning and assessing quality of Household and Other Non-anthropometric data*

Household data and other non-anthropometric child and women data are cleaned for missing responses, wrong entries and extreme values as well. There is no software to check the overall quality of the non-athropometric data.

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Table 5. Summary of data quality tests

Variable/tests	Acceptable Range	Description	Where to find the information
Sample size	Greater than the calculated sample size	It is important to ensure that the resulting analysis is carried out on a sample size greater than or equal to the calculated sample sizes prior to adding the 10% contingency (both for the anthropometric and the mortality data).	Main results panel of the "Results Anthropometry" screen.
Values out of usual range (SMART Flags) WFH	Less than XX% of the sample size	"Flags" are nutrition indices that are "more likely to be errors than real values". They lie out of the usual range (± 3 z-scores of the observed mean). Flags should be checked against the raw data and corrected if necessary. Flagged data should be excluded from analysis and recorded in the final report.	Main results panel of the "Results Anthropometry" screen. Exclusion of z-scores with "range data quality check"
Values out of usual range (SMART Flags) HFA	Less than XX% of the sample size		
Age distribution	There should not be no obvious peaks	Peaks at 12, 24, 36 and 48 months suggest that ages were not properly estimated.	Report data quality check
Overall sex ratio	Between 0.9 and 1.1	Allows a view of the representativeness of the sample. If the sex ratio is outside this range, the teams should be interviewed to determine what happened.	Report data quality check
Digit Preference Weight and Height distribution	There should not be no obvious peaks	This indicates how accurately the measurements were taken and if rounding to the nearest round number occurred. For weight and height measurement, there should be no digit preferences; however a small degree of rounding will not affect the end result.	Report data quality check
Standard Deviations WFH	< 1.2 z-score	The standard deviation (SD) of the z-scores for weight-for-height and height-for-age is an important check and should be examined carefully. It tells you if there is substantial random error in the measurements. The higher the SD, the more erroneous results there are in the dataset. If it the SD for WFH is above 1.2 then the calculated prevalence of malnutrition (from the mean with an SD of 1.0) should be reported and the counted prevalence noted in the annex.	Report data quality check
Standard Deviations HFA	Between 1.10 and 1.30 z-score		Report data quality check
Skewness WFH	Good: ≤ absolute value of 1 Acceptable: ≤ absolute value of 3	Measures the degree of asymmetry of the data around the mean. A normal distribution is symmetrical and has zero skewness so a positive skewness indicates a long right tail while a negative indicates a long left tail.	Report data quality check
Kurtosis WFH	Good: ≤ absolute value of 1 Acceptable: ≤ absolute value of 3	Measures the relative flatness of the data compared to a normal distribution. The normal distribution has zero kurtosis, so a positive value indicates a peaked distribution while a negative is a flat one.	Report data quality check

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6.4. Data analysis anthropometry

Once indices have been calculated and data checked for quality, the analysis of the data can be conducted.

6.4.1. *Classification of malnutrition*

6.4.1.1. Definitions of acute malnutrition

WFH is the criterion used to assess moderate and severe wasting, monitor changes in the nutrition status of the population, and make decisions on admission and discharge of individuals to and from feeding programs.

Oedema

Pitting oedema on both feet (bilateral oedema) is the sign of kwashiorkor. Any person with bilateral oedema has severe malnutrition[26] and is classified as severely malnourished even if the WFH z-score or percent of median is normal. ENA does not calculate WHZ and WAZ for children with oedema.

Moderate, severe, and global acute malnutrition

The classification of acute malnutrition is based on the presence/absence of oedema and on WFH index, as detailed in Table 6.

Table 6. Classification of acute malnutrition

	Degree of malnutrition	Definition using z-score	Definitions using % of median (NCHS ref only)
Acute Malnutrition	None/Mild	≥ -2.0	≥ 80%
	Moderate	≥ - 3.0 and <-2.0	≥70% and <80%
	Severe	<-3.0 or oedema	<70% or oedema
Global Acute Malnutrition (GAM)	Moderate + Severe	<-2.0 and/or oedema	<80% and/or oedema
Severe Acute Malnutrition (SAM)	Severe	<-3.0 and/or oedema	<70% and/or oedema

Severe Acute Malnutrition (SAM) is the term used to include all children with severe wasting or children who have oedema.

Global acute malnutrition (GAM) is the term used to include all children with moderate wasting, severe wasting and/or oedema.

Note that the terms "severe wasting" and "severe acute malnutrition" are not synonyms. A child with severe acute malnutrition is either severely wasted, oedematous, or both. Severe acute malnutrition is therefore the sum of severe wasting and oedema.Severe wasting does not include oedema.

The user of this manual will not have to make these calculations: they are done automatically using ENA software. GAM and SAM should be presented as prevalence expressed as a percentage of the population.

[26] There are other causes of bilateral oedema such as heart failure, kidney disease (nephrotic syndrome), thiamine deficiency, and pre-eclampsia in pregnant women. However, most bilateral oedema, especially in children, is due to kwashiorkor.

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6.4.1.2. Definition of chronic malnutrition

In the context of emergency nutrition survey, chronic malnutrition refers to the stunting levels, although other forms of chronic malnutrition exist, such as micronutrient deficiencies. The long time scale over which HFA changes makes it less useful for deciding when to intervene in an emergency. It is useful, however, for long-term planning and policy development. Although at an individual level stunting develops slowly, the degree of stunting can change within a few months when averaged over an entire population. Table 7 details the cut-offs used to classify chronic malnutrition, based on z-score and % of median.

Incorrect age data makes HFA information misleading, and reliable age data can be difficult and time-consuming to obtain.

Table 7. Classification of Stunting

	Height-for-age z-scores	**Height-for-age % of median (NCHS ref only)**
Severe stunting	<-3 Z scores	<70%
Moderate stunting	≥ - 3.0 and <-2.0	≥ 70% and <80%
Total stunting (moderate + severe)	<-2 Z score	<80%

6.4.1.3. Definition of underweight

Although underweight is not widely used in nutrition Survey for intervention it is useful to report. Table 8 details the cut-offs used to classify underweight, based on z-score and % of median.

Table 8. Classification of underweight

	Weight-for-age z-scores	**Weight-for-age % of median (NCHS ref only)**
Severe Underweight	<-3 Z scores	<70%
Moderate Underweight	≥ - 3.0 and <-2.0	≥ 70% and <80%
Total Underweight	<-2 Z score	<80%

6.4.1.4. Cut-off points for MUAC

MUAC is an alternative measure of thinness to weight-for-height with a comparative advantage of being better predictor of mortality.

In Somalia, as is the case in other countries where CMAM and IMAM programs are implememnted, 11.5 cm is used as a cut-off for severe acute malnutrition, and 12.5 cm is used as a cut-off for moderate acute malnutrition using MUAC. The cut-off points used to classify malnutrition based on MUAC are given in Table 9. It is recommended that surveys report both classifications so that data can be used for programming according to national standards, while providing data that are interpretable in the international context.

Table 9. Cut-off points for MUAC

	MUAC Cut-off for programming
Severe	<11.5 cm
Moderate*	≥11.5 and <12.5 cm
Mild malnutrition*	≥12.5 and <13.5cm

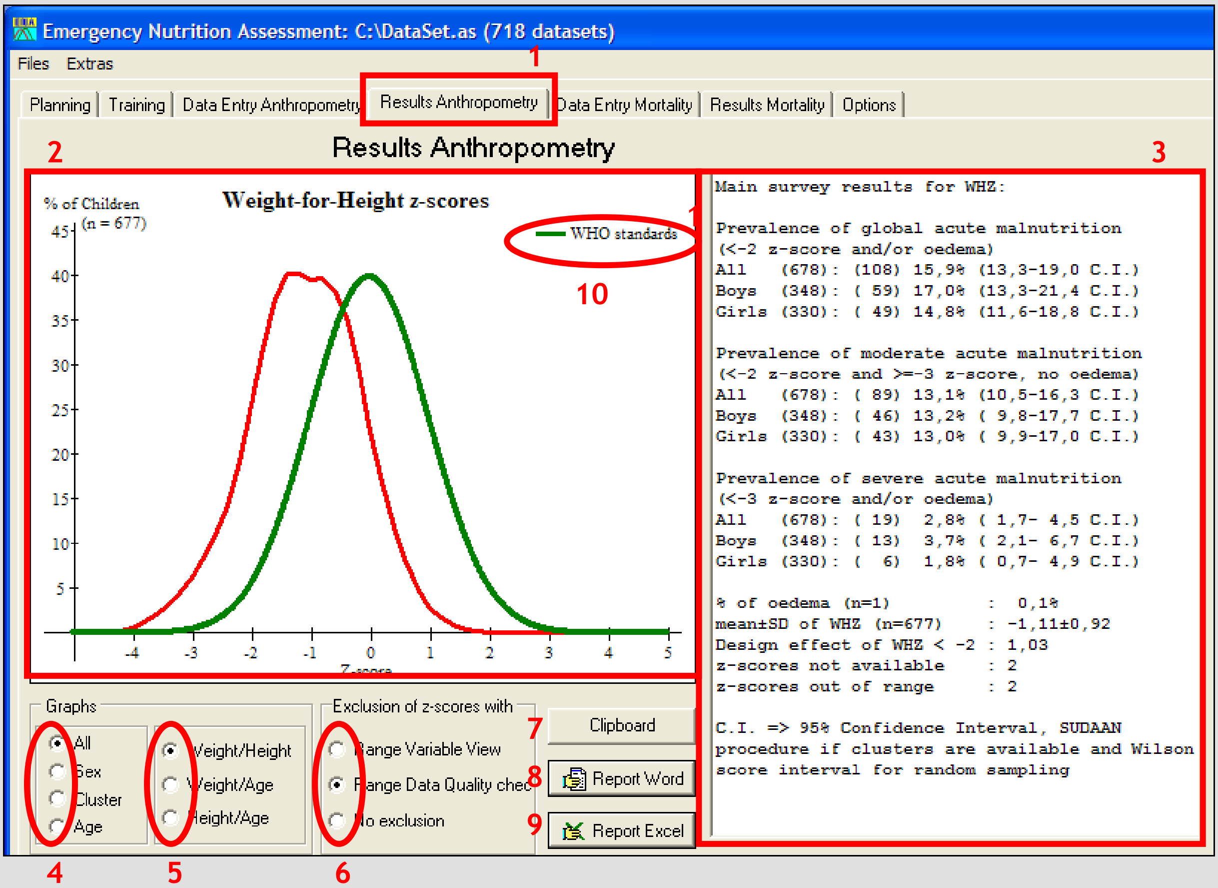
6.4.2. ***Anthropometric results***

An analysis plan should be drawn to ensure that the research questions are answered adequately. Both descriptive and interpretive analysis is necessary.

ENA for SMART should be used in the analysis of the nutrition and mortality data. ENA automatically calculates nutrition indices of each individual and nutrition status of the surveyed population, along with a 95% confidence interval. The analysis can be done using either population of reference; however, current recommendations are to report results based on both WHO standards and NCHS references.

Box 13. Using ENA for data analysis - Anthropometry

Data are automatically analyzed with the chosen population of reference in the "Results Anthropometry" screen of ENA (1). Graphs (2) and results (3) can be displayed for the chosen sub-groups (4), nutrition indices (5), and exclusion criteria (6). Simply changing one parameter will automatically update the graphs and results for the selected criteria. The graph can be exported as an image by adding into the "clipboard" (7). A survey report can be generated either in Word (8) or in Excel (9). The population reference in used is identified in the graph's legend (10).



Changing the reference population (WHO/NCHS) is done in "Data Entry Anthropometry".

Results are given for children 6-59 months, unless otherwise specified in the "Options" screen (options have to be saved to be taken into account). Results can be given by other selected variables (cluster, HH, ID, etc...) by using the filter function in "Data Entry Anthropometry".

If the data is collected using the two-stage cluster sampling methodology, the analysis should be done on one set of data without disaggregating it. The results from all clusters should be combined to give an estimate for the whole population from which the sample was taken. The results from each cluster should NOT be used as an estimate of the prevalence of malnutrition in those individual locations because the sample size in each location is too small to be representative of that location.

Data can be disaggregated by age groups. The age group can be set in the "Option" screen in ENA. For analysis by other variables, the filter function on the "Data Entry Anthropometry" screen should be used.

It is also possible to do a weighted analysis of the data. For each subject, a weight can be entered and a report is given out in excel. With a statistical calculator, it is also possible to do descriptive statistics for any variable categorized in different cutoffs or ranges. Cross tables between any of the variables and prevalence rates with design effect adjusted confidence intervals are also calculated.

6.5. Data analysis: mortality

6.5.1. *Calculating mortality rates*

Although the CMR is automatically calculated by ENA, the basis for calculation is given for reference.

6.5.1.1. Calculating the exact recall period

To calculate the exact number of days comprising the recall period, please refer to section 3.2.2.4, page 22).

6.5.1.2. Calculating the population at risk

The "total population" is estimated by assuming that those who were not present in the household for the whole of the recall period (those who left and those who joined the household, those who died, and those were born) were present on average for half the recall period[27]. Thus, the "Total Population" ENA uses is the sum of:

+ all those present in the household at the time of the survey
+ half the deaths
+ half those present at the beginning of the recall period but who had left by the time of the survey
− half those present at the time of the survey but who joined the household during the recall period.
− half the births

The 0-5 population uses the same formula, but for children under five only.

Infants that were born and died within the recall period should be counted as deaths (in the numerator) but should not be included in the total population (denominator)[28].

Similarly, a person who entered the household and subsequently died during the recall period should be counted as deaths (in the numerator) but should not be included in the calculation of the total population.

[27] Note that the denominator is actually person x days. It is mathematically equivalent to count half a person as it is to count half the recall period for that person.
[28] If a birth and death were entered for the same person, the two events would cancel each other out in terms of contributions of "person-time" of exposure.

6.5.1.3. Getting the mortality results

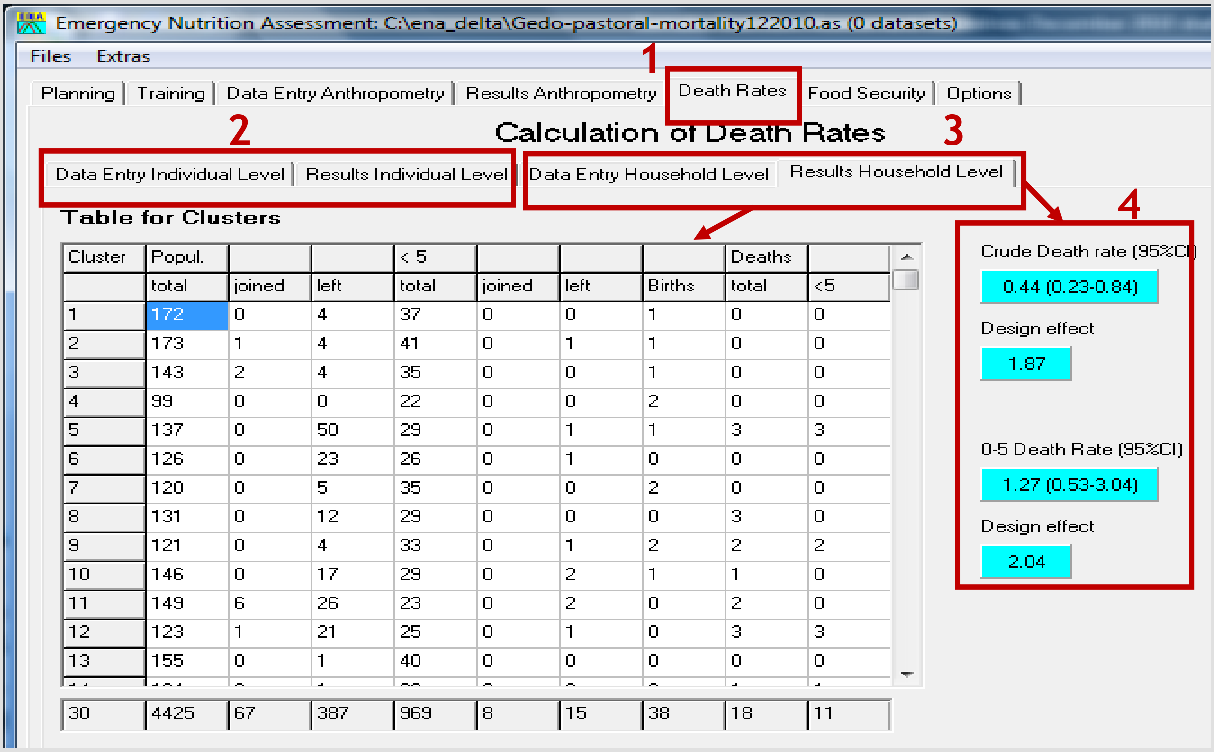
The formula used by ENA to calculate the crude mortality rate is:

$$\textbf{Crude Mortality Rate} = \frac{\text{No. of deaths}}{\left(\frac{\text{Total Population}}{10\ 000}\right) \times \text{No. of recall days}} = \text{Deaths/10.000/day}$$

ENA automatically calculates the crude mortality rate and the under-five mortality rate (see Box 14). Results are given for surveys that have used both simple (or systematic) random sampling and cluster sampling methods. A 95% confidence interval is given with each mortality rate.The ENA software allow data entry at either individual or household levels and the subsequent analysis being dependent on the data entry level. Data entered at individual level also allows entry and analysis of the causes of death and age disaggregated results given.

Box 14. Using ENA for data analysis - Mortality

Data are automatically analyzed in the "Results Mortality" screen of ENA (1). Data can be entered and analysed at individual level (2). Data can also be entered and analysed at household level (3). The Crude and 0-5 mortality rates for data entered and analysed at household level are given considering cluster sampling (4).



Cluster	Popul. total	joined	left	< 5 total	joined	left	Births	Deaths total	<5
1	172	0	4	37	0	0	1	0	0
2	173	1	4	41	0	1	1	0	0
3	143	2	4	35	0	0	1	0	0
4	99	0	0	22	0	0	2	0	0
5	137	0	50	29	0	1	1	3	3
6	126	0	23	26	0	1	0	0	0
7	120	0	5	35	0	0	2	0	0
8	131	0	12	29	0	0	0	3	0
9	121	0	4	33	0	1	2	2	2
10	146	0	17	29	0	2	1	1	0
11	149	6	26	23	0	2	0	2	0
12	123	1	21	25	0	1	0	3	3
13	155	0	1	40	0	0	0	0	0
30	4425	67	387	969	8	15	38	18	11

6.6. Data analysis: food security data

Key food security indicators which directly affect nutrition, mainly household/individual **dietary diversity** (number of food groups consumed) over a recall period of previous 24 hours, livelihood specific **coping strategies,** main source of staple food, and main source of income, are collected through the nutrition household questionnaire.

- Analysis of household dietary diversity (DD) is conducted by summarizing the distribution of the number of food groups consumed and determing the proportion of households who reportedly consumed four or more food groups, out of 12 possible food groups based on FAO food groups. The number of food groups have since been revised to 16, but a cut-off is yet to be established for a diversified diet.
- The level of coping, computed as the coping strateg index (CSI) is used as a proxy indicator of food insecurity, a change in mean CSI over time for the same livelihood indicate a change in food security situation.
- The main source of food, and income are computed by running of frequencies.

Additional information on the food security situation is provided by the FSNAU food security team, in collaboration with partners, and is conducted in separate food security assessments using standard questionnaires, at household or community level, and through checklists for market data. The scope covers changes over a three-six month period, in food and income sources and expenditure, water access and prices. Qualitative methods including key informants, focus group discussions and visits at local markets are used in the data collection. The food security data is analyzed vis-à-vis the baseline data (Ref: FSNAU livelihood specific baseline Profiles) in the given season. Positive or no change in the food and income sources and expenditure most often imply a 'normal' situation while a negative shift from the 'norm' for the season might imply a deterioration in the food security situation.

The Food security module currently integrated in the delta ENA version helps to conduct integrated analysis of the nutrition situation.

6.7. Data analysis: other data

Data cleaning should be conducted in order to correct/exclude data that are not plausible, such as data outside the plausible range (i.e., very low MUAC) or data outside the valid values (value 3 in a 0/1 categorical variable).

Most of the data recorded will need basic descriptive analysis. Categorical data should be presented as proportions in frequency tables (number of subject presented the condition / total population). Continuous data should be presented with a mean, a standard deviation, and a range.

Remember to select appropriate age groups for each variable that is analyzed for instance, analysis of infant and young child feeding (IYCF) data should be restricted to children 6-24 months; rate of exclusive breastfeeding should be reported for children under 6 months, etc.).

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7. Interpretation of results

7.1. Interpreting the results

Once data are analyzed, the survey results should be put in context to explain the findings and make recommendations for interventions. In order to fulfil these challenges, the following questions need to be answered:

- How critical are the level of malnutrition and mortality for the population in the current season and within the context of the area?
- How can the nutrition and mortality levels be explained?

The interpretation of the results is probably the most difficult part of a nutrition survey because there is no standard method for interpreting nutrition data, and there are many different factors to consider at the same time. However, a proper interpretation of the results is crucial in order to design the right intervention.

7.1.1 Classification of malnutrition

The following classification) has been adapted from the WHO 1995 classification of acute malnutrition (WHZ), Stunting (HAZ) and Underweight (WAZ) and is used in Somalia. This classification takes into account not only the prevalence of malnutrition, but also other aggravating factors. The classification of population malnutrition rates is intended to help interpret the seriousness of a situation by considering a variety of indicators, and consequently suggesting alert stages.

Index (based on the total)	**Normal/ Low**	**Alert/ Medium**	**Serious/ High**	**Critical/ Very high**
Wasting	<5%	5-9.9%	10-14.9%	>15% If ≥ 20%, then ***Very Critical***
Stunting	<20%	20-29.9%	30-39.9%	>40%
Underweight	<10%	10-19.9%	20-29.9%	>30%

The classification is a supportive tool: it should not be strictly followed as a set of rules. How a situation will be classified varies greatly according to the context and must be adapted accordingly.

Potential aggravating factors include:

- Poor household food availability and accessibility (due to a poor harvest, poor pasture conditions, high market prices, insecurity, or inadequate general distribution in a camp setting, etc).
- Epidemics of measles, cholera, or other communicable diseases; high level of malaria.
- Low levels of measles vaccination and vitamin A supplementation.
- Inadequate shelter and severe cold.
- Inadequate safe water supplies (quality and quantity) and sanitation.

Consideration of aggravating factors is an absolutely essential part of a good interpretation of anthropometric data. If more than one aggravating factor is present then the situation may be worse than if there is just one.
Although this classification was made for NCHS references, it should also be used with WHO standards during the transition phase until thresholds relevant to WHO standards are adopted.

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7.1.2. Thresholds for mortality levels

The following thresholds should be used, and level of mortality rates should be analyzed along with anthropometric results.

Table 10. Thresholds for mortality results

Total Population	0-5 Years	INDICATION
CMR <2/10,000/day	U5MR <4/10,000/day	Non-emergency threshold.
CMR ≥2/10,000/day	U5MR ≥4/10,000/day	Emergency threshold.

Source: WHO 2005

7.1.3 Food Security and other Non athropometric data

Interpration of food security data is based on the trends from previous assessments and seasonal data and tabulated with levels of acute malnutrition to give an indication of the contributory factors. For instance reduced dietary diversity, reduced milk consumption, and increased CSI for the same population over similar seasons may indicate a deterioration. WASH findings are compared to the minimum standards recommended in the SPHERE (2004) project to assess the situation and copared to previous findings as well. Other indicators such as infant and young child feeding (IYCF) are computed as child feeding index (CFI) or summarized as frequencies and proportions that meet a ceratin recommended threshold for comparisons across surveys.

7.1.4 Analyzing the context

In order to be able to interpret correctly the malnutrition rates from a survey, it is necessary to consider the following factors:

- Determine seasonal variations.
- Compare the results to previous surveys in the same area or livelihood zone at the same time of year.
- Using the livelihood analysis framework, explore how the levels of malnutrition can be explained by a change in the livelihood of the population compared to the baseline livelihood zone profile.
- Interpret all results in their cultural, socio-economic and agro-ecological context, together with other supporting data such as indicators on health, food supply, markets, etc
- Analyse mortality rates in the survey area.
- Look at what intervention are already being implemented in the survey area.

For international indicators (WHO, 2010) on infant and young child feeding, refer to http://www.who.int/nutrition/publications/infantfeeding/9789241596664/en/index.html

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7.1.5 Somalia Nutrition Situation Classification Framework

In an effort to illustrate the nutrition situation in a manner helpful for response agencies and donors, FSNAU has developed over the years, a format for analyzing the nutrition situation which results in a cartographical output. This came out of an identified need for a type of tool to describe the nutrition situation creating a contextual analysis, rather than focus on prevalence estimates and thresholds which is traditionally the case in nutrition analysis. The development of this analysis framework, although led by FSNAU's Nutrition team, has also involved a consultative process with many nutrition partners in the region including, WHO, UNICEF, WFP, ACF, CONCERN, SCUK, IMC, WV and more recently, Medair, DIAL and the Nutrition Cluster Support team as well. A revision of the framework was made in July 2010 to accommodate recent research developments, and the switch from NCHS 1997 to WHOGS.

This framework forms the basis for the nutrition situation classification and the *Estimated Nutrition Situation* map and is based on international thresholds (WHO, Sphere and Fanta) where available, and contextually relevant analysis where not available. The July 2010 version (Table 3) of the analysis framework below has three sections:
A. Core Outcome Indicators/Anthropometry Related Information and Mortality,
B. Immediate Causes
C. Driving/Underlying Factors

Where representative nutrition surveys have been conducted, the global acute malnutrition is the core outcome reference indicator as it denotes the numbers of children directly affected. Nevertheless, a minimum of 2 anthropometric indicators are required to make an analysis and classification of the situation into either of the five different phases (***Acceptable, Alert, serious, Critical and Very Critical)***. Information from the season in progress only is used and when sufficient data is not available, this is illustrated though slash marks on the map. However historical data is used for overall contextual and seasonal trends analysis. To provide a 3 month outlook, the immediate and driving factors are analyzed, and the convergence of the evidence of the projected scenario classified as ***Stable, Uncertain, Potential to Deteriorate or Potential to Improve***. This information is presented in the *Estimated Nutrition Situation Map* with arrows defined in a separate legend titled Projected Trend (July-December 2010 for the Gu'10).

Twice per year, in line with the seasonal assessments, post *Gu* (April – July) and post *Deyr* (October-December), the nutrition team develops an updated nutrition situation analysis at livelihood level by region and by IDP settlement. The overall analysis is consolidated into the *Estimated Nutrition Situation* Map. The July 2010 analysis framework below remains a working document and will be updated and refined as new information and guidance becomes available.

Analytical Process : Key Points in Utilizing the Framework

1) To make a statement on the
   a. Nutrition situation: A minimum of **two Core outcome indicators** are recommended ensuring a reliable analysis.
   b. Projected trend: A minimum of two **risk factors (immediate causes or underlying/Driving factors)** are recommended ensuring a reliable analysis.
2) The overall classification of the nutrition situation for a given area is done taking into account historical nutrition and contextual data. Triangulation of all indicators is also undertaken.
3) It is not necessary for all the indicators to fall into one category in fact this will rarely happen, the idea is to look at the bigger picture in terms of where the indicators are currently, where they have come from and where they are likely to go to make the overall statement of the situation.
4) Where possible nutrition information should be analyzed at livelihood level, & not at administrative, this is the case in Somalia.
5) The references or cut offs used for GAM, SAM, CDR and Immunization coverage are consistent with the international ranges. However, for many of the other indicators, agreed international ranges/ thresholds for each categorisation are lacking. As such, the various ranges have been developed following analysis of available nutrition data from Somalia.
6) Other contexts needed to refine certain indicators such as dietary diversity & MUAC - currently they are based on historical analysis from FSNAU
7) Further inclusion of indicators relating to i). Displacement and ii). Population concentration for displacement is required.
8) The age of the data needs to be considered and ideally should be from the current season. If the data is from an earlier season this needs to be considered in the overall analysis and may affect the results.
9) This tool should only be used by nutrition experts who have the ability to critically evaluate and contextualize nutrition information

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Table 11. The Nutrition Situation Classification Framework, Draft 7, July 2010

A. CORE OUTCOME INDICATORS (Anthropometry & Mortality)

Reference Indicators	Acceptable	Alert	Serious	Critical	Very Critical
Global Acute Malnutrition[29] *(WHO Reference) Reliability (R) =1*	<5%	5 to <10%; Usual range and stable	10 to<15% or where there is significant increase from baseline/ seasonal trends in last ≥2 yrs	15 to<20% or where there is significant increase from baseline/ seasonal trends in last ≥2 yrs	>/=20% or where there is significant increase from baseline/ seasonal trends in last ≥2 yrs
Mean Weight-for-Height Z (WHZ) scores *(R=1)*	>-0.40	-0.40 to -0.69; Stable/Usual	-0.70 to -0.99; >usual/increasing	<-1.00; >usual/increasing	
SAM[30] (WHZ and oedema[31]) *(WHO to advice on thresholds) R=1)*	<3.0%	3.0 – 4.4%	4.5 – 5.4%	5.5 – 6.9% (or where there is a significant increase from baseline/seasonal trends in ≥2yrs	≥7.0% (Or where there is a very significant increase from baseline/ seasonal trends in ≥2 yrs
Crude death rate[32]**/** 10,000/day *(R=1)*	<0.5	0.5 to <1	1 to <2 Include information on the main causes	2 to ≤5 Include information on the main causes	>5 *or doubling*[1] *of rate in preceding phase.* Include main causes
Under five years death rates/10,000/day *(R=1)*	<1	1-1.99	2-3.9 Include main causes	4 to 9.9 *or doubling from previous phase.* Include main cause	>/=10 *or doubling of rate in the preceding phase.* Include main causes
MUAC[33] Children: (% <12.5cm): *Ref: FSNAU Estimates* [34] *(R=2)*	<5%	<5% with increase from seasonal trends	5.0 - 9.9%	10.0-14.9%, or where there is significant increase from seasonal trends	>15%, Or where there is significant increase from seasonal trends
MUAC<11.5cm[35] *(R=2)*			≤1.0%	>1.0%	
Adult MUAC[36] **- Pregnant and Lactating(%<23.0cm,Sphere04)**	<9.5%	9.5 – 14.9%	15 – 21.9%	22.0 -27.9%	≥28%
Adult MUAC - Non-pregnant & non-lactating <18.5cm,Sphere04	<0.3%	0.3 – 0.49%	0.5 – 0.69%	0.7 – 1.99%	≥2.0%
Non Pregnant Maternal[37] Undernutrition **BMI<18.5**	<10%	10.0 to 19.9%	20.0 to 39.9%	>40%	
Non Pregnant Maternal[38] Overnutrition **BMI>24.9**	TBC	TBC	TBC	TBC	
HIS[39] **Trends of Acutely Malnourished Children** *(Ref: HIS), (R=3)*	V. low proportion in the preceding 3mths relative to ≥2yr seasonal trends	Low proportion and stable trend in the preceding 3mths relative to ≥2yr seasonal trends	Low but increasing proportion in the preceding 3mths relative to ≥2yr seasonal trends	High and stable proportion in the preceding 3mths relative to ≥2yr seasonal trends	High and increasing proportion in the preceding 3mths relative to ≥2yr seasonal trends
Sentinel[40] **Site Trends:** levels of children identified as acutely malnourished(WHZ), *FSNAU'06 SSS*	Very low and stable levels	Low levels and one round indicating increase (seasonally adjusted)	Increasing levels based on two rounds (seasonally adjusted)	High levels of malnourished children and stable (seasonally adjusted)	Increasing levels with increasing trend

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[29] Global Acute Malnutrition (weight for height <-2 Z score/oedema), WHO, 1995
[30] Severe Acute Malnutrition (weight for height <-3 Z score/oedema): Thresholds derived from quantile distribution of SAM from 148 PPS survey datasets at FSNAU
[31] Bilateral oedema is riverine livelihood specific indicator rather than for the whole country
[32] Refs: i). Sphere 2004; ii). Emergency Field Handbook (A guide for UNICEF staff, pg 139) July 2005
[33] Mid Upper Arm Circumference, data source – rapid assessments, based on children 6-59 months
[34] Follow up with S. Collins study/ Mike Golden/ Mark Myatt and on-going studies
[35] Review of Nutrition and Mortality Indicators for the Integrated Food Security Phase Classification, Helen Young and Susanne Jaspars, Sept 2009
[36] Thresholds for adult MUAC (pregnant/lactating and non-pregnant women) derived from quantile distribution of MUAC data from 63 PPS survey datasets at FSNAU
[37] WHO Expert Committee, 1995
[38] WHO Expert Committee, 1995
[39] Health Information System, data source – health facilities
[40] Data source, over 120 sentinel sites in different livelihoods in South Central Somalia

OVERAL NUTRITION SITUATION	*Acceptable*	*Alert*	*Serious*	*Critical*	*Very Critical*

B. IMMEDIATE CAUSES

Reference Indicators	Acceptable	Alert	Serious	Critical	Very Critical
Poor HH Dietary Diversity (% consuming<4fdgps) Mean HH dietary diversity Score [41]	<5% TBC	5 – 9.9% TBC	10-24.9% TBC	25 – 49.9% TBC	>50% TBC
Disease Outbreaks[42]: (seasonally adjusted). Frequency of reported outbreaks of AWD &, malaria & measles	-Normal levels, & seasonal trends, -Review data in relevant context	-AWD 1 case -Measles 1 case -Malaria–doubling of cases in 2 weeks in hyper endemic areas–using RDT	Outbreak not contained and/or in non endemic area – limited access to treatment: CFR for AWD >2% rural CFR for AWD >1% urban AWD – duration exceed >6 wks		
Morbidity Patterns: Proportion of children reported ill in 2wks prior to survey *(R=2)* **Health facility morbidity trends (R=3) /WHO surveillance (R=1)**	TBC Very low proportion reportedly sick	TBC Low & stable proportion of reportedly sick based on seasonal trends	TBC Low proportion reportedly sick, from previous months but increasing in >2 mnths based on seasonal trends	TBC High levels and stable numbers in >2 months based on seasonal trends	TBC High with significant Increase in numbers of sick children, based on seasonal trends

C. DRIVING FACTORS

Reference Indicators	Acceptable	Alert	Serious	Critical	Very Critical
Complementary feeding[43] in addition to breastfeeding i. Introduction of complementary food at 6 mths of age: %introduced ii. Meeting minimum recommended feeding frequency[44] iii. Dietary diversity[45] score	≥95% ≥95% ≥95%	80-94% 80-94% 80-94%	60-79% 80-94% 80-94%	0-59% 0-59% 0-59%	0-59% 0-59% 0-59%
Breastfeeding (BF) Practices[46] *I. Exclusive BF for 6mths* *ii).Continued BF at 1 yr* *iii)Continued BF at 2yr reference*	>90% >90% >90%	50-89% 50-89% 50-89%	12-49% 12-49% 12-49%	0-11% 0-11% 0-11%	
Measles immunization/Status **Vitamin A Supplementation Coverage[47]**:1 dose in last 6 mths	>95% >95%	80-94.9% 80-94.9%	<80% <80%		
Population have access i). to a sufficient quantity of water for drinking, cooking, personal & domestic hygiene–min 15lts pppd **ii).Sanitation facilities**	100% 100%	TBC TBC	TBC TBC	TBC TBC	TBC TBC
Affected pop with **access to formal/informal services:** health services	Should not be necessary	Access to humanitarian interventions for most vulnerable	Reduced access to humanitarian support for most vulnerable	Limited access to humanitarian support for majority	Negligible or no access
Selective Feeding [48] Programs Available: Coverage of TFP /SFP & referral systems(Sphere04); **-Admissions trends** *(R=3)*	Should not be necessary	Access for most vulnerable	None available		
Food Security Situation- current IPC status	Generally Food Secure	Borderline Food Secure	Acute Food and Livelihood Crisis	Humanitarian Emergency	Famine/Humanitarian Catastrophe
Civil Insecurity	Prevailing structural peace	Unstable disrupted tension	Limited spread, low intensity	Widespread, high intensity	Widespread, high intensity
3 MONTH NUTRITION SITUATION OUTLOOK	*Convergence of evidence on immediate Causes/Driving factors* vis-à-vis *Projected trend in 3 months time*				

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[41] Data source, nutrition surveys, dietary studies and sentinel sites
[42] Data source, nutrition surveys, Health Information System, Sentinel sites, feeding centers, rapid assessments
[43] Data source, nutrition surveys and dietary studies
[44] WHO 2008. Indicators for assessing infant and young child feeding practices. 2-3 feeds recommended for 6-8 months old, & 3-4 feeds for 9months old and above
[45] WHO 2008. Indicators for assessing infant and young child feeding practices
[46] FANTA 2003. Generating indicators of appropriate feeding of children 6 through 23 months from the KPC 2000+
WHO, 2003. Infant and Young child feeding. A tool for assessing national practices, policies and programmes
[47] WHO references
[48] Data source, 12 Therapeutic Feeding Centers (TFC) and 14 Supplementary Feeding Centers (SFC)

	No change: Stable; Uncertain: ← *Potential to deteriorate* ↓ *Potential to improve:* ↑

D. **STRUCTURAL INFORMATION** – For Interpretation purpose (not classification)

Gender disaggregated data on: i). Household head ii). Access to income or food/assets for h'hold iii). Control of main household resources	Analysis of key issues and how they impact on the nutrition situation (subject to availability of info) i). Relationship between GAM and child sex; ii). Relationship between GAM and sex of household head iii). Proportion of HH headed by women; iv). Proportion of HH with women generating the main household resources v). Proportion of HH with women making key decisions on utilization of main household

7.2 Presenting the results, writing the report

The nutrition survey report should provide an accurate account of the nutrition situation in a given area for intervention planning, decision-making, and advocacy.

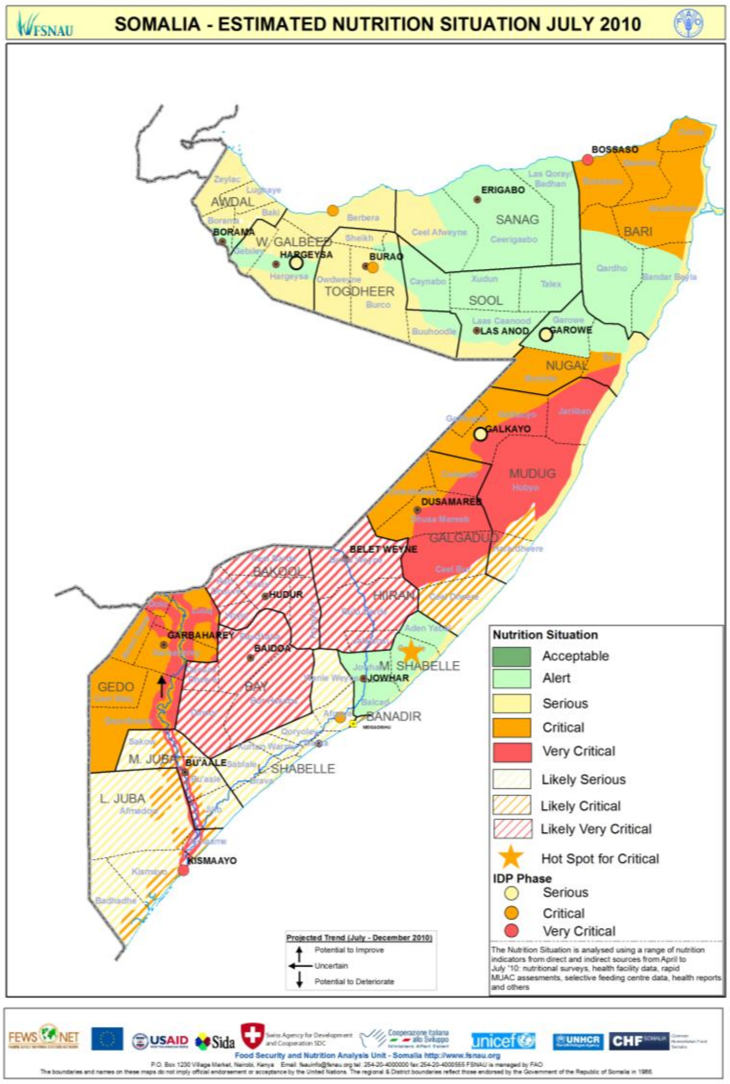
It should contain all the information that allows the reader to understand why the survey was conducted, the methods used and decisions made, the population to which the results apply, the results themselves, and a summary of problems encountered.

The report should be presented in a standard format (an example of report outline can be found in Annex 9.

ENA generates a survey report that is being updated. Some tables are generated automatically and can be inserted into the Survey report. To generate a survey report with ENA, click on "Report Word" in the "Results Antropometry" panel.

As described in Chapter 0, it would be good for each agency conducting a survey to share their survey results and to be endorsed by the Nutrition Cluster. The final report should be available within reasonable time, generally about one month after the end of data collection.

FSNAU provides cartographic illustration of the Estimated Nutrition Situation for clearer unerstanding of the situation. Below is the July 2010 developed from the July 2010 framework.



For any queries relating to the development and application of the tool and to provide feedback please contact info@fsnau.org

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7.3 Planning the response

The selection of appropriate nutrition interventions and strategies largely depends on the context. Consequently, a fixed intervention blueprint does not exist. However, it is important that there are relatively equal responses to nutrition emergencies in all parts of the country, i.e., access to nutrition interventions must be equitable.

To choose the right intervention, the following should be considered:

- The prevalence of global and severe acute malnutrition, mortality rates, coping mechanisms, seasonality and other aggravating factors.
- The analysis of the context and the interpretation of the situation. An informed decision can be made about what interventions to prioritise.
- The population's future needs, including immediate food prospects, potential disease outbreaks and potential changes in caring practices.
- What other on-going interventions already exist.
- What resources and capabilities are available and what constraints exist.

In order to make the best choice in programming, it is recommended to refer to the IASC Emergency Nutrition Cluster Modules produced in 2008 and Nutrition Cluster's IMAM guidelines.

Dissemination of survey results
After preliminary survey results have been shared with the Nutrition Cluster and (refer to flowchart for decision-making in chapter 2.1.1)and comments incorporated, they should be disseminated to other stakeholders including those from complementing clusters, as well as local authorities of the area where the survey was conducted.

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Annex 1: Sampling in pastoral areas – An exerpt from Ethiopia Nutrition survey Guidelines together with FSNAU Somalia Experience

Sampling of pastoralist populations is a highly specialized topic and no validated method is available to date. Experienced specialists may be consulted to help design the survey, such as Save the Children and ACF-international.

Major issues concern sampling in scattered and mobile populations on the one hand, and the appropriateness of using standard nutrition indicators in population with different body-shape on the other hand.

Background Information: Somalia Experience

FSNAU and partner agencies have conducted several nutrition surveys in pastoral livelihood zones. The nomadic lifestyle has however been a great challenge that always necessitates close collaboration with key informants including the local authorities, on the actual locations and estimated numbers of groups of pastoralists at the time of the survey. This information is used to update the Population Sampling Frame (normally the WHO NIDs 2005/6) used in sampling of clusters. FSNAU's experience with this method indicates that high mobility of pastoralists and crude estimates of population sizes limits precise population sampling in the pastoral livelihood zones.

As regards indicators, analysis of Somalia nutrition survey data indicates lower levels of those at risk based on MUAC findings, compared to the WHZ score. The reverse is true for pure farmers (riverine populations) in whom findings on MUAC levels are higher than the WHZ levels.

Based on the Somali experience/data analysis, agencies concur with recommendations to pilot test the sampling methodology proposed in the *Ethiopia Nutrition survey Guidelines, 2008 Interim Draft*, explained on here below.

Addressing the issue of sampling

Population scattering and mobility

Population scattering and mobility are the two main issues encountered in sampling in pastoral areas. The population numbers in pastoral areas are usually very inaccurate and it takes a longer time to travel between sites and find the subjects. If the settlements are small, it is essential to have more clusters, with fewer children per cluster, to ensure there will be a sufficient number of children at each site.

Conducting a survey in pastoral areas

When undertaking a survey in pastoral areas, a certain number of things can be done at the design stage to improve the representativeness of the sample.

Social organization

Pastoral populations are structured by clans, each with a clan leader. Clans are pretty small structures comprised of 10 to 20 households.

Clan leaders are key people to help identify the location of households belonging to their clan, and listing of households of a given clan. They will know who has moved and who has not. Before conducting a survey in pastoral areas, time should be spent with local

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communities to assess the best sampling method and constitute the sampling frame with as much information as possible. It is sometimes more appropriate to list the names of the nomadic groups, clans, or extended families themselves instead of villages or other fixed settlements. The clans to be sampled can then be selected proportional to population size and the teams set out to find the named groups within their migratory range.

Seasonality

Pastoral population from the low land of Somalia travel to water points with their cattle during the dry season. Their mobility and the members of household who may or may not move depend on the availability of water. When conducting a survey in pastoral areas, the season should be considered carefully to know whether the population might have moved to a water point. Seasonal calendars for low land should be used to determine the timing of the survey as well as to make the appropriate decisions in terms of sampling.

When surveys are conducted during the hunger gap, i.e., typically the dry season in the low land, sampling can also be conducted from water points, using the help of clan leaders to make household lists and locate members of selected households.

Sampling methods

To date, sampling methods to conduct nutrition surveys in pastoralist areas are still under consideration. Different options can be highlighted here; however, you should refer to the more details method in order to implement any of the following.

Social structure approach
ACF's Nutrition and Pastoralism Research Project (Myatt and Meyer, 2008) has described a method that employs both qualitative methods and quantitative methods. With the social structure approach, PSUs are sampled systematically from a list of potential sampling units. A qualitative phase is used to identify principal organising structures of the population to be surveyed (e.g. ethnic group, kinship groupings, traditional access to grazing territory, market access, religion, livestock holdings, water points, etc.) and hierarchies it into an organogram. Within each main structure, the qualitative method is then used to identify each "clan" and to locate the ones that are selected. The quantitative phase consists of selecting clans by systematic sampling, and selecting households to be sampled with the most appropriate method (simple random, modified EPI, etc.) depending on the clan size and structure.

Centric systematic sampling
Other sampling methods based on mapping can be used, such as the centric systematic sampling (ACF, 2008). One version of the method is to divide the entire geographic area into squares on a map. Each square having its centre falling in the area represents a cluster. Within each clusters, subjects are selected starting from the centre of the square (using GPS positioning), using the modified EPI method. At the arrival at the central point, survey team selects a direction by throwing a pen and walking on a straight line in the direction given by the pen. The first people met on the way would be surveyed, choosing the closest next household until the cluster is completed. If no settlement is encountered when reaching the edge of the square, then the team should return to the centre of the square and choose another direction. This method does not require any list of geographic areas not of households, but does require some good understanding of mapping techniques.

"Grazing Area" approach[49]

[49] ACF refers to this method as the "Enumeration Area" method. In these guidelines however, "Enumeration Areas" refers to the method used by CSA for second stage sampling in surveys like DHS, so the name was changed as "Grazing Area" approach.

Another version of the mapping method is to previously locate the boundaries of currently active grazing areas on a map (Myatt and Meyer, 2008). Depending on the number of areas identified, either all or a random sub-sample of areas is included in the survey. Within each sampling area, the centric systematic sampling method is used to define clusters and the centre of each cluster. Clans are then sampled by selecting the clan closest to the identified sampling locations (a GPS receiver and binoculars will likely prove useful). Within the selected clan, the most appropriate method (simple random, modified EPI, etc.) is used to select households, depending on the clan size and structure.

Addressing the issue of body shape

Using weight-for-height case definition of malnutrition in pastoralists who tend to have a different body shape compared to other populations has been showed to be problematic (Myatt, 2007). WFH based case-definitions indeed tend to produce biased estimates of malnutrition that increase the true prevalence.

The issue of body shape should therefore be addressed by using a MUAC case definition of malnutrition. MUAC is recommended because it is more robust to the typical body shape of pastoralists than the weight-for-height case definitions. Using MUAC in addition offers considerable flexibility and saves resource compared with using WHF.

In pastoralist areas, until advised otherwise, MUAC should therefore be systematically used as an indicator for nutrition Survey, along with WFH and oedema.

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Annex 2. Example and use of a table of random numbers

Here is an example of a table of random numbers:

67594	63100	37579	30635	41209	73080	82555	78577	74647	81058	87062	37659
30145	75645	28051	37618	28754	71462	65290	94121	50440	83974	19419	98412
79181	39377	71243	73176	49173	39997	76624	46346	40733	78182	88592	87066
26995	24143	88447	80534	24984	15722	16463	10934	87176	50553	44567	14192
42128	33584	65823	24755	85272	25425	98057	33131	13468	99502	81493	13394
49417	48474	92008	42379	14513	12884	39783	74789	21243	67523	85976	30926
28714	63460	11157	66265	37420	56220	67564	14598	21817	53066	42114	78958
71826	84874	43611	97049	66842	10542	33704	40385	28342	14425	36525	18886
69695	79758	87665	65117	54264	73528	90426	84913	85389	30772	39183	23594
94351	68772	12224	49502	54907	14103	78879	39059	35493	18019	18316	10090
42681	38133	29820	22610	82000	46868	36912	68800	74694	59638	70157	46392
11525	88244	95984	22185	27213	57436	21388	24900	11602	15118	86837	69104
16146	89168	82240	54415	36817	26337	73313	16712	27019	61197	38188	60561
26602	25601	66613	44585	45584	21639	96583	13990	83650	63542	75745	56966
59049	76512	17421	84190	72959	42946	73599	53134	17933	19016	49726	11418
81501	37089	58650	75902	28545	21933	73563	36761	28514	51204	32275	98238
56094	53157	97674	60316	46420	37070	71709	28009	38415	84342	42741	87501
12368	70727	48613	10854	50325	12685	70270	73489	30403	63314	73281	41181
68607	15825	17107	65764	64258	85039	44456	51285	57610	79869	95569	14808
70770	42261	14784	28598	15486	50549	69212	62905	93928	57713	21888	71056
71038	27493	54214	51081	49537	23836	15066	20598	91207	21635	66385	44157
10511	39247	57615	24785	59174	45735	23810	73934	92793	18327	84782	46550
53092	98036	25104	90503	31897	93937	27337	32064	95440	39040	93303	31679
70074	13257	30770	16735	53004	81409	15373	10555	94110	46752	50121	79328
37483	92994	87348	81194	83738	80261	80424	54213	46721	52990	65094	32427
70686	40212	32782	81734	16557	41205	10691	19796	58341	31961	66068	16705
13312	30471	64448	55608	82045	11259	24249	35034	26892	22168	42539	67119
50010	68840	49335	98465	84515	74875	30265	72841	84865	68135	29950	77451
55072	46150	80938	26982	15821	76116	45537	82153	44105	37430	10398	51995
91463	57255	96179	11555	29411	12059	97146	69271	33170	90619	18046	30715
87275	26442	78105	87941	29160	30082	34475	86135	39324	84320	40009	71812
69153	47666	52664	79254	50008	64174	56414	14426	49667	80006	45997	68075
14707	79751	10336	42244	19936	67936	81997	46906	78456	13718	52509	95952
28452	89211	85897	24233	35307	24437	75275	89896	20133	24342	59838	38715
38307	45872	92095	99644	54118	15560	37696	23309	10103	80608	82686	37662
32181	98910	45532	57509	94170	26013	23780	77132	17778	89462	67661	17726
76673	23509	15515	23875	65713	79652	18358	65774	28942	70975	53445	66421
12431	20749	79176	85501	10578	68278	76175	24182	36936	97441	51901	47529
93186	25920	18625	63769	12334	95554	67121	42125	74729	76821	50914	93420
78001	12887	38428	70200	54508	21216	12876	85562	92379	23183	57384	67594
11525	88244	95984	22185	27213	57436	21388	24900	11602	15118	86837	69104
16146	89168	82240	54415	36817	26337	73313	16712	27019	61197	38188	60561
26602	25601	66613	44585	45584	21639	96583	13990	83650	63542	75745	56966
59049	76512	17421	84190	72959	42946	73599	53134	17933	19016	49726	11418
81501	37089	58650	75902	28545	21933	73563	36761	28514	51204	32275	98238
56094	53157	97674	60316	46420	37070	71709	28009	38415	84342	42741	87501
12368	70727	48613	10854	50325	12685	70270	73489	30403	63314	73281	41181
68607	15825	17107	65764	64258	85039	44456	51285	57610	79869	95569	14808

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HOW TO CREATE A TABLE OF RANDOM NUMBERS

❶ ENA software
In the planning panel, use "Random Number Table". If you need number between 1 and 250, use that range and define the number of numbers that you need.

❷ Microsoft Excel
Function to produce random numbers: RAND()
Type that into a cell and it will produce a random number in that cell.
You can modify the formula to obtain whatever range you wish. For example, if you wanted random numbers between 1 and 250, you should enter the following formula:

=INT(250*RAND())+1

"INT" eliminates the digits after the decimal,
"250*" creates the range to be covered, and
"+1" sets the lowest number in the range.

HOW TO USE A TABLE OF RANDOM NUMBERS

❶ Determine how many numbers you need (M), and the maximum number of digits you need (X).
❷ Determine starting point in table by randomly by dropping your finger on the table of random numbers with your eyes closed.
❸ Choose a direction in which to read (up to down, left to right, or right to left).
❹ Select the first M numbers read from the table whose last X digits are between 0 and N. (If N is a two digit number, then X would be 2; if it is a four digit number, X would be 4; etc.).
❺ Once a number is chosen, do not use it again.
❻ If you reach the end of the table before obtaining your M numbers, pick another starting point, read in a different direction, use the first X digits, and continue until done.

Example 1: You need 5 numbers between 1 and 255.
M = 50; Starting point is column 3, row 2 on Random Number Table (previous page); read down.
You would select population numbers 51, 243, 8, 157, and 224 (until you have 5 unique numbers).

67594	63100	37579	30635	41209	73080	82555	78577	74647	81058	87062	37659
30145	75645	28051	37618	28754	71462	65290	94121	50440	83974	19419	98412
79181	39377	71243	73176	49173	39997	76624	46346	40733	78182	88592	87066
26995	24143	88447	80534	24984	15722	16463	10934	87176	50553	44567	14192
42128	33584	65823	24755	85272	25425	98057	33131	13468	99502	81493	13394
49417	48474	92008	42379	14513	12884	39783	74789	21243	67523	85976	30926
28714	63460	11157	66265	37420	56220	67564	14598	21817	53066	42114	78958
71826	84874	43611	97049	66842	10542	33704	40385	28342	14425	36525	18886
69695	79758	87665	65117	54264	73528	90426	84913	85389	30772	39183	23594
94351	68772	12224	49502	54907	14103	78879	39059	35493	18019	18316	10090

Example 2: You need to find the stating point of your systematic sampling.
You have enumerated 255 households and your need to survey 24 per cluster. The sampling interval is 10,6 (255/24). You need to select a household between the 1st and the 11th.
M=1; Starting point is column 4, row 8, read left.
You would select the house number 11.

67594	63100	37579	30635	41209	73080	82555	78577	74647	81058	87062	37659
30145	75645	28051	37618	28754	71462	65290	94121	50440	83974	19419	98412
79181	39377	71243	73176	49173	39997	76624	46346	40733	78182	88592	87066
26995	24143	88447	80534	24984	15722	16463	10934	87176	50553	44567	14192
42128	33584	65823	24755	85272	25425	98057	33131	13468	99502	81493	13394
49417	48474	92008	42379	14513	12884	39783	74789	21243	67523	85976	30926
28714	63460	11157	66265	37420	56220	67564	14598	21817	53066	42114	78958
71826	84874	43611	97049	66842	10542	33704	40385	28342	14425	36525	18886
69695	79758	87665	65117	54264	73528	90426	84913	85389	30772	39183	23594
94351	68772	12224	49502	54907	14103	78879	39059	35493	18019	18316	10090

Annex 3. **Example of local calendar of events: Togdheer Agro-pastoral March 2010**

Year Significant Event	Month	Age in Months	Regional specific events	Monthly event specific to that year	Recurring yearly events
2010	Mar			Dhamaad	Rabiul awal /Mowliid
	Feb	1		Badhtame Jilaal	Safar
	Jan	2		Bilowgii/ start of Jilaal	Sako
2009	Dec	3		Dhamaad	Aarafo
	Nov	4		Badhtame Deyr	Seditaal
	Oct	5		Bilowgii /start of Deyr	Soonfur
	Sep	6		Dhamaad	Ramadaan
	Aug	7		Badhtame Xagaa	Sacbaan
	July	8		Bilowgii	Rajab
	June	9		Dhamaad	Jamatul Akheyr
	May	10		Badhame Gu	Jamatul Awal
	Apr	11		Bilow	Rabiicul Akheyr
	Mar	12		Dhamaad	Rabiicul Awal/Mowliid
	Feb	13		Badhtame Jilaal	Safar
	Jan	14		Bilowgii/ start of Jilaal	Sako
2008	Dec	15		Dhamaad	Aarafo
	Nov	16		Badhtame Deyr	Seditaal
	Oct	17	Qaraxii Hargeisa	Bilowgii /start of Deyr	Soonfur
	Sep	18		Dhamaad	Ramadaan
	Aug	19		Badhtame Xagaa	Sacbaan
	July	20		Bilowgii	Rajab
	June	21		Dhamaad	Jamatul Akheyr
	May	22		Badhtame Gu	Jamatul Awal
	Apr	23		Bilowgii /	Rabiicul Akheyr
	Mar	24		Dhamaad	Rabiicul Awal/Mowliid
	Feb	25		Badhtame Jilaal	Safar
	Jan	26		Bilowgii/ start of Jilaal	Sako
2007	Dec	27		Dhamaad	Aarafo
	Nov	28		**Badhtame**	Seditaal
	Oct	29		Bilowgii / start of Deyrta	Soonfur
	Sep	30		Dhamaad	Ramadaan
	Aug	31		Badhtame	Sacbaan
	July	32		Bilowgii/ start of Hagaa	Rajab
	June	33		Dhamaad	Jamatul Akheyr
	May	34		Badhtame	Jamatul Awal
	Apr	35		Bilowgii / start of Gu'	Rabiicul Akheyr
	Mar	36		Dhamaad	Rabiicul Awal/Mowliid
	Feb	37		Badhtame	Safar
	Jan	38		Bilowgii / start of Jiilaalka	Sako
2006	Dec	39		Dhamaad	Aarafo
	Nov	40		Badhtame Deyr	Seditaal
	Oct	41		Bilowgii / start of Deyr	Soonfur
	Sep	42		Dhamaad	Ramadaan
	Aug	43		Badhtame	Sacbaan
	July	44		Bilowgii/ start of Hagaa	Rajab
	June	45		Dhamaad	Jamatul Akheyr
	May	46		Badhtame	Jamatul Awal
	Apr	47		Bilowgii/ start of Gu'	Rabiicul Akheyr
	Mar	48		Dhamaad Jiilaalka	Rabiicul Awal/Mowliid
	Feb	49		Badhtame	Safar
	Jan	50		Bilow	Sako
2005	Dec	51		Dhamaad	Aarafo
	Nov	52		Badhame Deyr	Seditaal

	Oct	53		Bilow	Soonfur
	Sep	54	Doorashadii Baarlamanka	Dhamaadkii Xagaa (End)	Ramadaan
	Aug	55		Badhtame	Sacbaan
	July	56		Bilow	Rajab
	June	57		Dhamaad Gu’	Jamatul Akheyr
	May	58		Badhtame Gu	Jamatul Awal
	Apr	59		Bilow	Rabiicul Akheyr

JIILAAL Beginning of Jiilal/Dry period –

GU Beginning of Gu’/Long rainy season –

XAGAA Beginning of Xagaa/ light showers –

DEYR Beginning of Deyr/Short rainy

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Annex 4. Reference table for weight-for-height (WHO)

Children < 24 months (or < 87cm if age cannot be estimated): length measured lying down
Children ≥ 24 months (or ≥ 87 cm if age cannot be estimated): height measured standing up

BOYS **Weight for Height WHO standards in Z-score**

Weight for Length (Lying down)

	Severe < -3	Moderate ≥ -3 to < - 2	Normal ≥ -2
Z-score	**-3**	**-2**	**0**
cm			
55	3.6	3.8	4.5
55.5	3.7	4	4.7
56	3.8	4.1	4.8
56.5	3.9	4.2	5
57	4	4.3	5.1
57.5	4.1	4.5	5.3
58	4.3	4.6	5.4
58.5	4.4	4.7	5.6
59	4.5	4.8	5.7
59.5	4.6	5	5.9
60	4.7	5.1	6
60.5	4.8	5.2	6.1
61	4.9	5.3	6.3
61.5	5	5.4	6.4
62	5.1	5.6	6.5
62.5	5.2	5.7	6.7
63	5.3	5.8	6.8
63.5	5.4	5.9	6.9
64	5.5	6	7
64.5	5.6	6.1	7.1
65	5.7	6.2	7.3
65.5	5.8	6.3	7.4
66	5.9	6.4	7.5
66.5	6	6.5	7.6
67	6.1	6.6	7.7
67.5	6.2	6.7	7.9
68	6.3	6.8	8
68.5	6.4	6.9	8.1
69	6.5	7	8.2
69.5	6.6	7.1	8.3
70	6.6	7.2	8.4
70.5	6.7	7.3	8.5
71	6.8	7.4	8.6
71.5	6.9	7.5	8.8
72	7	7.6	8.9
72.5	7.1	7.6	9
73	7.2	7.7	9.1
73.5	7.2	7.8	9.2
74	7.3	7.9	9.3
74.5	7.4	8	9.4
75	7.5	8.1	9.5
75.5	7.6	8.2	9.6
76	7.6	8.3	9.7
76.5	7.7	8.3	9.8
77	7.8	8.4	9.9
77.5	7.9	8.5	10
78	7.9	8.6	10.1
78.5	8	8.7	10.2
79	8.1	8.7	10.3
79.5	8.2	8.8	10.4
80	8.2	8.9	10.4
80.5	8.3	9	10.5
81	8.4	9.1	10.6
81.5	8.5	9.1	10.7
82	8.5	9.2	10.8
82.5	8.6	9.3	10.9
83	8.7	9.4	11
83.5	8.8	9.5	11.2
84	8.9	9.6	11.3
84.5	9	9.7	11.4
85	9.2	10.0	11.7
85.5	9.3	10.1	11.8
86	9.4	10.2	11.9
86.5	9.5	10.3	12.0

Weight for Height (Standing up)

	Severe < -3	Moderate ≥ -3 to < - 2	Normal ≥ -2
Z-score	**-3**	**-2**	**0**
cm			
87	9.6	10.4	12.2
87.5	9.7	10.5	12.3
88	9.8	10.6	12.4
88.5	9.9	10.7	12.5
89	10.0	10.8	12.6
89.5	10.1	10.9	12.8
90	10.2	11.0	12.9
90.5	10.3	11.1	13.0
91	10.4	11.2	13.1
91.5	10.5	11.3	13.2
92	10.6	11.4	13.4
92.5	10.7	11.5	13.5
93	10.8	11.6	13.6
93.5	10.9	11.7	13.7
94	11.0	11.8	13.8
94.5	11.1	11.9	13.9
95	11.1	12.0	14.1
95.5	11.2	12.1	14.2
96	11.3	12.2	14.3
96.5	11.4	12.3	14.4
97	11.5	12.4	14.6
97.5	11.6	12.5	14.7
98	11.7	12.6	14.8
98.5	11.8	12.8	14.9
99	11.9	12.9	15.1
99.5	12.0	13.0	15.2
100	12.1	13.1	15.4
100.5	12.2	13.2	15.5
101	12.3	13.3	15.6
101.5	12.4	13.4	15.8
102	12.5	13.6	15.9
102.5	12.6	13.7	16.1
103	12.8	13.8	16.2
103.5	12.9	13.9	16.4
104	13.0	14.0	16.5
104.5	13.1	14.2	16.7
105	13.2	14.3	16.8
105.5	13.3	14.4	17.0
106	13.4	14.5	17.2
106.5	13.5	14.7	17.3
107	13.7	14.8	17.5
107.5	13.8	14.9	17.7
108	13.9	15.1	17.8
108.5	14.0	15.2	18.0
109	14.1	15.3	18.2
109.5	14.3	15.5	18.3
110	14.4	15.6	18.5
110.5	14.5	15.8	18.7
111	14.6	15.9	18.9
111.5	14.8	16.0	19.1
112	14.9	16.2	19.2
112.5	15.0	16.3	19.4
113	15.2	16.5	19.6
113.5	15.3	16.6	19.8
114	15.4	16.8	20.0
114.5	15.6	16.9	20.2
115	15.7	17.1	20.4

GIRLS WHO standards in Z-score

Weight for Length (Lying down)

	Severe < -3	Moderate ≥ -3 to < - 2	Normal ≥ -2
Z-score	-3	-2	0
cm			
55	3.5	3.8	4.5
55.5	3.6	3.9	4.7
56	3.7	4.0	4.8
56.5	3.8	4.1	5.0
57	3.9	4.3	5.1
57.5	4.0	4.4	5.2
58	4.1	4.5	5.4
58.5	4.2	4.6	5.5
59	4.3	4.7	5.6
59.5	4.4	4.8	5.7
60	4.5	4.9	5.9
60.5	4.6	5.0	6.0
61	4.7	5.1	6.1
61.5	4.8	5.2	6.3
62	4.9	5.3	6.4
62.5	5.0	5.4	6.5
63	5.1	5.5	6.6
63.5	5.2	5.6	6.7
64	5.3	5.7	6.9
64.5	5.4	5.8	7.0
65	5.5	5.9	7.1
65.5	5.5	6.0	7.2
66	5.6	6.1	7.3
66.5	5.7	6.2	7.4
67	5.8	6.3	7.5
67.5	5.9	6.4	7.6
68	6.0	6.5	7.7
68.5	6.1	6.6	7.9
69	6.1	6.7	8.0
69.5	6.2	6.8	8.1
70	6.3	6.9	8.2
70.5	6.4	6.9	8.3
71	6.5	7.0	8.4
71.5	6.5	7.1	8.5
72	6.6	7.2	8.6
72.5	6.7	7.3	8.7
73	6.8	7.4	8.8
73.5	6.9	7.4	8.9
74	6.9	7.5	9.0
74.5	7.0	7.6	9.1
75	7.1	7.7	9.1
75.5	7.1	7.8	9.2
76	7.2	7.8	9.3
76.5	7.3	7.9	9.4
77	7.4	8.0	9.5
77.5	7.4	8.1	9.6
78	7.5	8.2	9.7
78.5	7.6	8.2	9.8
79	7.7	8.3	9.9
79.5	7.7	8.4	10.0
80	7.8	8.5	10.1
80.5	7.9	8.6	10.2
81	8.0	8.7	10.3
81.5	8.1	8.8	10.4
82	8.1	8.8	10.5
82.5	8.2	8.9	10.6
83	8.3	9.0	10.7
83.5	8.4	9.1	10.9
84	8.5	9.2	11.0
84.5	8.6	9.3	11.1
85	8.8	9.6	11.4
85.5	8.9	9.7	11.5
86	9.0	9.8	11.6
86.5	9.1	9.9	11.8

Weight for Height (Standing up)

	Severe < -3	Moderate ≥ -3 to < - 2	Normal ≥ -2
Z-score	-3	-2	0
cm			
87	9.2	10.0	11.9
87.5	9.3	10.1	12.0
88	9.4	10.2	12.1
88.5	9.5	10.3	12.3
89	9.6	10.4	12.4
89.5	9.7	10.5	12.5
90	9.8	10.6	12.6
90.5	9.9	10.7	12.8
91	10.0	10.9	12.9
91.5	10.1	11.0	13.0
92	10.2	11.1	13.1
92.5	10.3	11.2	13.3
93	10.4	11.3	13.4
93.5	10.5	11.4	13.5
94	10.6	11.5	13.6
94.5	10.7	11.6	13.8
95	10.8	11.7	13.9
95.5	10.8	11.8	14.0
96	10.9	11.9	14.1
96.5	11.0	12.0	14.3
97	11.1	12.1	14.4
97.5	11.2	12.2	14.5
98	11.3	12.3	14.7
98.5	11.4	12.4	14.8
99	11.5	12.5	14.9
99.5	11.6	12.7	15.1
100	11.7	12.8	15.2
100.5	11.9	12.9	15.4
101	12.0	13.0	15.5
101.5	12.1	13.1	15.7
102	12.2	13.3	15.8
102.5	12.3	13.4	16.0
103	12.4	13.5	16.1
103.5	12.5	13.6	16.3
104	12.6	13.8	16.4
104.5	12.8	13.9	16.6
105	12.9	14.0	16.8
105.5	13.0	14.2	16.9
106	13.1	14.3	17.1
106.5	13.3	14.5	17.3
107	13.4	14.6	17.5
107.5	13.5	14.7	17.7
108	13.7	14.9	17.8
108.5	13.8	15.0	18.0
109	13.9	15.2	18.2
109.5	14.1	15.4	18.4
110	14.2	15.5	18.6
110.5	14.4	15.7	18.8
111	14.5	15.8	19.0
111.5	14.7	16.0	19.2
112	14.8	16.2	19.4
112.5	15.0	16.3	19.6
113	15.1	16.5	19.8
113.5	15.3	16.7	20.0
114	15.4	16.8	20.2
114.5	15.6	17.0	20.5
115	15.7	17.2	20.7

HOW TO USE THE WEIGHT FOR HEIGHT REFERENCE TABLES

❶ Select the appropriate table (boys or girls).

The weight-for-height indices are different for boys and girls. Make sure you are using the appropriate table.

❷ Look for the height of the child, rounding to the closer value.
Height should be rounded to the nearest .5 cm using the following rule:

Height in cm
80.7
80.8
80.9
81.0
81.1
81.2
81.3
81.4
81.5
81.6
81.7
81.8

81.0 is used for: 80.8 and 80.9
and for
81.1 and 81.2

81.5 is used for: 81.3 and 81.4
and for
81.6 and 81.7

❸ With a ruler, look across to find the weight of the child, or the interval in which the weight of the child is.
❹ Refer to the top of the column to find out the category of the nutrition of the child.

EXAMPLES
Example n°1: A girl with a height of 63 cm and weighing 6.6 kg.
❶ Look for the height of 63 cm in the first column on the chart,
❷ Take a ruler, place it under the figure 63, and look along the line for the figure corresponding to the weight of the child. When you find this figure (i.e., 6.6),
❸ Go to the top of the column and you will see that this corresponds to 0.0 z-score. This child is the normal weight for his height.

Example n°2: A girl with a height of 78 cm and weighing 7.7 kg.
❶ Look for the height of 78 cm in the first column on the chart,
❷ Look along this line, where you will find the weight of the child. 7.7 kg does not correspond to any figure written on the chart.
❸ However, 7.5 kg is between 7.5 and 8.2 kg and therefore between -3 and -2 z-score. This child is suffering from moderate acute malnutrition and will be admitted into the SFC.

Example n°3: A boy with a height of 66.8 cm and weighing 5.5 kg.
❶ Look for the height of 66.8 cm in the first column on the chart. This height does not exist on the chart,
❷ Take the nearest height i.e., 67 cm,
❸ Look across the 67 cm line, where you will find the weight of the child. 5.5 kg does not correspond to any weight on the chart,
❹ However, 5.5 kg is less than the last weight on the chart i.e. 6.1 kg, and therefore is less than -3 z-score. This child is suffering from severe acute malnutrition and will be admitted to the TFC.

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QNO:

QNO:

Annex 5. NUTRITION ASSESSMENT HOUSEHOLD QUESTIONNAIRE, *Gu* 2011

Household Number ______ **Date**_______________ **Team Number** ______ **Cluster Number** ________**Cluster Name**_________________ **District:** __________

Q1-7 Characteristics of Household

Q1. Household size[50] ?__________ **Q2.** Number of children less than 5 years (0-59 months)? ________

Q3a. Household head? 1=Male 2=Female **Q3b.** Highest level of mother's/caregiver's education: **0**=None **1**= Primary **2**= Secondary **3**= Tertiary (college/university)

Q4a.How long has this household lived in this locality? 1= Resident 2= IDP<6 Months 3=IDP >6 months 4=Returnee (within the last 6 months) 5=Refugee 6=Migrant

b. Are you hosting any recently (in the last 6 months) internally displaced persons? 0= No 1= Yes

c. If yes, Number of persons ________

Q5. How many mosquito nets does the household have? 0=none 1=one 2=two 3=three 4= 4 or more

Q6. What was the source of the net? 1= NGO 2=Health Centre 3= Purchase

Q7. What is the household's <u>main</u> source of income? 1= Animal & animal product sales 2= Crop sales/farming 3= Trade 4= Casual labor

5= Salaried/wage employment 6= Remittances 7=Self-Employment (Bush products/handicraft) 8=gifts/ *zakat* 9= Others, specify ________________

Q8-15 Feeding and immunization status of children aged 6 – 59 months in the household.

First Name	**Date of Birth** **-- /-- /--**	**Q8** **Child Age** (months) *(**if** child is more than 24 months old, **skip** to **Q11**)*	**Q9** Are you breast-feeding[51] the child? *0= No* *1=Yes*	**Q10** How many times did you feed the child in the last 24 hours *(besides breast milk)*? *0=Zero times* *1= 1 time* *2=2 times* *3 = 3 times* *4=-4 times* *5= 5 or more times*	**Q11** How many times did you feed the child with **milk** in the last 24 hours *(besides breast milk)*? *0=None* *1= 1 time* *2=2 times* *3=-3 times* *4= 4 times* *5= 5 times or more*	**Q 12** Has child been provided with Vitamin A in the last 6 months? *(show sample)* *0= No* *1=Yes*	**Q13** Has child been Vaccinated against measles? *0= No* *1=Yes*	**Q14** No of doses of polio vaccine given to the child orally? 0=none 1=one 2=two 3=three or more	**Q15** Does child have immunization card? *0= No* *1=Yes*
1									
2									
3									

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[50] Number of persons who live together and eat from the same pot at the time of assessment

[51] Child having received breast milk either directly from the mothers or surrogate mother breast within the last 12 hours

4									

Q16-27 Anthropometry and morbidity for children aged 6 – 59 months in the household

First Name	**Q16a** **Age** **(month)**	**Q16b** **Sex** *1=Male* *2=Female*	**Q17** **Oedema** *0= No* *1=yes*	**Q18** **Height (cm)** *To the nearest tenth of a cm*	**Q19** **Weight (kg)** *To the nearest tenth of a kg*	**Q20** **MUAC (cm)** *To the nearest tenth of a cm* *(≥6 mo)*	**Q21** Diarrhea[52] in last two weeks *0= No* *1=yes*	**Q22** Pneumonia (*oof wareen/ wareento)*[53] in the last two weeks *0= No* *1=yes*	**Q23** Fever[54] in the last two weeks *0= No* *1=yes*	**Q24** Suspected Measles[55] in last one month *0= No* *1=yes*	**Q25** Did the child sleep under a mosquito net last night? *0= No* *1=yes*	**Q26** Where did you seek healthcare assistance when child was sick? **(**If yes in ***Q21 – 24)*** *0=No assistance sought* *1=Own medication* *2=Traditional healer* *3=Sheikh/Prayers* *4=Private clinic/ Pharmacy* *5= Public health facility*	**Q27** Is the child currently registered in any feeding centres? *0= none* *1= SFP* *2= TFC/SC* *3= OTP* *4= Other*
1													
2													
3													
4													

28a. Anthropometry (MUAC) for adult women of childbearing age (15-49 years) present at the household

Sno	**Name**	**Age** (years)	**No of doses of Tetanus vaccine received** *0= None* *1= One* *2= Two* *3=three*	**MUAC** (cm)	**Physiological status** *1=Pregnant* *2=Lactating (infant <6months)* *3= none of the above*	Did the woman sleep under the mosquito net last night *0= No* *1=yes*	**Is women currently registered in** 0=None 1=SFP (food) 2=MCHN (Food and Vitamins) 3=MCH -vitamins 4=Other	**Illness in last 14 days?** If yes, what illness?
1	*Mother:*							

Codes** for adult **illnesses

0= None
1= ARI
2=Diarrheal
3=Fever/Febrile
4=Joint
5=Urinary tract infection (UTI)
6=Pain in the chest
7= Pain in lower abdomen/pelvis
8=Anemia
9= Reproductive

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[52] Diarrhea is defined for a child having three or more loose or watery stools per day
[53] ARI asked as oof wareen or wareento. The three signs asked for are chest in-drawing, cough, rapid breathing/nasal flaring and fever
[54] Fever – The three signs to be looked for are periodic chills/shivering, fever, sweating and convulsions
[55] 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

										10=Other, specify

28b. Where do you seek health assistance when sick? **0**=No assistance sought ***1***=Own medication **2**=Traditional healer **3**=Sheikh/Prayers **4**=Private clinic/ Pharmacy **5**= Public health facility

28c. If 'No assistance' in 28b, why? 1 = Too expensive 2 = Too far 3 = Not enough time 4 = Security concerns 5= other, specify ……

29a. Child dietary Diversity

Please describe the foods (all meals and snacks) that the children (6-24 months) ate yesterday during the day and night, whether at home or outside the home. Start with the first food you ate yesterday morning. Record the respective codes to the foods mentioned. *When a mixed dish is reported, ask about and tick all of the ingredients in their respective columns.*

Write down all foods and drink mentioned. When composite dishes are mentioned, ask for the list of ingredients. *The interviewers should establish whether the previous day and night was usual or normal for the households. If unusual- feasts, funerals or most members absent, then another day should be selected*.

	Breakfast	**Snack**	**Lunch**	**Snack**	**Dinner**	**Snack**
Child 1						
Child 1						
Child 1						

When the respondent[56] recall is complete, fill in the food groups based on the information recorded above. For any food groups not mentioned, ask the respondent if a food item from this group was consumed by the children.	**If 6-24 months** Did the child (Name) consume food from any these food groups in the last 24 hours?[57] *0=No 1= Yes*		
	Child 1	Child 2	Child 3
1. Cereals, roots and tubers (*maize, ground maize, wheat, millet, rice, sorghum, spaghetti, bread, chapatti , macaroni, canjera; white potatoes, cassava, arrowroot, white sweet potatoes, or foods made from these)*			
2. Legumes, nuts and seeds *(cowpeas, beans, lentils , peanut, pumpkin seed, lentil seed, sunflower seed, wild nuts)*			
3. Milk and milk products *(Fresh/fermented/powdered sheep, goat, cow or camel milk, Cheese (sour milk), condensed milk, yoghurt)*			
4. Flesh (meat, fish and poultry) products *(fish, beef, lamb, goat, camel, wild game, such as Dik Dik, chicken, duck, other birds such as guinea fowl and francolin)*			
5. Eggs *(eggs of chicken, eggs of duck or eggs of other fowl)*			
6. Vitamin A rich fruits and vegetables *(ripe mangoes, pawpaw, wild fruits such as gob, hobob, berde, isbandlays, kabla, coasta, red cactus fruit; yellow fleshed pumpkins, carrots, orange sweet potatoes, yellow cassava)*			
7. Other fruits and vegetables *(banana, orange, apple, coconut, custard apple, dates, unripe mangoes, grapes, guava,*			

[56] Respondent refers to the person responsible for food preparation on the recall day. For the child, refer to the mother or caregiver
[57] WHO, 2008. Indicators for assessing infant and young child feeding practices: Conclusion of a consensus meeting held 6-8 November 2007 in Washington D.C., USA ;FANTA 2002 Summary Indicators for Infant and Child Feeding Practices;

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wild fruits and 100% fruit juices; tomato, onion, squash, bell pepper, cabbage ,light green lettuce, white radish)			
Q 29b. Total number of food groups consumed by each child			

Q 33. In the past 30 days, if there have been times when people did not have enough food or money to buy food, which of the following coping strategies did they use? *(Select based on relevant livelihood system)*

Q30a Household Food Consumption & Dietary Diversity: *Please describe the foods (meals and snacks) that members of your household ate or drank yesterday during the day and night at home[58]. Start with the first food or drink of the morning. Include wild foods e.g. game meat, honey, fruits, vegetables, leaves.*

Write down all foods and drink mentioned. When composite dishes are mentioned, ask for the list of ingredients. *The interviewers should establish whether the previous day and night was usual or normal for the households. If unusual- feasts, funerals or most members absent, then another day should be selected*.

Breakfast	Snack	Lunch	Snack	Dinner	Snack

When the respondent[59] recall is complete, fill in the food groups based on the information recorded above. For any food groups not mentioned, ask the respondent if a food item from this group was consumed.	Any household member[60] *0=No 1= Yes*
1. Cereals and cereal products (*maize, ground maize, wheat, white wheat, wholemeal wheat, millet, rice, white grain sorghum, red sorghum , spaghetti, bread, chapatti , macaroni, canjera)*	
2. Milk and milk products *(Fresh/fermented/powdered sheep, goat, cow or camel milk, Cheese (sour milk), condensed milk, yoghurt)*	
3. Vitamin A rich vegetables and tubers *(yellow fleshed pumpkins, carrots, orange sweet potatoes, yellow cassava)*	
4. Dark green leafy vegetables *(amaranth, kale, spinach, , onion leaf, pumpkin leaves, cassava leaves, dark green lettuce)*	
5. Other vegetables *(tomato, onion, squash, bell pepper, cabbage ,light green lettuce, white radish)*	
6. Vitamin A rich fruits *(ripe mangoes, pawpaw, wild fruits such as gob, hobob, berde, isbandlays, kabla, coasta, red cactus frui,)*	
7. Other fruit *(banana, orange, apple, coconut, custard apple, dates, unripe mangoes, grapes, guava, wild fruits and 100% fruit juices)*	
8. Organ meat *(liver, kidney, heart or other organ meat)*	
9. Meat and Poultry *(beef, lamb, goat, camel, wild game, such as Dik Dik, chicken, duck, other birds such as guinea fowl and francolin)*	
10. Eggs *(eggs of chicken, eggs of duck or eggs of other fowl)*	
11. Fish *(fresh or dried) and other seafood (shellfish)*	
12. Legumes, nuts and seeds *(cowpeas, beans, lentils , peanut, pumpkin seed, lentil seed, sunflower seed, wild nuts)*	

[58] Include foods prepared inside the home but consumed outside the home
[59] Respondent refers to the person responsible for food preparation on the recall day. For the child, refer to the mother or caregiver
8 FAO Household Dietary Diversity Tool

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13. White roots and tubers (*white potatoes, cassava, arrowroot, white sweet potatoes, or foods made from roots)*	
14. Oils and Fats *(cooking fat or oil, ghee, butter, sesame oil, margarine)*	
15. Sweets (*sugar, honey, sweetened soda and fruit drinks, chocolate biscuit, cakes,, candies, cookies, Sugar cane and sweet sorghum)*	
16. Coffee, tea and Spices (*coffee, tea, spices such as black pepper, cardamoms, cinnamon, ginger, nutmeg, cloves, salt. Condiments such as ketchup, soy sauce, chilli sauce)*	
Q 30b. Total number of food groups consumed?	
Q 30c. Did you or anyone in your household eat anything (meal or snack) OUTSIDE of the home yesterday	

Q31 a. In the last three months, what is the main source in the household of: i) staple cereal? _______________ ii) milk? ________________ *(Use codes below)*1= Own production 2= Purchasing 3=Community Gifts/Donations 4= Food aid 5= Bartering 6= Borrowing 7= Gathering

Q31b. How many times did you receive cereal food aid in the last 6 months? 0=never 1= once 2= twice 3= three times 4= fourth 5= five times 6= six times or more

Q32 How many meals[61] has the household had in the last 24 hours (from this time yesterday to now)? 0= none 1= One 2=Two 3= Three 4=Four +

Coping Strategies

Q 33. In the past 30 days, if there have been times when people did not have enough food or money to buy food, which of the following coping strategies did they use? *(Select based on relevant livelihood system)*

Pastoralist Livelihood: Indicate type of Pastoralism practiced : 1= Nomadic/mobile 2= Sedentary/settled

In the past 30 days, if there have been times when you did not have enough food or money to buy food, how often has your household had to:	0=Never (zero times/week) 1=Hardly at all (<1 times/ week) 2=Once in a while (1-2 times/ week) 3= Pretty often? (3-6 times/week) 4=All the time (Every day)
a. Reduce home milk consumption and sell more of milk produced?	
b. Consume less preferred cereals	
c. Borrow food on credit from another household *(Aamah)*?	
d. Reduce number of meals per day?	
e. Reduce the portion size/quantity consumed at meal times *(Beekhaamis)*?	
f. Rely on food donations (gifts) from the clan/community *(Kaalmo)*?	
g. Consume weak un-saleable animals *(caateysi)?*	
h. Send household members to eat (for food) elsewhere?	
i. Skip (go an) entire days without eating *(Qadoodi)*?	

[61] *A meal refers to food served and eaten at one time (excluding snacks) and includes one of the three commonly known: - breakfast, lunch and supper/dinner*

j. Beg for food *(Tuugsi/dawarsi)*?	
k. Rely on hunting for food *(ugaarsi)?*	

Agropastoralists Livelihood:

In the past 30 days, if there have been times when you did not have enough food or money to buy food, how often has your household had to:	0=Never (zero times/week) 1=Hardly at all (<1 times/ week) 2=Once in a while (1-2 times/ week) 3= Pretty often? (3-6 times/week) 4=All the time (Every day)
a. Shift from high priced cereal varieties to low price cereal varieties?	
b. Shift from high quality cereals to low quality cereals *(*from *osolo to obo)*?	
c. Borrow food on credit from shop *(Deyn)*?	
d. Borrow food on credit from another household *(Aamah)*?	
e. Reduce home milk consumption and sell more of milk produced?	
f. Reduce the number of meals in a day by adults?	
g. Stop all home milk consumption and sell all milk produced?	
h. Rely on food donations (gifts) from the close relatives *(Qaraabo)*?	
i. Rely on food donations (gifts) from the clan/community *(Kaalmo)*?	
j. Skip (go an) entire days without eating *(Qadoodi)*?	
k. Community identified your household as in need of food and fives support? (Qaraan)	
l. Send household children to live or eat with relatives (elsewhere)?	

Riverine Livelihood

In the past 30 days, if there have been times when you did not have enough food or money to buy food, how often has your household had to:	0=Never (zero times/week) 1=Hardly at all (<1 times/ week) 2=Once in a while (1-2 times/ week) 3= Pretty often? (3-6 times/week) 4=All the time (Every day)
a. Shift to less preferred foods (e.g. white maize to yellow maize)?	
b. Reduce the portion size/quantity consumed at meal times *(Beekhaamis)*?	
c. Consume poor quality foods (unsafe or spoilt)?	
d. Reduce number of meals per day by one (e.g. from three to two)?	
e. Consume wild foods?	
f. Consume immature crops (fruits or cereals)?	
g. Reduce number of meals per day by two (e.g. from three to one)?	
h. Feed particular members (elderly, children) at the expense of other household members?	

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i. Consume seeds meant for future planting?	
j. Borrow food for consumption (to be repaid in future – in kind)?	

WATER, SANITATION AND HYGIENE

Q34-40 Access to water (quality and quantity)

Q34a What is the household's main source of drinking water?
Protected sources: 1 = Household connection 2 = Standpipe (Kiosk/Public tap/Taps connected to a storage tank) 3 = Protected Shallow well (covered with hand pump/motorized pump) 4 = Tanker 5 = Spring 6 = Bottled water 7 = Rooftop rainwater
Unprotected sources 8 = *Berkads* 9 = River/stream 10 = Dam/Pond *(Balley)* 11 = Open Shallow well 12 = other (specify) …

Q35a If the household has no access to protected water sources (if the answer to Q34a is 8, 9, 10, 11 or 12), what is the main reason?
0 = Not Available 1 = Distance too far 2= Security Concerns 3 = Cannot afford 4 = Queuing time is too long 5 = Other reasons (specify)

Q35b If you get your water from a protected water source (if the answer to Q34a is 1, 2, 3, 4, 5, 6 or 7), **How many days in the last year month were you NOT able to get water from the protected source 1= None2 = 1-5 days 3 = >5 days**

Q35c What was reason for not getting water? 1 = couldn't afford 2 = source dried up 3 = machine broke down 4 = others

Q36 What is the average time taken per TRIP to and from the main water source *(including waiting and collecting time)?*
1 = Less than 30 minutes 2 = 30 to 60 minutes 3 = More than 1 hour

Q37b Most days (on average) how much water do you collect for the household

	Jerican (20 liter)	Jerican (5 liter)	Drum (200liters)	*Haan* (local container with capacity of about 12.5 liters)	Other container *(specify)*	**Total No. of Liters**
No. of containers						

Q38 Is the water for drinking treated and/or chlorinated[62] at the Household level? 0 = No 1 = Yes

Q39 If Yes, what is the method of treatment (*select more than 1 option if applicable*)?
1 = Boiling 2 = Chlorination 3 = Straining/filtering 4 = Decanting/letting it stand and settle 5 = Leaving the water out in the sun 6 = Other (specify)

Q40 Does the family pay for drinking water? 0 = No 1 = Yes

Q41-43 Sanitation and Hygiene (access and quality)

[62] Chlorinated water should have a characteristic taste and smell

Q41a What type of toilet is used by <u>most</u> members of the household?

0 = No toilet is available (an open pit/open ground is used) 1 = Household latrine 2 = Communal/Public latrine 3 = Flush toilet

Q41b If the answer to Q41a is 0, what is the main reason?

1 = Pastoral/ frequent movements 2 = Lack resources to construct 3 = Lack of space to construct 4 = Don't see the need 9 = Don't know

Q41c If the answer to Q41a is 1,2 or 3 , how many households share/use the same toilet? 1= One 2= 2 to 3 3= 4 to 9 4= 10 or more 9 = Don't know

Q42 When you wash your hands, what substance do you use for hand washing?

0= None (only with water) 1= Soap/Shampoo 2= Sand 3= Ash 4= Plant extracts

Q43 Have you been exposed to information on correct personal hygiene and sanitation practices <u>in the last 3 months</u>? *(select more than 1 option if applicable)*

0= No 1= Yes via mass media 2= Yes via printed media 3= Yes via interpersonal communication 4= Yes via group meetings

Supervisor Checked ______________________________

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Annex 6. The mortality questionnaire

Household No: ___Date: __________ Team No: __ Cluster No: __ Cluster Name: ____________
Enumerator:___________

No.	**1**: First Name	**2**: Sex *(1=M; 2=F)*	**3**: Age (yrs)	**4**: Born since **__ / 3/ 2010**	**5**: Arrived since **__ / 3/ 2010**	**6**: Reason for leaving	**7**: Cause of death
a) How many members are present in this household now? List them.							
b) How many members have left this household (out migrants) since **Mar __, 2010**? List them							
c) Do you have any member of the household who has died since **Mar __, 2010**? List them							

Codes

Reason for migration

1= Civil Insecurity
2= Food Insecurity
3= Employment
4=Divorce/ Married away
5=Visiting
6= Hospitalised
7= In boarding school
8= Grazing/herding
9= Other, specify

Cause of death

1= Diarrhoeal diseases
2= ARI
3= Measles
4= Malaria
5= STD/ HIV/AIDS
6= Anaemia
7= Pregnancy/Birth complications
8= Accident/ killed/ physical injuries
9= Hunger/starvation
10= Other, specify (e.g. still birth)

Summary*

	Total	**U5**
Current HH Members		
Arrivals during the Recall period		
Number who have left during Recall period		
Births during recall		
Deaths during recall period		

** For Supervisor Only*

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Annex 7. Infant and young child feeding indicators and questionnaire

Source: ENA (Essential Nutrition Actions) training module.

I. DEFINITIONS OF INDICATORS

TIMELY INITIATION OF BREASTFEEDING (TIBF): BF2 = 00 HRS
Percentage of infants born in the last 24 hours who were put to the breast within one hour of birth

EXCLUSIVE BREASTFEEDING (EBF): BF4A = YES AND BF4B TO BF4J = NO
Percentage of infants under 6 months (0-5 months or until the day before completing their sixth month) who were exclusively breastfed in the previous 24 hours. An infant is considered to be exclusively breastfed if he/she receives only breastmilk with no other liquids or solids, even water. Make sure to include in the denominator children who have never been breastfed (**BF1 = NO**).

TIMELY COMPLEMENTARY FEEDING (TCF): BF4A = YES AND ONE OR MORE OF BF4G - BF4J = YES
Percentage of infants aged 6 to 8 months (from the first day of the sixth month until the day before completing the nineth month) who are still breastfed AND who have received semi-solid and/or solid foods in the previous 24 hours.

II. HARMONIZED QUESTIONNAIRE

Now I'd like to ask you specific questions about the things (name of child) eats or drinks.	
BF1. Have you ever breastfed (name of child)?	1. Yes 2. No ***Stop***
BF2. How long after birth did you put (name of child) to the breast? *If "immediately" or less than 1 hour, record "00"hours.* *If less than 24 hours, record hours.* *Otherwise, record days.*	_____ Hours _____ Days
BF3. Are you still breastfeeding (name of child)?	1. Yes 2. No
BF4. Since this time yesterday, has (name of child) received (insert each item here)?	

A. Breastmilk	1. Yes	2. No
B. Plain water	1. Yes	2. No
C. Teas, millet water, fruit juice, sweetened water, herbal teas, etc.	1. Yes	2. No
D. Milk (fresh cow milk, tin milk, baby formula, other)	1. Yes	2. No
E. ORS	1. Yes	2. No
F. Other liquids	1. Yes	2. No
G. Fruits	1. Yes	2. No
H. Semi-solid foods (porridge, tom brown, rice water, weanimix, cerelac, soup)	1. Yes	2. No
I. Solids or mushy foods (meat, fish, eggs, beans, nuts, yam, kenkey, rice, potatoes, petepete, yama, stew, etc)	1. Yes	2. No
J. Other semi-solid foods, solids	1. Yes	2. No

Annex 8. Example of standardization test's form

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Mesure 1 Enumerator name………… ID ###		
Child	Weight (Kg)	Height (cm)
1	14,6	96
2	10,3	89,8
3	13,8	105,1
4	11,1	84,5
5	10,8	89,3
6	9,4	76,3
7	10,3	87,6
8	14,3	101,1
9	8,0	74,3
10	15,6	97

Mesure 2 Enumerator name………… ID ###		
Child	Weight (Kg)	Height (cm)
1	14,8	96,1
2	10,4	89,5
3	13,8	105,3
4	11,0	84,7
5	10,7	89
6	9,4	76,4
7	10,3	87,6
8	14,1	101,2
9	8,1	74,1
10	15,4	97,5

Annex 9. Example of survey report outline

A brief explanation of each section of the standard survey report is given below. Refer to the report format from ENA software for additional details.

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 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 survey.
- The methodology used.
- The main results, discussions and recommendations.
- Plausibility Checks Summary Table

Since mid 2009, FSNAU provides a 2-page (maximum) summary report to partners for each survey conducted, through its routine publications, with no additional detailed (and bulky report on the survey). This is based on the fact that majority of partners have indicated that they do not read the detailed reports, which being time and resource intensive, take a minimum of one month to release. Nevertheless, partners visit FSNAU's office for any additional information required and are attended to promptly.

Introduction
The context in which the survey was carried out should be described. The introduction should be scene-setting, 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 local authorities, etc.

- What population was surveyed
- At which period
- In which geographical area?

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Objectives of the survey

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

Methodology

Give a straightforward description of the methods employed. This is necessary so that readers can ensure the validity of the survey and have a clear reference for future comparison.

- Sampling frame used to select clusters (what was the smallest sampling unit, what was the source of data, etc.),
- Calculation of sampling size and parameters used (estimated precision end prevalence, design effect),
- Calculation of the number of clusters,
- Methodology used for selection of households and children.
- Describe any problems encountered.
- Describe what measurements were taken, by whom and using what instruments.
- Explain what was the recall period chosen.
- Describe how the questionnaires were designed and piloted.
- Explain how the training was conducted, by whom.

Results

This section is mainly graphs and tables.

- Describe the sample
  - Number of children measured for the anthropometric data.
  - Number of children excluded from analysis and based on which criteria.
  - Information about Plausibility checks (full plausibility check report should be included in the annex).
  - Sample distribution by age and sex
- Anthropometric results: all nutrition results should be expressed relative to both the **new WHO Standards and the old NCHS standards**.
  - Prevalence of acute malnutrition based on weight-for-height and/or oedema and by sex (WHO in z-scores, NCHS in z-scores and % of the median)
  - Prevalence of acute malnutrition based on WFH and/or oedema and by age (WHO in z-scores, NCHS in z-scores and % of the median)
  - Distribution of oedema and severe acute malnutrition based on WFH z-scores
  - Prevalence of stunting based on HFA z-scores and by sex
  - Prevalence of stunting based on HFA z-scores and by age
  - Prevalence of underweight based on WFA z-scores by sex
  - Prevalence of underweight based on WFA z-scores by age
  - Risk of mortality based on MUAC for children over 6 months of age
  - Extrapolation of the number of malnourished children based on: z-score with WHO reference, % of median with NCHS reference, and MUAC.
  - Give mean z-scores, Design Effects and excluded subjects for WFH, HFA, WFA
- Mortality results
  - (Retrospective over x months/days prior to interview)
  - Crude Mortality rates
  - Age adjusted Mortality rate – Under 5
- Report results of all other data collected. Not all surveys will have food security, health, vaccination, care, program coverage or other data —the collection of these variables depends on the objectives of the survey. Thus, the reporting of these variables will vary.

Discussion

- The discussion puts the results back into context.
- Explain the results seen (e.g., prevalence of malnutrition and mortality rates) in terms of the causes of malnutrition — health, food security and care. It is often easiest to split the discussion up into these three broad areas and discuss each separately.
- Compare current findings to previous surveys and explain changes seen (if any)
- Much of information for the discussion will come from key informant interviews, observations and casual conversations (that is, not during questionnaires) with community members it is useful to focus on what is normal and what is happening now, also to try to predict what might happen in the future.

Conclusions

- Overall conclusions on the severity of the situation and the urgency of the response required.

Recommendations

- Consider what other interventions are on-going. Resources should not be wasted by over-lapping with other programmes.
- Remember to prioritise recommendations and try to give a time when action would be appropriate (e.g., immediate, medium term or longer term).
- Needs for future nutrition monitoring

Annexes

- A map or diagram of the survey area,
- Assignment of clusters and a complete list of clusters visited during the survey
- Survey questionnaires and/or response sheets used for data collection
- Evaluation of enumerators
- The local calendar of events used
- Plausibility check report

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References

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Glossary of Terms

Anthropometry The technique that deals with the measurements of the size, height, weight, and proportions of the human body.

Baseline data Baseline data represent the situation before or at the beginning of a program or intervention. Survey data may be compared to baseline data if defined criteria for comparison are met (e.g., similar methods and coverage)

Bias Anything other than sampling error which causes the survey result to differ from the actual population prevalence or rate.

Chronic Malnutrition Chronic malnutrition is an indicator of nutritional status over time. Chronically malnourished children are shorter (stunted) than their comparable age group.

Cluster Sampling Cluster sampling requires the division of the population into smaller geographical units, e.g. villages or neighbourhoods. In a first step, survey organizers select a defined number of units among all geographical units. In a second and sometimes third step, households are selected within the units using simple random sampling, systematic random sampling, or the modified EPI method.

Confidence interval When sampling is used, any figure derived from the data is an estimate of the actual value and is subject to sampling errors, i.e., there is a risk that the result obtained is not exactly equal to the actual value. The estimated prevalence coming out of a sample is therefore accompanied by a confidence interval, a range of values within which the actual value of the entire population is likely to be included. This value is generally 95% in nutrition and mortality surveys. This means that we can be 95% confident that the true prevalence lies within the given range.

Crude mortality rate (CMR) Mortality rate from all causes of death for a population (Number of deaths during a specified period /number of persons at risk of dying during that period) X time period.

Cut-off points The point on a nutritional index used to classify or screen individuals' anthropometric status.

Design Effect (DE) Cluster sampling results in greater statistical variance (see definition below) than simple random sampling because health outcomes tend to be more similar within than between geographical units (see cluster sampling). To compensate for the resulting loss in precision, the sample size calculated for simple random sampling must be multiplied by a factor called "design effect"; A measure of how evenly or unevenly the outcome (for example wasting, stunting, or mortality) is distributed in the population being sampled.

Global Acute Malnutrition (GAM) GAM includes all children suffering from moderate and severe acute malnutrition; percent of children under 5 who have low weight-for-height measured by -2 z-scores and with or without oedema.

Growth Monitoring Observation of a child growth over time by periodic assessment of his/her weight-for-height or weight-for-age.

Kwashiorkor Sign of severe malnutrition characterized by bilateral oedema.

Malnutrition State in which the physical function of an individual is impaired to the point where he or she can no longer maintain adequate bodily performance process such as growth, pregnancy, lactation, physical work, and resisting and recovering from disease.

Morbidity A condition related to a disease or illness.

Oedema An accumulation of excessive extra cellular fluid in the body; a distinguishing characteristic of kwashiorkor when bilateral. All children with nutritional oedema are classified as severely malnourished.

Outcome Wasting and mortality are examples of outcomes measured in surveys.

Prevalence Proportion of a population with a disease or condition of interest at a designated time.

P-value If you want to know whether there is a significant difference between two survey estimates, frequently a statistical test is applied and a P value calculated. The P value is the probability that the two estimates differ by chance or sampling error.

Recall period A defined period in the past used to calculate estimated mortality and/or morbidity rates.

Reference Population The NCHS (1977) and WHO (2006) reference values are based on two large surveys of healthy children, whose measurements represent an international reference for deriving an individual's anthropometric status.

Sample A subset of the total population that should be selected at random to guarantee a representation of the total population.

Sample size The size of the sample calculated based on objectives of the survey and statistical considerations.

Sampling error Sampling error is the degree to which a sample might differ from the whole target population, e.g., how well it represents a target population or total population. Sampling error can be quantified (e.g., in a confidence interval).

Sampling frame The list of all the ultimate sampling units from which the sample is selected.

Sampling interval The sampling interval is the total number of sampling units in the population divided by the desired sample size.

Sampling unit The unit that is selected during the process of sampling; depending on the sampling process the sampling unit can be a person, household, cluster, district, etc.

Severe Acute Malnutrition (SAM) SAM includes all children suffering from severe malnutrition; percent of children under 5 who have low weight-for-height measured by -3 z-scores and with or without oedema.

Simple Random Sampling The process in which each sampling unit is selected at random one at a time from a list of all the sampling units in the population.

Stunting (chronic malnutrition) Growth failure in a child that occurs over a slow cumulative process as a result of inadequate nutrition and/or repeated infections; stunted children are short for their age and may look younger than their actual age; it is not possible to reverse stunting; measured by the height-for-age index.

Systematic Random Sampling (SRS) A methodology which selects a sampling unit at random, then selects every n^{th} household thereafter, where 'n' equals the sampling interval.

Underweight Percentage of children under the age of five with weight-for-age below -2SD from median weight-for-age of reference population.

Wasting (1) Growth failure as a result of recent rapid weight loss or failure to gain weight; wasted children are extremely thin; readily reversible once condition improve; wasting is measured by the weight-for-height index.

Wasting (2) Percentage of children under the age of five suffering from moderate or severe wasting (below minus two standard deviations from median weight-for-height of reference population). Wasting differs from acute malnutrition because it does not take into consideration the presence/absence of oedema.

Z-score Score expressed as a deviation from the mean value in terms of standard deviation units; the term is used in analyzing continuous variables such as heights and weights of a sample.

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Useful publications, organizations, and websites

FSNAU website: http://www.FSNAU.org

ENCU Ethiopia: http://www.dppc.gov.et/pages/ENCU.htm

Food and Nutrition Technical Assistance (FANTA) website: http://www.fantaproject.org

IASC Nutrition Cluster website: www.humanitarianinfo.org/iasc/content/cluster/nutrition/

SMART methodology can be downloaded on www.smartindicators.org, and the latest version of the Emergency Nutrition Survey accompanying software can be downloaded on www.nutrisurvey.de/ena/ena.htm.

The Sphere Project. Humanitarian charter and minimum standards in disaster response. Chapter 3: Minimum standards in nutrition. Geneva; 2004. Available at URL: http://www.sphereproject.org/handbook/hdbkpdf/hdbk_c3.pdf

United Nations Standing Committee on Nutrition (SCN), website: http://www.unsystem.org/scn

Somalia Support Secretaria: http://www.somoliasupportsecretariat.info

United Nations Standing Committee on Nutrition (SCN), website: http://www.unsystem.org/scn

Somalia Support Secretaria: http://www.somoliasupportsecretariat.info

Indicators for assessing infant and young child feeding practices. http://www.who.int/nutrition/publications/infantfeeding/9789241596664/en/index.html

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