



GUIDELINES FOR NUTRITION BASELINE SURVEYS IN COMMUNITIES

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Version 1.2

Jakarta, 1997

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*Published under the joint auspices of
The Southeast Asian Ministers of Education Organization (SEAMEO)
Regional Tropical Medicine and Public Health Network (TROPMED)
TROPMED Central Office
and
Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH
Federal Republic of Germany*

**"The most important resource
is always people."**

Barber Conable (1988)
President of the World Bank

Foreword

During the second half of the 1980s the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH redefined its nutrition policy within technical cooperation. The new position was published by GTZ in the document "Development and Nutrition." The main message of this document is that poverty alleviation is a

priority in the cooperation policy of the government of the Federal Republic of Germany with developing countries and that reduction of hunger and malnutrition is a major issue in poverty alleviation. However, very little is known about the effectiveness and success of reduction of malnutrition through poverty alleviation. Consequently all projects which are expected to improve the nutritional situation and reduce poverty should assess the nature, magnitude, causes, and groups at risk of malnutrition at the beginning of the project and after the project has been implemented for a substantial length of time. For this purpose a standardized methodology for a nutritional baseline survey has been developed and tested in various projects.

These guidelines do not contain any new methods. It often refers to international standards for nutrition surveys. For the experienced reader some information may even appear too basic and trivial. However, the content of the present guidelines documents the GTZ experience with nutritional baseline surveys and considers the repeated occurrences of different procedures, errors and failures. By ensuring quality and standardization, it is possible to make comparisons with some of the experiences and results of nutrition surveys from other organizations. Where standards fall short, practical experience has been used to develop the methodology.

It should be stressed that guidelines for survey techniques will never have the last word on the subject. Rather it is important to be keep abreast of new scientific discoveries, international standardization, and practical experience. Therefore, all readers are encouraged to submit comments or summaries of their experiences for consideration in future editions of the guidelines.

During the years of work, the authors have consulted numerous persons. All of them deserve an additional expression of gratitude for their valuable contributions. In particular, the authors thank D'Ann Finley and Ursula Gross for editing and proof reading the guidelines.

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1. Introduction

Despite all efforts undertaken both nationally and internationally, poor nutritional status is still a **fundamental** cause of disease and shortened life-span. Most people are aware that many factors are either directly or indirectly responsible for undernutrition, including insecure food supply, lack of basic education, inadequate health services, deteriorated environment, low income, and inadequate empowerment. The factors contributing to malnutrition vary from community to community. However, poverty is nearly always an underlying factor.

To improve the nutritional status and improve living conditions in communities, it is necessary to determine the nature, magnitude and causes of malnutrition. Anthropometric indices are internationally accepted as nutrition key indicators of populations. Additionally, they have been recommended repeatedly as a suitable key indicator for poverty as well. The use of anthropometric indicators is based on the extensively observed phenomena that a growing child who lacks an adequate intake of food and is repeatedly ill, does not have the body height corresponding to its genetic potential. Furthermore, inadequate food availability, caring capacity, basic education, health systems, housing and environmental conditions have been proven to be underlying causes of inadequate food intake and repeated episodes of diseases. As a result, communities that are not able to satisfy their basic needs adequately generate higher proportions of individuals with inadequate anthropometric indices.

The quality of intervention strategies is closely linked with the quality of the assessment of the situation. Planning methods for interventions, such as ZOPP (Objective-Oriented Project Planning), triple A (Assessment - Analysis - Action) or PMC (project management cycle), provide a structure for gathering and analyzing data that can be used subsequently in monitoring the impact of an intervention. Therefore, if an objective of an intervention or program/project is to raise the nutritional and living standards, appropriate and realistic indicators must be established.

Appropriate planning requires both quantitative and qualitative information. To measure the impact of **nutrition-oriented programs/projects**, i.e. self-standing nutritional programs/projects and nutrition-related programs/projects, it is necessary to collect quantitative information. Therefore, projects/programs must start with a baseline survey, and such survey must be repeated periodically.

Self-standing nutrition projects/programs are directly targeted for an improvement of the nutritional situation of the population. **Nutrition-related programs/projects** may belong to the **agricultural** sector (in terms of producing, processing and storing of food; food hygiene and quality control as well as regional development in rural areas), **health care, nutritional security, urban development** and **urban planning**. These programs/projects have objectives related to the particular subject, but the improvement of the nutritional situation is stated as an **overall objective** or **positive impact** in program/project planning. Therefore, the program/project should be evaluated as to whether its impact on the nutritional situation is positive, neutral, or negative.

1.1 Purpose and organization of the guidelines

The purpose of the guidelines is to provide guidelines for nutrition surveys. These guidelines should serve especially

- to initialize the assessment of the nutritional situation of communities,
- to assist in planning and implementing sound surveys, enabling nutrition and public health workers and specialists to formulate appropriate nutrition policy and measures,
- to standardize survey methods and techniques, enabling later comparison of data and results from different surveys, projects and countries,
- to be used for training of nutrition and public health workers and specialists, and, ultimately
- to help to bring about an improvement of the nutritional situation of target groups.

This guidelines does not contain any new methods but describes international standard operating procedures (SOP) for nutrition surveys. If these SOP are used, results from different organizations and projects can be compared. Where SOPs fall short, illustrations from practical experiences of the authors will fill the gap. This guidelines can only provide guidelines for the selection of the variables to be studied; the final survey document must be adapted to the local situation.

This document is not a text book which teaches the inexperienced reader how to organize and implement a nutrition survey. Certainly, there is information available in the guidelines with which some readers are very familiar. However, the pertinent chapter should be read to ensure that the survey is carried out using a consistent standardized method.

This publication has the following structure:

parts

€€ ↓

chapters

€€ ↓

sub-chapters

€€ ↓

sections.

1.2 Objective of a Survey

A survey is a method for collecting information directly from people. Nutrition surveys assist in the planning and implementation of projects by providing objective data that can be used to improve the nutritional situation. The objective of a nutrition survey is derived from the purpose of nutrition-related projects. The survey should

- monitor the improvement of the nutritional situation (project objective, overall objective, or positive impact), and/or
- guard against the worsening of the nutritional situation (negative side effect).

General objective of a nutrition survey:

The objectives of the nutrition surveys dealt with in this guidelines are the **assessment and analysis of the nutritional situation and of contributing poverty factors of risk groups** and the **evaluation of the nutritional effect of a project/program** on the improvement of living conditions.

The following individual activities are part of the process of a baseline survey:

- to initiate **dialogues among all groups** participating in a project (target group, non-governmental organizations, governmental authorities, donors, and project implementation personnel) concerning the living situation of the poor,
- to assess the **needs** of the poor, in particular, about their problems in daily life,
- to increase the **awareness and sensitivity** of the **specialists** involved in the project and also those responsible for programs designed to improve the basic need situation of the poor,
- to reveal the nature, magnitude and severity of the **nutrition- and poverty-related problems** and their possible causes,
- to identify the particularly affected **target groups**,
- to arrive at a **causal model** (problem tree),
- eventually to propose additional smaller **in-depth surveys** that are necessary to be carried out to diagnose important causes of poverty problems,
- to identify the **appropriate scope of intervention** for the improvement of the poverty situation,
- to identify project-defined indicators (poverty-related socioeconomic determining factors) for **evaluation**,
- to determine the **impact of project measures** on living conditions of the observed risk groups, and finally
- to obtain data for **cross-sectional comparisons** between the country and the project target groups.

The objective of a baseline survey is **not to undertake pure research**. As the fundamental causes of malnutrition are known, it is unnecessary to gather scientifically supportable proof of a causal relationship for a nutritional problem. A survey should record all possible important variables known from literature to be responsible for nutritional problems. If, for example, no statistical relationship can be identified between nutritional indicators and early weaning in a project area under survey due to the small sample size, the higher percentage of early weaned children should, nevertheless, be included in a problem tree and suitable intervention measures, e.g., nutritional advice, should be considered. Of course, these variables must be tested for their relevance no later than a pilot testing.

To illustrate this even more vividly: if, while collecting data on 500 children, only one case of eye abnormality caused by vitamin A deficiency is discovered - in which case the sampling is indisputably too small to derive a scientifically

supportable conclusion concerning this (health) problem - vitamin A deficiency should nevertheless be considered in project planning. This potential cause-effect relationship must then be followed up in greater detail no later than during the first implementation phase of a project or program (orientation phase).

During the assessment of the nutritional situation of a community, a baseline survey provides information about the nutritional problems in individuals. Therefore if, for example, a child is identified as undernourished, the child must be sent to the nearest available health service for further examination. Before commencing a survey, arrangements must be made with the local health service. Many surveys have shown that both communities and health services have been extremely cooperative in adopting such an arrangement.

The objective of a nutrition survey is not only to obtain information on the nutritional situation of a community in a survey area, but this information should be fed back to serve the needs of individuals in the community.

A nutrition survey takes place in 5 steps:

1. **Collection of available information on the nutritional situation and other demographic, socioeconomic and ecological data in the survey region;**
2. **Planning and preparation of the nutrition survey;**
3. **Implementation of the nutrition survey;**
4. **Data processing, evaluation and analysis;**
5. **Dissemination of the results of the nutrition survey and preparation for translation into action.**

1.3 Target group of the guidelines

As explained before a nutrition survey has several objectives and the guidelines is a tool to reach these objectives adequately. However, it cannot be expected that all there is to know about carrying out a survey can be taught by means of a handbook. It is only able to set guidelines and standardize procedures. These guidelines have therefore been written for an **experienced community** or **public health nutrition specialists** who possess already a basic knowledge in nutritional epidemiology and practical experiences in survey technic. It is designed so that the user can extract the relevant sections corresponding to the project types, phase and needs.

The primary target group of this nutrition baseline survey guidelines is the **experienced nutrition specialist** who **plans, implements, and analyzes nutrition surveys.**

1.4 Types of surveys

There are four types of nutrition surveys; each is important for a different type of project or a different phase of a project.

1. In a **rapid appraisal** of the nutritional situation, information on the nutritional condition of the target community should first be obtained during the planning phase using qualitative methods. Anthropometric data (such as height and weight) are not recorded in this type of survey.
2. In a **rapid assessment**, anthropometric data are measured to obtain information on the type of nutritional problems using quantitative methods. However, the sampling selection and sampling coverage do not allow quantitative conclusions to be made concerning the prevalence of nutritional problems that can be generalized for a broader population.

Both types of surveys are suitable for a pre-feasibility study for the assessment of the nutritional situation. One of these two types of surveys should be used for identification of the project during the planning phase.

3. The **baseline survey** (for further information, see section 3.1.3.1) gathers information concerning the type, prevalence, reasons and causes of nutritional problems (see chapter 1.2).
4. The **follow-up survey** assesses the impact of the project or individual project measures on the nutritional

condition of a community (for further information, see section 3.1.3.2).

Complete nutritional baseline and follow-up surveys cover the following areas:

- Felt needs by the community
- Demographic data of the households
- Socioeconomic factors
- Anthropometry
- Signs of malnutrition and disease
- Nutrition and health practices.

Complete nutritional baseline and follow-up surveys should only be considered for a **self-standing nutrition project** in which the objective of the project is the improvement of the nutritional situation of a community. In **nutrition-related projects** that are expected to have a positive impact on the nutritional situation or projects with potential negative side effects resulting in the worsening of the nutritional situation, **only specific nutritional indicators** should be assessed. Data on other aspects, in particular socioeconomic data, should then be taken from a project-specific baseline survey.

1.5 Timing of a survey

The overview in Figure 1 shows **how a nutrition and poverty baseline survey and a follow-up survey are integrated into the Project Cycle**.

A project starts with a project idea and ends when its main objective has been achieved. This objective, or objectives should be planned jointly by all involved parties including the community. The project lifetime can be subdivided into phases, such as identification, conceptualization and implementation. The baseline survey is an instrument for the development of a project strategy.

Figure 1. Project Cycle for nutrition- and poverty-oriented projects/programs

Project Phase	Planning Decisions	Instrument
	Project idea	
Project identification	↓	Pre-feasibility study (e.g. RAN)
	Decision about project purpose	
Project design (conceptualization)	↓	Baseline survey and participatory planning (e.g. ZOPP)
	Decision about projects strategy	
Project implementation	↓	Follow-up survey and participatory planning (e.g. ZOPP)
	Decision about project strategy adjustment	
Project redesign and implementation	↓	Follow-up survey and participatory planning (e.g. ZOPP)
	Desired project impact	

RAN: Rapid Assessment on Nutrition for Community-Based Poverty Alleviation Projects/Programs

ZOPP: Ziel-Orientierte Projekt-Planung (objective-oriented project planning)

2. Data collection from existing information

For almost all countries some information is available on the nutritional situation of the population. This information should be collected before starting a nutrition survey since it

- provides **important information** for the planning process and
- yields **complementary information** for analysis and interpretation of data.

Indirect collection of information should commence during the project identification phase, or at the latest, in the orientation phase and before the planning and implementation of a baseline survey (see section 3.1.3). Three sources of information are outlined below:

1. **Scientific literature**
2. **Data from national literature and/or international institutions**
3. **Nutritional information obtained directly in the local setting.**

2.1 Scientific Literature

Literature searches for relevant scientific nutritional articles can be made using special computer software with CDROM or the Internet:

- **Current Content (Life Science)**,
- **Medline** (e.g. <http://www.ncbi.nlm.nih.gov/PubMed/>).

Of the two, Medline is more strongly oriented toward the medical field.

The search for relevant articles requires one or several index words in the English language, for example:

nutritional status, malnutrition, anemia, IDD, or xerophthalmia

in connection with a geographical region indicator, e.g.,

Pakistan, Brazil, or Sahel

or an ethnic group, such as

Quechua, Bantu, or casts.

The search provides the following information:

- the authors' names and addresses,
- the title of the scientific article,
- the literature citation (e.g., Am J Clin Nutr 1994;60:36-41.)

and usually a synopsis of the article. Once a relevant article has been identified, the complete article can be obtained. If no library is available, the specific article can be requested by writing to the authors directly.

The quality and relevance of articles are not uniform. The following criteria should be used for evaluation:

- the reputation of the scientific journal
- the quality of the presentation.

Scientific literature on nutrition surveys, in addition to other information relevant to nutrition, can be obtained from **scientific institutions**. Annex 6.9 provides a list with some examples of scientific institutions. However, it must be emphasized that this list is incomplete.

2.2 Data obtained from national and international institutions

Information from published and unpublished **national** as well as from **international institutions** is available and may complement information from scientific literature.

Multilateral and bilateral organizations can also be contacted at their respective offices in most countries, usually in the capital city.

Besides international organizations, most **national agencies**, such as ministries of health, agriculture, education, planning and related areas can provide valuable information. Similarly, in some countries there are ministries of land reform, water resources, women's affairs, family planning and social affairs, urban development, etc. The country-specific political and bureaucratic delineations of ministries and their subordinate offices have to be considered.

As literature from these sources often fails to include methodology, and there is sometimes a risk of political influence on the contents of publications by government institutions, the validity of these data should be carefully reviewed.

2.3 Information obtained directly in the local setting

Chapters 2.1 and 2.2 have dealt with the collection of scientific and technical information based on literature review and to a lesser or greater degree on official statistics. However, actual experiences in everyday life can provide valuable supplementary information about the local situation. Only with the help of many observers from as many different points of view as possible can precise intervention measures successfully be found. In this case, sociologists, anthropologists and psychologists can provide valuable insight. The explanation of the causes of the nutritional situation of a particular community group leads to a greater understanding of the environmental conditions, in terms of social and cultural factors that determine the life of the community concerned.

Valuable information that would be difficult, if not impossible, to collect through quantitative methods, such as epidemiological techniques, can be obtained through qualitative methods, such as focus group discussions. Two examples are given below:

1. It is extremely difficult to establish whether there is a vitamin A deficiency in a certain area. Deficiency can be determined only through a large random survey in which blood samples are analyzed using an expensive assay procedure. Measurement of the prevalence of xerophthalmia (blindness caused by vitamin A deficiency) is also very difficult, and this symptom occurs only in cases of extreme vitamin A deficiency. If there is no xerophthalmia in a region, it is still possible to find many people suffering from vitamin A deficiency. However, information on the problem of vitamin A deficiency can be obtained through discussions with the target groups, e.g., inquiring whether there are words for night blindness in the local language,
2. The word "kwashiorkor," used to describe symptoms of protein deficiency, originates from Ghana and means "*the displaced child*." It is a euphemism used by village people when speaking about imminent death due to protein-energy-deficiency.

Thus language usage provides additional indications of the picture of the nutritional situation in a sociogeographic area.

In conclusion, methods of social sciences may provide very important complementary information about the nutritional situation and help to put the data gathered by natural science methods into the proper context.

2.4 Survey of structural data

Before embarking on door-to-door interviews, relevant community structural data on the village or suburb and

region must be obtained for a nutrition survey. This is particularly important to put the results of the survey into the proper context of the overall situation of the province or country. For example, a 20% undernutrition rate in a population can be low if the general prevalence in a country is 40%, and it can be high if the general prevalence is only 5%. **Consequently, nutritional data have to be set within the overall demographic, socioeconomic and ecological framework.**

Therefore, it is necessary to obtain demographic, economic, ecological and other information, such as: Do many families migrate in or out of the survey area? Are there any unusual climatic conditions at the time of the survey? Is the country going through an economic crisis?

Other important structural data to consider are:

1. Growth of the Gross Domestic Product (GDP).

The GDP growth reflects a country's economic structural environment and assists in the interpretation of other indirect indicators such as:

- Agriculture (e.g., fertilizer consumption per ha of cultivated land, agricultural output).
- Education (e.g., teachers per 10,000 inhabitants, school attendance rates, % illiteracy)
- Health (e.g., doctors per 10,000 inhabitants, hospital beds per 10,000 inhabitants, infant mortality)

2. Developments in the demographic data of a project area

Exact demographic data of the project area are necessary to identify the target group and to plan intervention measures. These data include if possible:

- Population density (number of people/km²)
- Annual population growth (%)
- Population migration rate (%)
- Birth rate (%)
- Breakdown (%) of the population by age group (e.g., 0-5 months, 6-11 months, 1-4 years, 5-9 years, 10-17 years, 18-29 years, 30-39 years, 40-49 years, 50-59 years, 60 and more years)
- Life expectancy at birth for men and women (years)
- Infant mortality (%)

3. Rainfall in the Project Area.

In many parts of the world, water is a limiting resource for agricultural production and living conditions. Particularly in marginal regions, rainfall patterns may differ substantially in relatively small geographical areas. Therefore, information should be collected on the amount and yearly distribution of precipitation. Inadequate rainfall can cause a precarious nutritional situation. To do this, one should begin with the survey month and then trace back over the most recent 12 months. Rainfall measurements can generally be obtained from meteorological institutes or agricultural agencies in the district or state capital. In certain areas, factors other than rainfall data, such as frost and hail, also exert an effect.

Table 1. Rainfall data in the project area

Month	Average annual rainfall over the last 10 years (mm)	Observed rainfall over the last 12 months (mm)

Structural data can be sought from the statistical yearbooks at local government agencies. However, it is advisable to ask also for data from officials in the capital city, because the data are often more readily obtainable at the capital than in provincial areas due to centralization.

3. Nutrition survey methodology

In deciding the form and content of a nutrition survey, the **social structure** of the community of an area must be considered. Social structures between people may be built on biological, economic, political, religious and/or geographical grounds. These social structures are assembled by various levels. Structures are built starting with the smallest survey unit (the individual) through families, communities, etc. up to the level of the population of a country or region (see table 2).

Great differences can also be found between urban and rural areas. Although in both urban and rural areas the smallest unit is the individual (survey level A), at the next higher level (survey level B) the social organizational structures start to differ from each another. In rural areas, the household unit is a family or extended family. In urban areas, households consist of single families or individual persons.

The complexity of the social structure is also important. The higher the survey level, the more complex the social organizational structure. In addition, these structures grow even more complex with increasing numbers of people in an interdependent living environment.

As shown in the following table, the quality of a higher survey unit is different from the sum of the subordinate survey units. In order to describe the quality of the whole, all levels must be described. If one wants to undertake a nutrition survey of a population, this principle also applies to the nutritional assessment of individuals. Not only should the sum of individual units be assessed, but the higher structural levels must also be assessed.

Therefore, a survey must allow for the special characteristics at the level of the individual, household, and village or suburb. The sum of information on individuals alone does not provide a complete picture of a family situation, and similarly the sum of information on families does not do so for villages or suburbs, etc.

Table 2. Observable characteristics related to the survey level

Survey level	Survey unit		Examples of observable characteristics
	Rural areas	Urban areas	
A	Individual	Individual	Age, size, sex
B	Household	Household	Size, income, religion
C	Village	Suburb	Electricity supply
D	Valley (geographical unit)	City/town, part of a metropolis	Health structures, types of schools
E	District (political)	Metropolis	Climate

Information concerning survey levels A and B has to be obtained by direct interviews and data collection from the target group. Variables concerning individuals will be described in sub-chapters 3.2.10 - 3.2.13, and those concerning households in sub-chapters 3.2.1 - 3.2.9. Inquiries should be made at the appropriate agencies concerning the variables at survey levels C, D and E before household interviews are conducted. Part 2 discusses how to obtain this information.

In a nutrition survey the data collection is divided into

- **interviews** (e.g., socioeconomic and health related questions)
- **observations** (e.g., socioeconomic and health related questions)
- **measurements** (e.g., anthropometric and biochemical data).

Interviews must normally be carried out with the person responsible for the child. Usually this is the mother. If the mother is absent at the time of the interview, the interview should be conducted later. Only if the mother cannot be interviewed before the survey team leaves the village or suburb can another **adult** person (e.g., grandmother, aunt, older sister, etc.) of the same household be interviewed.

3.1. Survey design

3.1.1 Initial interactions with community

To obtain an actual view of the nutritional situation of a target community and to lay the foundation for intervention, an essential requirement is that **the survey is planned, carried out and evaluated only in cooperation with the community concerned.**

This means that from the **very beginning**, a **dialogue** is sought with representatives of the **target population**. In this way the

community will be informed as to the purpose of the survey and its form and contents. Before any planning of the survey method and its contents, time and cultural requirements must first be defined. **If parts of the survey cannot be carried out due to the wishes of the community, and therefore, some information cannot be gathered, this objection must be accepted and respected.** For example, taking blood samples from children or asking questions concerning income is often rejected by community members.

F A basis of trust is a necessary starting point for any future cooperation with the community and paves the way for sustainable intervention.

During, or at the latest upon completion of, a survey a dialogue must be initiated with the local population concerning the results of the survey. At this opportunity

- **the people should be informed of the results,**
- **their opinions on nutritional problems should be noted,**
- **their wishes and reservations should be considered in the formulation of intervention, and**
- **the potential for indigenous intervention should be identified.**
-

3.1.2 Survey groups

An important principle in planning and evaluating a survey is to distinguish between the following community groups:

1. The **total population**, i.e., all people living in the project region.
2. The **target group**, i.e., those people for whom and with whom the project is planned and carried out.
3. The **risk group**, i.e., the section of the population with the worst nutritional conditions and in greatest danger of sickness and death from malnutrition.

A distinction has to be made between nutritional physiological risk groups and social risk groups. **Physiological risk groups** are, for example, small children, school children, nursing and pregnant mothers, elderly people, and men and women who perform physically hard work. Examples of **social risk groups** are the landless, low income or other groups displaying particular forms of behavior (e.g., nutritional or health practices).

4. The **beneficiary group**, i.e., those people who will benefit from the project intervention measures.
5. The **survey group**, i.e., those persons who provide personal data relevant to nutrition (e.g., weight, height, immunization status, diarrheal diseases).

Ideally, groups 2-5 are identical, thus maximizing project efficiency and optimizing the results. In reality, this is usually impossible.

During planning and evaluation the distribution of individual groups among the other groups needs to be defined. From the baseline survey the proportion of the risk group to the total beneficiary group can be estimated and the proportion of the beneficiary group to the total risk group can similarly be estimated.

This is illustrated in the following diagram:

		Risk group	
		yes	no
Beneficiary group	yes	a	b
	no	c	d

1. Planned **degree of intervention**:

Proportion of total beneficiary group that is at risk = $a / (a + b) * 100$

With a known degree of intervention, the efficiency of the assistance provided can be determined; in other words, the proportion of efforts that reach those who need them will be established.

2. Planned **coverage of intervention**:

Proportion of the total risk group that receives benefits = $a / (a + c) * 100$

The coverage of intervention will determine the proportion of the population at risk that will benefit from intervention.

As described earlier, a project would be overtaxed both in terms of schedule and expertise if all risk groups were to be considered in a

nutrition survey, therefore:

F The nutrition survey methods discussed in this publication are restricted to observations on infants and small children up to 59 months.

The reasons for this are as follows:

1. Latent nutritional problems influence health-related infant and child (0-59 months) mortality. The nutritional condition of this risk group serves therefore as an indicator of the nutritional situation of the entire target group.
 Additionally, the type, severity and causes of risks differ with each age group of children.
 - In terms of **nutritional physiology**, the most vulnerable group is infants (0-11 months) because they do not have fully developed immune systems, are changing from breast milk to plant and animal foods, and are exposed to risks of infection due to their increased mobility.
 - In terms of **epidemiology**, the most vulnerable group is children aged from 6 to 23 months. The type and cause of the risks can also differ within this group, e.g., between the 6-11 months age group and the 18+ month age group.
2. The direct and indirect causative factors for malnutrition based on intensive studies of this child group (0-59 months) have been established. Similarly, previous experience in intervention measures can also be applied to this group.
3. Although it is impossible to recover fully from nutrition and health related stunting after a child has reached the age of two, children older than two should be surveyed for the following reasons:
 - acute energy deficiency problems can be easily diagnosed and treated in this age group, and
 - follow-up investigations of long-term interventions should be made after four years at the earliest because successful nutritional intervention from infancy should have manifested itself by then. Therefore it is important to have baseline data at the older age for comparison with the follow-up data for children who had participated in the project.

The broader coverage of age groups also has the advantage that more children can be covered for a given number of households surveyed. This produces a larger sample size without requiring extra effort to visit more households.

When the term "survey group" is used in these guidelines, it is the community group on whom the nutrition survey is being carried out (i.e., children under 5 years) and not the broader risk or beneficiary group of the project.

3.1.3 Cross-sectional vs. longitudinal surveys

The survey design needs to be tailored in a way that the maximum amount of information can be collected regarding the impact of the planned intervention. For example, the impact of a oil palm plantation project on the nutritional situation of its smallholders/producers is studied according to table 3.

Table 3. Survey design of nutrition surveys

LONGITUDINAL	CROSS-SECTIONAL	
	Intervention Group	Group for comparison
Baseline survey (start of project)	(A)	(B)
1. Follow up survey	(C)	(D)
2. Follow up survey	(E)	(F)
etc.

A baseline survey at the start of the project (A) gives information about the nutritional situation of the project population. After several years a follow-up survey will be carried out within the same area or population (C) to study the project's impact on the nutritional situation. However, the comparison of the nutritional situation between (A) and (C) cannot be used alone to measure the impact of a project because several additional factors that have changed during the time of the implementation of the project may have influenced the nutritional situation of the population. It is difficult to attribute the project's impact to the change of the nutritional situation. If the general condition of the population in the area, but not in the project, deteriorated during the intervention period, for instance due to climatic or political factors, no change of the nutritional situation of those in the project area has to be regarded as a success because the nutritional status of the rest of the project's surrounding population has decreased. Therefore, it is recommended to include in the baseline survey a population that will not be included in the project (B). Often projects are carried out in phases and start with a smaller population group for a later expansion. The group of comparison (B) could be identified as a future expansion area. During the follow-up survey the population of the group for comparison will be surveyed again (D) and this survey can be used as their baseline survey. After several years a follow-up survey will be carried out within the same population (F) to study the project's impact on the nutritional situation of group (D).

If no comparison group is available, the results must be analyzed with extreme caution because it is difficult to separate changes due to the project from those independent of the project. If, for example, no improvement in the nutritional situation is observed within a specific time, it cannot be definitely concluded that the measures have not worked. It is possible that general worsening conditions have caused a general decline in the nutritional situation of the entire region. Under these conditions, if the original nutritional situation has been maintained, the results have been positive. Alternatively, observed improvements in the nutritional situation may not have much meaning by themselves as long as they are not compared to the overall situation. It is conceivable that improvements in nutritional indicators can be attributed to the general situation in the region and not to the measures undertaken in the project.

To further complicate matters, comparison groups are never fully identical to intervention groups. This problem can be reduced statistically by studying many individuals. However, this significantly increases the cost of a survey.

It can be said that in principle:

F	The nutritional situation of the target population should be assessed by case control studies through periodical surveys with comparison groups.
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It has to be recognized that the assessment of the nutritional situation of population groups for the purpose of comparison may create ethical problems, since no immediate actions are planned to improve their situation (see section 3.1.3.3).

There is a special type of long-term study undertaken with the same individuals over the period of the survey. This survey method can be more economical, but in certain cases, more difficult to carry out. The primary advantage of this method is that a smaller number of individuals provides statistically valid results. Such a study cannot always be carried out because it is necessary to ensure that the same individuals will be available throughout the entire study. However, at the outset of an intervention this cannot be guaranteed for such reasons as migration, death, etc. This type of study also raises concerns about whether the results are due to the intervention or to the repeated surveys. Experience has shown that surveys carried out without any implementation of intervention measures can lead to an improved nutritional situation for the survey group.

3.1.3.1 Baseline survey

Each nutrition-related project should start with a **nutrition survey**. **This first (baseline) survey is much more extensive than a follow-up survey, not only because the nutritional condition of the community has to be assessed, but also the possible causes (such as inappropriate weaning practices or child nutrition, frequent diarrheal diseases, etc.) and important determining factors must be identified. Only if the causes of undernutrition are known, can sensible and equitable intervention measures be planned and carried out. The success of intervention can be checked and evaluated by establishing the determining causes of the nutritional condition.** The analyses of causes and determinants will be discussed later in further details (see Chapter 4.7).

Before each baseline survey there must be a comprehensive **collection of background information** (see part 2 of the guidelines). Because the surveys are carried out in developing countries, where it is often difficult to obtain scientific publications, literature research should be conducted in advance. In addition, at least one week should be allocated for the collection and analysis of information in the project country.

Most projects start with an orientation phase in which specific sector data for the project are assessed to analyze the starting situation. If during the orientation phase data are obtained which are also relevant to the nutritional baseline survey (e.g., socioeconomic data), perhaps both surveys can be combined. If the nutrition baseline survey is a part of an overall socioeconomic survey, the assessment of socioeconomic data can also be carried out by other persons in the survey team. Care should always be taken that the community is not overburdened with unnecessary and redundant questions.

The relationship between the amount of information collected and the quality of the information collected is not linear. Frequently, the amount of information climbs sharply with the first few variables, but the law of diminishing returns takes effect with less and less additional information obtained from increasing numbers of variables. Finally a saturation point is reached and from there on less information actually results from the growing number of variables. A basic underlying principle is that the patience of the interviewee and the accuracy of the enumerator declines with increasing numbers of variables, and thus the likelihood of clean analysis and interpretation of data is reduced. A decision must therefore be made at some point concerning the benefits in terms of information to be derived from further variables.

Only those variables that are relevant to the objective of the survey (e.g., selection of intervention measures, determination of intervention groups, measurement of project results) **should be assessed. Therefore, not every variable that appears interesting should be included in the survey.**

F	Data collection time should be limited to no more than three quarters of an hour spent with each family.
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The timing of the baseline survey can be very important. In many rural areas there is a seasonal influence on the nutritional situation of children, because in agricultural areas the nutritional situation is often under greatest strain before the harvest season.

In urban areas a similar situation can be found with the families of employees. With incessant inflation, wages often do not increase gradually, but are only adjusted to the price of necessities after a long period. The nutritional situation is undoubtedly worse before such an adjustment in wages than afterwards.

It is very informative if a survey can be carried out at a critical time such as the period before harvest, before an expected general increase in wages, or after a period of drastic increases in food prices. Such timing will undoubtedly bias results negatively, however, it is far better to obtain information on the situation during "bad" than during "good" times, as it is not the "good" times one needs to worry about. Also, in an agricultural community, the period before harvest is a desirable time to carry out a baseline survey because family members are free from work in the fields and therefore are available to spend time participating in a survey.

As the timing of the survey depends on the progress of the project (see chapter 1.4), it is not always possible however to carry out the survey precisely during a critical phase.

3.1.3.2 Follow-up Survey

If a follow-up survey for evaluation is to be carried out, the relationship between the effect of the project on the nutritional status and the contributing poverty situation of the target group should be assessed.

A follow-up survey is faster than a baseline survey because most of the parameters, such as the survey area, the beneficiary group, the infrastructure, etc. have already been established in the baseline survey. It is also unnecessary to conduct any preliminary sampling as the questions used in earlier survey(s) should be used again. Ideally, the former survey staff will be available to conduct the follow-up survey and therefore can apply their earlier training. Consequently, only a short retraining period will be necessary.

F	<p>It is essential that in the follow-up survey the same method of assessment is used as in the baseline survey.</p>
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This means for example, **variables with the same coding as in the baseline survey must be used, and that as far as possible the survey design** (such as sampling procedure) **remains constant**. To achieve this, the report of the baseline survey must be carefully documented and reviewed as it must serve also as a basis of the follow-up survey..

Occasionally a project or intervention area will extend into a former comparison area. In this case the follow-up survey in the former comparison area can also serve as the baseline survey for a future evaluation phase. A new comparison area should be found.

3.1.3.3 Groups for comparison

As described at the beginning of this sub-chapter, when possible and ethically justifiable, comparison groups (or "control groups") should be employed in nutrition baseline surveys. A comparison group differs from the survey group only in that no project intervention measures have been carried out there. The comparison area should be selected so that it lies outside the influence of the activities of the project as much as possible.

There is an ethical aspect in comparison group surveys. Because no intervention is carried out on the comparison group these individuals are left with their problems for the sake of comparison. Before arriving at a survey scheme, this point has to be discussed in depth with as many project representatives as possible and decided in all seriousness.

F	<p>The interests of individuals have priority over the accuracy of survey implementation.</p> <p>No survey without service!</p>
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This means, for example:

- When disease is identified in an individual, medical treatment must be provided.
- When individuals, or sections of the community, seek help to solve major problems, it must be decided whether the project can contribute to the solution of the problem.

The observations made on a comparison group can in themselves constitute intervention measures and consequently the observations no longer portray an accurate picture of the situation outside the intervention area. This influence becomes more apparent with increased intensity of observation of the comparison group and must be considered in the interpretation of the results of the survey.

3.1.3.4 Frequency of the surveys

Determination of the frequency of surveys is a compromise between the requirements of accuracy in the M+E (monitoring and evaluation) system and the completion of the project within the deadline.

The interval between the baseline survey and the follow-up survey, as well as the frequency of the follow-up surveys, depends on:

- The type of problems surveyed in the risk groups,
- The type of target, risk and beneficiary groups,
- The type of intervention, and
- The expected impact and results.

If acute malnutrition occurs due to catastrophes, direct nutritional aid is essential, and a follow-up survey must be carried out after a few weeks or months. In the case of chronic nutritional problems rooted in multiple causes and requiring long term inter-sectoral development measures, no significantly measurable changes can be expected on for at least 3-4 years, or until there is a significant improvement of the situation underlying the nutritional problem.

3.1.4 Sampling

As a rule, it is impossible and unnecessary to investigate all members of the target community to determine the prevalence of malnutrition is present in the community. A **representative sample is studied** and the results are extrapolated to the entire community. A sample is not representative if sampling systematically favors certain groups of people or makes systematic errors. As this can happen unknowingly, unintentionally, and is only detected during the analysis after the completion of the survey or even never, **random sampling** is essential. This means that all eligible persons have an equal chance to be included in the survey.

It is rare that nutritional deficiencies are evenly distributed between men and women or among age groups. When one wishes to determine the **frequency of a certain problem**, one should also define and describe the groups to be investigated, whether by age, sex, place of residence or social status, etc. **In the selection of a sample, this means that the sampling should only be done in these groups.**

In large survey regions it is difficult to secure that every person in the group under investigation will be equally likely to be selected as part of the sample. To ensure this, a complete list of all inhabitants and their characteristics would be necessary. Since such a list is rarely available, a solution to this problem is the division of the area into **clusters** (sampling units). Clusters of individuals often arise naturally (e.g., classrooms) or they may be formed artificially (e.g., geographic clusters). **The clusters are then selected at random** and within each cluster investigations are carried out on every member of the community concerned. If the cluster is still too large, further random sampling can then be done.

3.1.4.1 Sample size

Calculation of sample size depends on the objective of the nutrition survey. If the sampling is to be done for a survey in a **nutrition-related project**, in which the prevalence of undernutrition is to be established in a baseline survey, where specifically aimed nutritional intervention is not to be undertaken, the necessary **sample size for the survey of anthropometric data** can be derived using the following formula:

$$n = (4 \times p \times (100 - p)) / 25$$

where: p = expected prevalence of undernutrition.

EXAMPLE:

If the prevalence of undernutrition in a survey area is estimated at 40%, the sample size (n) should be:

$$n = (4 \times 40 \times 60) / 25 = 384$$

In other words, the survey must be conducted on 384 individuals.

The estimated prevalence of undernutrition can be derived from literature study, data from health services, or ideally from the pilot study. The formula can only be used if:

- estimated prevalence of undernutrition is greater than 5%, and
- the sample is representative of the whole population to be surveyed. This means that each individual, as well as each household, has an equal chance to be sampled, and the selection of either individuals or households is not affected by other individuals or households.

If clustering is used for sample selection, or the prevalence in each cluster differs because of a very low prevalence, the calculated sample size in rural areas must be multiplied by a design factor of 2. In the urban area, however, where a far higher heterogeneity is to be expected the design factor should be 4.

In **self-standing nutrition projects**, where intervention is to be undertaken, a different method is used to determine sample size. The following information must be available to ascertain the required **sample size** for comparison with anthropometric data in a **follow-up**

survey:

1. the percentage of the comparison group and/or intervention group estimated to have nutritional problems **before** intervention (prevalence), and
2. the percentage of the intervention group estimated to still have nutritional problems **after** intervention (prevalence).

Estimated values for the prevalence of nutritional problems can be obtained from the literature (see part 2 of the guidelines) or preferably from a pilot survey.

The formula used to calculate the sample size is relatively complicated and cannot be understood without an extensive knowledge of statistics. Sample size can more easily be determined using graphs (see the following page), based on Fleiss' illustrated calculations (Fleiss, J.L. (1981) Statistical methods for rates and proportions. Second edition, John Wiley & Sons, New York, pp 38-42).

First one looks for the exponential curve that corresponds to the expected rate of nutritional problems for the surveyed community before intervention. Then on the lower horizontal axis the expected prevalence of malnutrition **after** intervention is identified and a perpendicular line is followed from this point to the exponential curve. From where these lines intersect one goes horizontally to the left or right vertical axis of the graph, and one can find the respective number of persons needed for sampling. If the prevalence of undernourished children under five is 30% before intervention and the desired goal is to halve this number, i.e., to 15%, slightly fewer than 300 children should be investigated before and after the intervention.

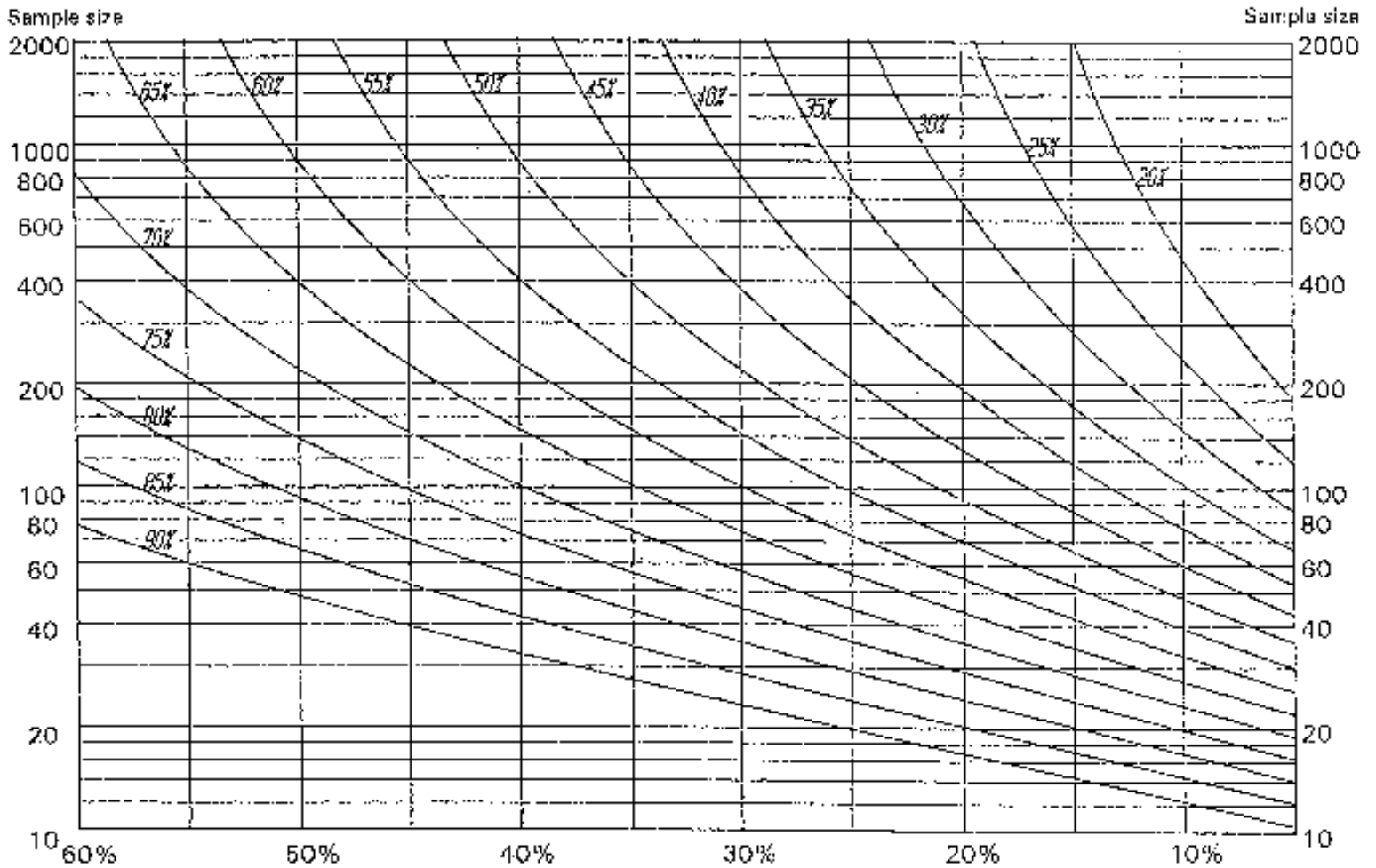


Figure 2. Expected prevalence after intervention (Sample size for the comparison of proportions, $a = 0.01$; $1-b = 0.05$!)

3.1.4.2 Implementation of sampling

Two methods are available for selecting the clusters to sample. The selection of the method depends on the availability of maps of the area.

1. If the map of a rural project area shows all villages, or if the city or urban map identifies districts, the sampling can take place using the grid method. A grid is placed over the map, and the resulting rectangles are numbered. The rectangles should be small enough that in only a few cases will more than one village or urban district fall within a rectangle. The specific clusters (rectangles) in which a survey is to be carried out are selected by a draw or by using a random number table (Appendix 6.5). The number of clusters (rectangles) necessary for a survey is determined by the overall sample size and the number of children

estimated to live in a typical village or urban district.

EXAMPLE:

If 500 children are to be surveyed and in each village there are at least 30 families with an average of 1.5 children under 6 years (i.e., 45 children/village), then $500/45 = 11$ clusters must be selected. If there is more than one village or urban district within a single rectangle, one village or urban district in that rectangle must be selected by draw. This can be done by drawing lots, throwing dice, or tossing a coin.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	34	35	36	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90

- Another option is to construct a table listing all clusters, e.g., the urban districts or the villages in the project area. In this table, the total number of inhabitants for each cluster should be included in a column. An additional column should tabulate the cumulative number of inhabitants in the project area (see table on next page). Using literature data or pilot study data, the percentage of the target group in the total population can be estimated.

EXAMPLE:

It is known that in developing countries the under-five age group of children generally makes up 18% to 22% of the total population. Consequently, the number of children in each cluster can be estimated. In the following table there are least 77 inhabitants per cluster (Mayama, the least populated cluster) or at least 15 children under five years of age. If a total of 300 children is to be surveyed, we can calculate that $300/15 = 20$ clusters need to be surveyed.

To decide which cluster villages should be surveyed, all villages can be assigned numbers and from these twenty can be selected at random. However, this does not consider the differing sizes of the clusters. Therefore, the following procedure is preferred:

EXAMPLE:

The total number of inhabitants in the survey area is divided by the selected number of clusters and the mean number of inhabitants is calculated (In the example from table 4: $99,756/20 = 4,988$). Now, a number below the mean is randomly selected from a table (e.g., 507). With this random number a series of numbers is constructed by addition of the mean to this randomly selected number and subsequently to each sum (in the example: 507, $507 + 4,988 = 5,495$; $5,495 + 4,988 = 10,483$; $10,483 + 4,988 = 15,471$, etc.). Using the second column of the cluster list (cumulative population) this series of numbers can be used to identify the villages to be surveyed, that is, all villages that against the selected cumulative number of inhabitants have the lowest difference from the numbers in the series.

Table 4. List of communities

Cluster or Community	Number of Inhabitants	Cumulative No. Inhabitants

Moutebe	1 363	1 363
Vouka	605	1 968
Missiele	926	2 894
Tofi	1 167	4 061
Simba	703	4 764
N'Zororo	491	5 255
Mungundou Sur	573	5 828
Manbangua	1 012	6 840
Boupanda	387	7 227
Youlandzambi	155	7 382
Biyamba	1 109	8 491
N'Zima	821	9 312
Mayama	77	9 389
Mouyamba	904	10 293
Bac Louesse	210	10 503
Boungoto	427	10 910
Dounguila	1 269	12 199
Mianga	1 101	13 300
Kanga	2 174	15 474
Ibeni	1 129	16 603
Popo	371	
...	...	
...	...	
		16 974
		...
		...
T o t a l		99 750

In our example the clusters to be surveyed are:

1. Moutebe
 2. N'Zororo
 3. Mouyamba
 4. Mianga
- etc.

After the individual clusters, i.e., urban districts or villages, are selected, the households within the clusters need to be selected. Again, either of the two methods described above can be used for selection of households.

If an accurate city map is available, in which all residential areas are shown, the grid method can be used. The size of the rectangle should be selected so that it contains about 4-8 houses. All rectangles are numbered and the numbers of the rectangles to be sampled are selected at random. In each of these areas (rectangle) one household with at least one child will be surveyed. If individual houses are shown on the city map, the houses in the sampling area should be numbered at random and assigned numbers in sequence starting at number 1. The survey team starts the survey at house 1. If there is no family with children under 5 years, they go on to house 2. If there is still no household with children under 5, the team continues to house 3 etc. When a family with at least one child under 5 is found, the survey is completed in that area and the survey team proceeds to the next sampling area.

If there is no city map, or the map is very unreliable in showing houses, the following option can be used: a central location is chosen in the selected area (intersection, marketplace, etc.), and a coin is tossed twice, once to select north/south and once for east/west, or a number between 1 and 4 is picked from a randomized number table (see chapter 6.5) to choose north/south and east/west. From the same table a number can then be selected between 1 and 25, and the survey will commence at the house corresponding to this number. From this house, sampling will be undertaken at the next 15 houses with children under five years. If the edge of the village is reached before there is the opportunity to visit 15 houses, one starts again in the central location to continue the investigation on the next street in the clockwise direction. A third possibility arises if there is a list of households with children in a village, the listed children can then be selected by draw.

This type of sampling can be undertaken when there is a **homogeneous target community**. If a survey has to be undertaken with a **heterogeneous community group**, however, clusters representing certain population groups are the basis of selection. In this way the specific nutritional conditions of that group can be determined. In this case, however, it is not possible to make a statement on the nutritional situation of the total population.

In rural areas village communities do not always understand why only some of their community should be surveyed. It may therefore be necessary to conduct the survey including all families, and consequently correspondingly fewer villages will be surveyed, or more time will be needed to complete the survey.

3.1.5 Training and supervising of survey personnel

Beyond generating information on the nutritional situation, the implementation of surveys on nutritional status also has a second important task. **The importance of nutritional problems as a major constraint of living conditions in developing countries should be emphasized by involving technicians and communities.**

The training of technical personnel for nutrition survey implementation carries a special importance beyond that of the survey itself.

F	Adequate time and funds should be made available for planning and implementing training.
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3.1.5.1. Job description of enumerators and supervisors

There are two distinct groups of technical personnel for conducting the survey:

- **enumerators** and
- **supervisors.**

Enumerators are in direct contact with the surveyed persons. They obtain data through interviews and measurements. For technical reasons related to the work, two persons usually work together as a survey team. In a baseline survey carried out as part of an overall socioeconomic survey, a third enumerator is sometimes included in the team, for example to record data on the agricultural situation. Time spent on the survey can be reduced through teamwork, and in addition the enumerators can help and check on one another.

Supervisors are responsible for the technical quality of the surveys for which either they or the survey teams under their charge are conducting. Furthermore, they function as a liaison between institutions with an interest in the survey and representatives of the target groups.

Knowledge of local government structures and sociocultural characteristics are prerequisites for effective coordination. Only if the supervisor has the trust of the target groups, their representatives, and local authorities, can the survey proceed as planned. Efforts should be made to draw survey personnel from the health sector, or from the agricultural or educational sectors. Thus, it is possible for the respective sectors to gain greater understanding of, and motivation for intervention measures.

If the survey teams are required to investigate families in their own homes, and the families are widely scattered over the project area, the supervisors will be able to oversee only a small number of survey teams. The assignment of survey teams to a supervisor must be done randomly. The randomized number tables can be used for this purpose (see Appendix 6.5).

A supervisor should be in charge of approximately four to no more than six survey teams.

The duties of a supervisor include advice and control of the accuracy of the survey data.

To reduce the incidence of error, the supervisor should check various measurements, such as the height and weight of the children, as well as check three to five answers on the survey questionnaire of one out of every ten or fifteen families.

If differences are evident between the data collected by the supervisor and those collected by the enumerators, then obviously the causes must be found and specific measures taken to prevent further discrepancies.

F	The supervisor should meet with all surveyors at least once a week during the survey implementation to discuss and exchange experiences.
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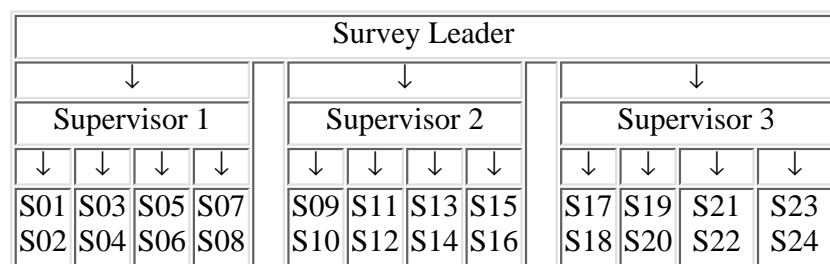
It is important to maintain constant feedback with representatives of the target community about problems arising during implementation in order to prevent failure and friction.

The organizational structure of a survey is presented in figure 3. The **survey leader** should be chosen from a sector in charge of the

nutritional situation of the population in that country. This is normally the health sector. The training workshop is carried out by the survey leader. The survey leader is responsible for hiring the supervisors, and the supervisors for hiring the survey teams. In smaller surveys, the survey leader may be able to undertake direct supervision of the survey teams, thus eliminating one organizational level. One or two additional persons are responsible for data entry into the computer. Data entry should occur during the implementation of the survey. This has the following advantages:

- time can be saved in the analysis of the survey;
- the quality of the questionnaires can be checked, and if necessary, the survey can be modified to avoid gathering unusable data;
- the completeness and accuracy of the finished forms can be rechecked, and inaccurate enumerators can be instructed accordingly.

Figure 3. Organizational chart of field personnel participating in a nutrition survey



Data entry personnel (S01 - S24: Enumerators)

3.1.5.2 Personnel recruitment

The progress of a survey depends just as much on human qualities as on the technical qualifications of the personnel taking part in the survey. **Completion of elementary education is a minimum requirement for an enumerator. An enumerator must have reading and writing capabilities, as well as the mastery of basic types of calculations. Previous work experience can replace the minimum formal educational requirements.**

Besides education and work experience, an accurate knowledge of the local language is required. People who speak the same language, know the local customs and are familiar with the problems of the target community will more easily win the confidence of the target groups necessary for conducting interviews. As far as possible, the enumerators should originate from the same sociogeographical and cultural area as the target groups. However, it is also possible that foreign enumerators are more accepted than local interviewers. Therefore, in each survey the possibility that distinctions such as religion, ancestry, caste or sex may influence the result of the survey has to be examined.

In all societies there are varying degrees of distinct roles for the sexes. **These distinctions have to be considered in the recruitment of enumerators. As the responsibility for household nutrition generally lies with women, it is recommended that women be engaged as nutritional enumerators.**

Personality attributes should be considered when selecting an enumerator. Therefore, it is important to study the personalities of the enumerators during the training program to identify potential problems. In addition, potential enumerators should be assessed in relation to the following easily recognizable attributes:

- **Motivation:** Only a motivated enumerator will work convincingly with the target groups and win their confidence. Motivation is influenced by the work itself and the leadership style of the surveying organization. A positive motivation can be expected if achievements by the enumerator are recognized by his colleagues and leaders, and also by the target groups.
- **Communication skills** For a survey to be conducted successfully, the enumerators must be able to maintain communication in the field, even under difficult conditions.
- **Reliability:** The results of the interview depend on the reliability of the enumerator and on the care taken in measurements and completion of the questionnaires.
- **Initiative:** The difficult working conditions of a survey require that an enumerator has initiative and self-reliant problem solving abilities.
- **Willingness to learn:** During the training program the future enumerator will become familiar with interview techniques, measurement techniques and forms of communication. He or she must be prepared to learn these subjects and then to apply them.
- **Physical strength:** Health and a robust physical constitution are requirements for enumerators as all will work under difficult climatic, topographical and hygienic conditions.
- **Mental health:** Work in poverty stricken or abandoned rural areas can be psychologically demanding. The work requires patience and a friendly nature as well as the ability to bear disappointments and frustrations.

These personal attributes are important requirements for an enumerator. Of course in practice, enumerators can rarely be found who possess all these attributes. Nevertheless, the training period should be used as an opportunity to examine them in the enumerators and to prevent hiring personnel with wholly unsuitable personalities.

The requirements set for enumerators apply also to supervisors, but also additional educational qualifications should be required. This could include education at a vocational school, or studies continued toward a specific goal after elementary education. Once again, successful previous work experience should be rated over formal education.

Finally, personnel engaged in a survey should also be motivated through an adequate level of remuneration.

3.1.5.3 Training of survey personnel

Enumerators must be trained intensively to carry out carefully the following tasks:

- **anthropometric measurements,**
- **clinical and biochemical diagnosis,**
- **interviewing using predetermined wording,**
- **completion of the questionnaires, and**
- **communication with the community.**

Enumerators in a particular region or sector should receive their training together. The training should be provided by the survey leader of the supervisors and enumerators in order to assure **the standardization of the survey.**

The training should stimulate interest through teaching aids. To achieve this, the following materials should be used:

- **Charts and diagrams** describing the various forms of malnutrition allow accurate and rapid transfer of information.
- **Audio recordings** taken during practice interviews provide the trainees with actual examples of the types of questions asked and allow detailed discussions of mistakes.

Enumerators should not treat the community as "second class citizens," but must see them as "partners." Without this perception, cooperation from the community will not be possible.

Patience is one of the most important qualities of an enumerator. As target groups are often not accustomed to being asked questions, interviewees can take a long time to answer, and the answers may be limited by the vocabulary of the interviewee and can be very ambiguous.

The communication between the "survey partners" will be enhanced if the enumerator looks at the interviewee with a friendly expression, uses encouraging words, and does not stare incessantly at the questionnaire.

Training content:

The first concern of the survey leader is to instill in the enumerators the **importance of their future activities.**

When the person in charge of training has made sure that the enumerators have grasped the importance of the survey for the subsequent program or project, the next step is to make the participants aware of the **inherent risks** of mistakes caused by:

- erroneous,
- incomplete, and
- inaccurate

measurements and completion of questionnaires. These could significantly alter the interpretation of the situation in the region and may result in selecting the wrong interventions. Consequently, a survey that does not reflect reality can impair the effectiveness of assistance rendered to the target group.

To assure standardization, the individual questions on the questionnaires should be asked using a consistent predetermined wording. This can be reinforced through practice with different interview partners during training. The other enumerators and the supervisor can then make critical observations of the dialogue and discuss its strengths and weaknesses. These exercises will introduce the enumerators to a variety of interview situations and help them to gain confidence in asking questions and in completing the questionnaires. The amount of time needed during an average survey can be estimated by timing the practice interview session. However, in a field study, it is necessary to allow additional time for the enumerator to establish contact with the target person.

Next the anthropometric measurements and investigation methods relevant to nutritional physiology (e.g., measurement of blood hemoglobin levels, examination for xerophthalmia and goiter) will be practiced, and the data entered on the questionnaires. At this point, there should be a knowledgeable person supervising the measuring in order to eliminate potential errors. Measurement of the same person by several enumerators can help to check for uniformity of measuring results.

F	Plenty of time must be made available for surveyors to receive proper training.
----------	--

A proposed schedule for the training of enumerators is shown on the next page. At the end of the training period, a pilot study must be carried out (see subchapter 3.1.6). Therefore, additional time has to be made available.

Adequate space and audiovisual materials are necessary for the training of survey teams.

Table 5. Proposed training schedule for enumerators

Day 1	Enumerators arrive, register and are briefed, etc.
Day 2	<p>Morning:</p> <p>Introductions between the enumerators and training personnel, time to become acquainted, introduction of the training program and discussion.</p> <p>Lecture on the general concept of the project, the survey objectives, and the consequences for the target groups and the entire project.</p> <p>Introduction of the survey plan.</p> <p>Afternoon:</p> <p>Introduction of the questionnaire.</p> <p>Step-by-step presentation and memorization of the individual questions (in the predetermined wording).</p> <p>Interview practice in pairs with survey colleagues (e.g., through role play) followed by discussion of positive and negative types of behavior during the interviews.</p>
Day 3	<p>Morning:</p> <p>Short lecture:</p> <ol style="list-style-type: none"> 1. Malnutrition and its consequences on the target group 2. Anthropometry - what for? <p>Demonstration of anthropometric measurement techniques</p> <p>Afternoon:</p> <p>Practice with anthropometric measurement techniques.</p> <p>Determination of intra- and inter-observer errors through repeated measurement of same individual at given intervals by both same and different enumerators</p> <p>Analysis of measurements with the enumerators, checking for errors, and discussion of any unclear points</p>
Day 4	<p>Morning:</p> <p>"General test" - completion of three questionnaires (including anthropometric measurements) with different survey partners</p> <p>Afternoon:</p> <p>Analysis of the surveys with the enumerators, checking for errors, and discussion of any unclear points.</p>
Day 5	<p>Payment of daily allowances.</p> <p>Departure.</p>

3.1.5.4 Procedure for the collection of information in a household

In the training session the following items should be emphasized:

- When a survey team visits a household the first time, a brief introduction should be made in which the enumerators
 - introduce themselves with their names and the name of their professional institution,
 - explain the purpose and the importance of the survey, and
 - ask for the necessary support from the household.
- Many questions are related to values and norms and may involve very personal matters. Therefore, the presence of another person beside the enumerators and the interviewee may be distracting and responses may be altered.
- Although it is important to stay on schedule with the survey, some interviewee may have difficulties hearing and understanding the questions. For the sake of accuracy it is then necessary to slow the interview and repeat the questions.
- At the end of the survey, the enumerators should ask the interviewee about their impression of the survey and should thank them for their support.

3.1.6 Pilot testing

Shortcomings and unforeseen factors are always discovered during a survey, despite careful planning. Such unforeseeable deficiencies can be considerably reduced by conducting a pilot survey.

Pilot testing must be conducted before any baseline survey.

The **pilot survey has the following objectives:**

- Training the enumerators.
- Testing the instruments to be used (e.g., questionnaires, measuring devices) for reliability.
- Estimating the incidence of nutritional problems in order to recheck the sample size (see section 3.1.4.1).
- Fine-tuning the scheduling and organizational planning of the main survey.
- Determining intra- and inter-observer errors, since it tells whether enumerators need more training and identifies error limits (see also chapter 4.6 and annex 6.7).
- Determining the mean weight of a child's clothing under circumstances where clothes cannot be removed either because of climate or local customs.

The benefits of a pilot study include:

- testing the variables for relevance (irrelevant variables must be deleted from the questionnaires, while new variables may be added to the questionnaires),
- checking the variables for cultural acceptance in the community,
- rechecking the survey type of each variable (question, observation, or measurement),
- transforming open-ended questions into closed form (creating answer categories; see sub-chapter 3.1.9),
- testing the wording of the questions (are they clearly understood by the interviewees),
- adapting the questions to the local language,
- rechecking the measuring devices, such as scales, height measuring devices, and devices for determination of blood levels, for usability and accuracy,
- defining the time required for data collection per family in order to estimate the total time required,
- discovering and correcting possible shortcomings in the enumerators,
- training the enumerator groups and the community in organizational coordination.

A pilot survey is conducted after the initial determination of sampling size, the drafting of the questionnaire, and the training of the enumerators. The pilot survey is the last action taken before the start of a baseline survey. It should be carried out under circumstances **as similar as possible** to those under which the main survey will be carried out. In particular, the pilot survey should be done in the same geographical area with the same population group a short time before the main survey.

A pilot survey should be conducted on about 2-5% of the households to be surveyed later. The households recorded in the pilot study may not be re-recorded during the main survey.

After the completion of the pilot survey, a final consultation is held with the enumerators. The aim of this discussion is to clarify any remaining obscure points and to reach an agreement on the final procedure and survey to be used.

Reproduction of the questionnaires can only take place after the final discussion on the experiences of the pilot survey.

3.1.7 Scheduling of a survey

The scheduling of the survey is subject to factors outside the control of the planning but which nevertheless have to be considered. In table 6, some circumstances are listed under which a survey needs more or less time.

Table 6. Factors influencing the time needed for a survey

Less time spent on the survey	More time spent on the survey
Nutrition-related project	Self-standing nutrition project
End of the project	Beginning of the project
Follow up survey	Baseline survey
Experienced survey team	Inexperienced survey team
Part of a socioeconomic survey	Isolated survey
Family travels to the enumerator	Enumerator travels to the family
Good transportation infrastructure	Poor transportation infrastructure
Closed village settlements and urban areas	Open village settlements and nomadic settlements
Functioning group structures	Non-functioning group structures
Time schedules not interrupted for religious or cultural reasons	Time schedules interrupted for religious or cultural reasons

The chronological progression of an isolated nutrition survey is presented in table 7. In this example, the schedule is based on the maximum time required for a purely nutrition project - estimated to be about 9 weeks (2 months). However, the time taken may be considerably less, depending on local circumstances. The search and study of literature, as well as further statistical analysis, which do not have to take place in the project area, are not included in this table.

Table 7. Example of scheduling of a baseline survey

ACTIVITIES	1	2	W 3	E 4	E 5	K 6	7	8	9

Review of scientific literature								
Review of reports from national and international organizations								
Preparation of the training program for the enumerators	#							
Gathering information at local institutions and from local persons	#	#	#	#	#	#	#	#
Collection of structural data	#							
Initial calculation of sampling size	#							
Design of questionnaires	#							
Organization of the survey								
Recruitment of enumerators		#						
Talks with target groups and representatives of local organizations and institutions		#						
First test of the questionnaire		#						
Training of the enumerators		#						
Preliminary study and determination of the final version of the questionnaires (pilot study)								
Final determination of the sample size			#					
Data collection in the communities					#			
Data entry into the computer					#			
Initial analysis of the survey					#			
Informing the target groups and technical personnel of the survey results						#		
More detailed analysis (analysis of causes and determinants)						#	#	#
								#

3.1.8 Resources needed

The following list is a checklist for quick reference to see if the necessary resources are in place for a nutrition survey. No quantities are given, as these depend on the sample size. The resources in parentheses are not essential, but they may be needed depending on the specific situation.

Personnel

- Survey leader
- (One supervisor per 4-5 survey teams)

- Enumerators (usually two enumerators per team)
- Driver
- 2 persons for data input and correction

Means of transportation

Equipment and supplies

- **For scheduling and geographical planning**, extensive map materials will be needed (maps, road maps, city maps, etc.)
- **Production of the questionnaires** will require the following:
 - Computer + printer
 - Paper, printing ink or tonerfor photocopying:
 - photocopy machine
 - toner, paper
 - Mimeographing: - mimeograph machine (!!!!)
- **Each survey team** of two should be provided with the following:
 - 1 weighing scale (e.g., UNIScale, UNICEF)
 - 1 anthropometer (length board for length measurement of infants, AHRTAG)
 - 1 microtoise measuring tape (UNICEF)
 - 1 tape for mid-upper-arm circumference measurement (UNICEF)
 - questionnaires
 - pens and pencils
- **For data processing** the following will be required:
 - Computer and printer
 - Software: Nutrition Baseline software and word processing program
 - (statistical program, e.g., SPSS for Windows, SAS)
 - (graphics program, e.g., Excel, Prism,...)
 - Diskettes, paper and printing ink or toner.

If it is necessary to determine the **prevalence of anemia**, (refer to section 3.2.10.1 for the danger of blood transmitted infections), the following equipment and materials will be required to measure hemoglobin levels:

- Field photometer for hemoglobin determination (e.g. Compur, Bayer)
- Test tubes
- Batteries
- Autoclick (e.g. Boehringer)
- Disposable lancets (e.g. Boehringer)
- Receptacle for used disposable lancets
- Protective gloves (e.g. latex, rubber, plastic).

3.1.9 Questionnaires

Despite all desires for standardization, **it is necessary for each survey to develop its own questionnaire** to be completed by the enumerators with data obtained from the field.

There are three distinct types of questionnaires:

1. Questionnaire for collecting individual data
2. Questionnaire for collecting household data
3. Questionnaire for collecting structural data (data at community level - village or city suburb, district level, etc.)

In addition to these, a special questionnaire is required for supervision purposes. In the Nutrition Baseline software only the questionnaire for individual and household data is created automatically.

Variables applying equally to individuals within a household, such as the size of the family or the amount of living space, should be recorded on a **separate** questionnaire for the family (household). Similarly, observable variables applying equally to all families in a village, such a climatic data, should **not** be recorded on a household questionnaire, but should be entered on a questionnaire prepared for a village or city suburb.

The questionnaires should be standardized to simplify their completion and subsequent use. For this purpose, the following rules should be explained on the following example of a page from a questionnaire (figure 4).

Figure 4. Example of a page from a questionnaire for a nutrition survey

number should be written on each page of the questionnaire. In this way the survey will be protected against accidental exchange of pages between households, and no two households will be given the same identification number (household number).

A household or family is defined as the group of people for whom food is prepared using the same cooking facilities, who eat together and who sleep under the same roof at least three times a week.

As only households with at least one child will be surveyed, each household number must be entered as well on the individual questionnaires before the survey begins, which will save some work during the survey. If a family has more than one child under five years, during the survey the corresponding household number must be entered on additional individual questionnaires (one questionnaire for each additional child). If more than one family lives together, but the families use separate cooking facilities, each family is assigned its own household number.

In some cultures, men may have several wives. If a husband has several wives with children, an additional variable, "family unit," must be included in the survey. Thus all family units with the same male head of family are assigned the same family unit number, but individual mothers are assigned unique household numbers.

Example:

Household number (Mother with cooking facilities)	Family unit (Father)
001	001
002	001
003	001
004	002
005	002
006	002
007	002
008	003
etc.	etc.

In summary, each page of a questionnaire must bear a household number to avoid accidental exchange during subsequent analysis.

3. **Each variable shall be assigned a sequential number (variable number).**
4. **The order of the variables should follow a logical sequence related to the topic and to the procedure of the data collection.** The survey should start with the questions and end with the measurements. At the end or the very beginning the observations may be carried out so that the interviewed person is not burdened with waiting.
5. **Within the individual or household questionnaires the order of the variables to be surveyed can be determined newly in each baseline survey.** Because each variable has a unique variable code (see point 18 below) there is no need to follow the order shown in the guidelines. However, a logical sequence of the questions should be maintained.
6. **A variable can be recorded as a response to a question, observation, measurement, or calculation.**

EXAMPLE: The age of a child can be ascertained by asking the mother during the interview or by reading a birth certificate. The data obtained will likely be more reliable in the case of reading the birth date from the birth certificate.

For standardization, the type of recording of each variable must be defined and stated after the number of variable.

Variables that result from calculations carried out during the data analysis by computer (e.g., persons per living room, z-scores, or BMI) do not appear in a questionnaire.

7. **The text of questions to be asked during the survey must be stated in full on the questionnaire, so that the enumerator has no doubts about the wording during the interview. This means that the questions on the questionnaire should be stated as briefly but as precisely as possible. The questions must be stated so that the answer is not obvious from the question (leading questions must be avoided).**

The local language of the target community often differs from the national language. **In these cases, the questions and answers in a questionnaire should be written in the language that the people of the target community use to communicate among themselves.** If the questions were initially written in the national language, the quality of the translation into the local language should be checked by reverse translation back into the national language.

8. Questions with sociological content are easier to handle with open questions which permit greater flexibility, and there is no risk of loss of information. However, using closed questions in a survey allows for faster and more objective data collection, particularly if a survey relies on several enumerators.

With closed questions, possible answers are predetermined during the pilot study, and therefore, there is the risk of loss of information. Nevertheless, using standardized questions with corresponding answer categories allows for a rapid and meaningful analysis of the entire data set, which outweighs the disadvantages of any possible loss of information. This is particularly true when several enumerators are used.

For these reasons, where the purpose of a nutrition survey is to identify problems and suggest solutions and not to carry out basic research, closed questions must be used.

9. **As for the questions, all possible responses are listed on the questionnaire. The answers must not be read by the interviewed person.**
10. **The response categories for closed questions shall be coded** (e.g., male = 1; female = 2). The answer categories on the questionnaire shall be completed with the corresponding code for each question. In cases of size measurements (such as height, age, weight) the appropriate unit (such as cm, months or kg) shall be stated on the questionnaire.
11. **On the right side of the questionnaire a field for each variable should be identified. The number of spaces in the field should correspond to the maximum number of digits in the anticipated response - either a code or a measurement.** The general organization of the fields on the right side of the questionnaire simplifies filling in the form and later reading the data for data entry. Codes of responses will be entered in these fields. For example, 3 fields should be used if body height (measured in cm) where the measurement is to be given to the nearest centimeter only.
12. **For ease of subsequent reading of the data, the fields should appear in vertical order as shown above, and not next to each other.**
13. For easier data analysis, **all response codes should be expressed as numbers.**
14. **The following response code numbers should be reserved:**
 - 7 or 77 when an answer is given which has not been provided for in the coding, it should be recorded as "other"**
 - 8 or 88 when the interviewed person answers "I don't know," or in the case of an observation when it was not possible to identify a clear symptom**
 - 9 or 99 when the interviewed person gives no answer or it was not possible to carry out an observation or measurement**
15. Several variables have the same responses independent where a survey will be carried out. Suggestions for responses and its corresponding code numbers are presented in the following chapter 3.2. **It is recommended to use these suggested codings.** This would allow that several studies can be analyzed easier cross-sectionally.
16. **All response code fields must be filled in.** This helps to determine whether an enumerator forgot a variable during the survey.
17. **There should be no additional response coding or other forms of recording during the survey, as**

- this adds considerably to the workload of data entry and the later analysis, and
- when several enumerators are engaged, it is impossible to maintain standardization.

However, it may be extremely valuable for the improvement of the survey procedure and the later data analysis if additional, qualitative observations are written down. For this purpose, all enumerators should have some additional sheets of paper where notes can be reported.

18. **Each variable must have its own, unique code name (variable code) that should consist of not more than 8 digits. The code name of each core variable is mentioned later in the description of the variables** (a list of all variable codes used here is presented in Appendix 6.2). Uniform variable codes are necessary for merging the data of different surveys

e.g., *Variable code:* GENDER

In contrast to the individual, household and structural questionnaires, the variable codes of the supervision questionnaires can be selected within each country since the reproducibility of the collected data should be calculated within each country separately.

19. **Some data needed for analysis are based on further calculation of variables.** For example, the body mass index is calculated from body stature and weight. As already mentioned, these variables do not appear in the questionnaire but will be

analyzed later during data processing automatically by the Nutrition Baseline software. However, it is also necessary to standardize the variable codes of these variables. These variables are marked in chapter 3.2 "Contents of a Survey" of these guidelines by square brackets [].

If for cultural or other reasons no accurate answer can be expected, the question should be dispensed with.

It is better to obtain a lesser amount of precise information than large amounts of imprecise information.

Samples of questionnaires can be produced automatically by the Nutrition Baseline software.

3.1.10 Ethical considerations

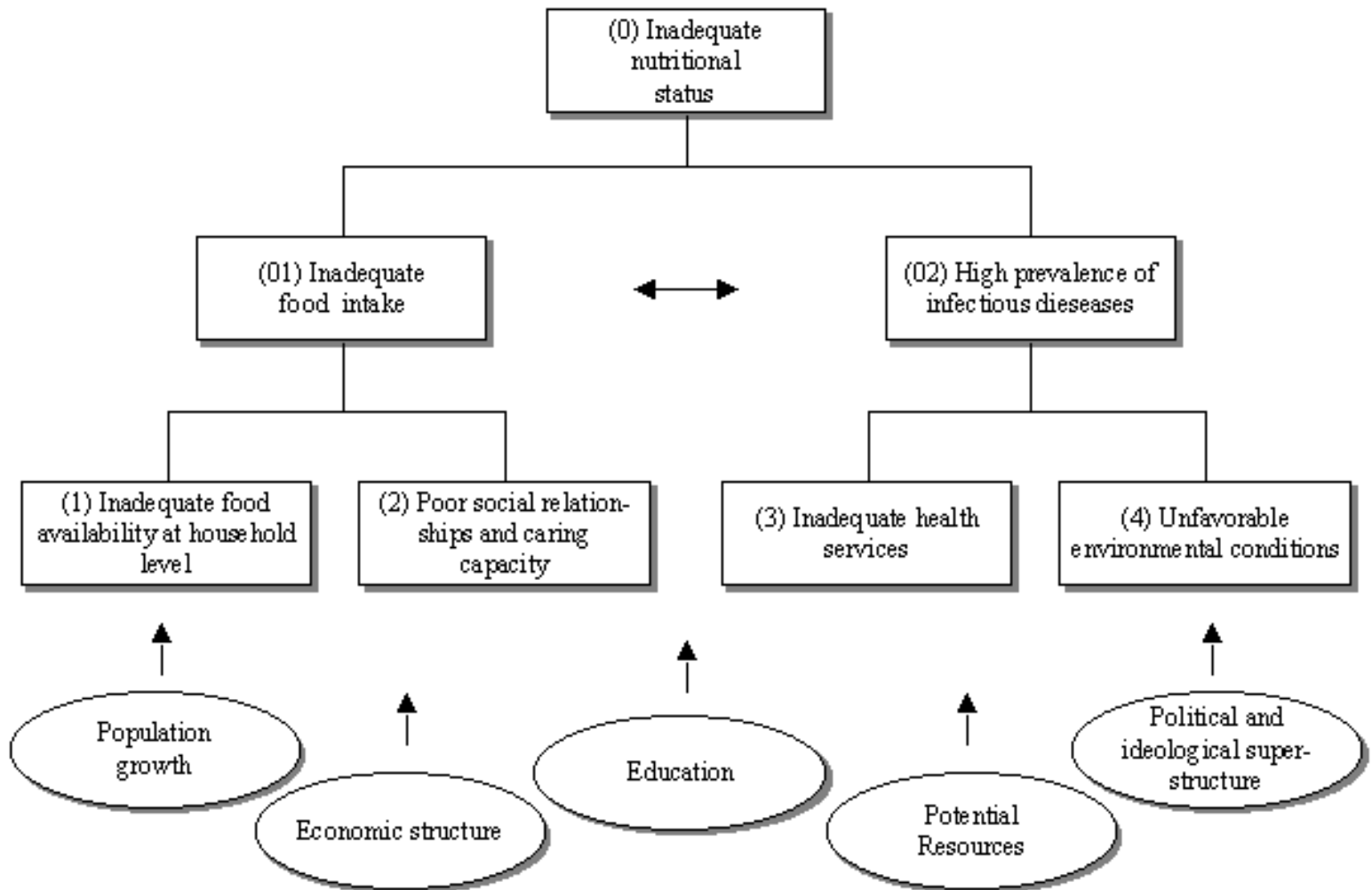
The implementation of surveys has ethical implications that need to be considered thoroughly as early as the planning stage. Although a baseline survey is intended to establish the basis for interventions to improve conditions and has no scientific research component, ethical implications must be considered. Ethics are strongly associated with cultural norms and values that may differ from society to society; however, there are some universal issues that have to be respected.

- **Ethical evaluation of survey design and procedures by local professional experts and community representatives**
- **Efficiency of the survey**
 - information is collected with the least burden on the expected respondent
 - survey expenditures are justifiable considering the resources available for later activities/ interventions
 - information collected does not duplicate information already available
 - information is wanted by communities and organizations dedicated to improving the nutritional and general basic needs situation
 - commitment that information is used later to improve the nutritional situation and living conditions of the target population
- **Information to all surveyed persons**
 - honest explanation of the survey purpose and procedure
 - description of benefits and any risks
 - offer to answer all inquiries
 - affirmation that persons and communities are free to withdraw consent and to discontinue participation without any form of prejudice
- **Informed consent**
 - individual consent
 - community agreement
- **Privacy and confidentiality of collected information**
 - collection of information in a way that makes it impossible or at least very hard to identify the respondent
 - destruction of questionnaires that contain information that could be used to identify the surveyed household or persons (after the survey)
 - instruction of all personnel working with data collected in the survey about their obligation and responsibility to respect the privacy of the respondents and the confidentiality of the data.
- **Authorship and property of a survey**
 - all information collected and analysis carried out is available to relevant institutions of the respective country
 - all main contributors to the survey are listed as authors and consensus on authorship is reached during the planning stage
 - all contributors and supporters who are not authors are mentioned in the acknowledgment

3.2 Contents of a survey

The contents of a nutrition survey are arranged according to the objectives as described in Chapter 1.2. In particular, if an objective of a project is to improve the nutritional status and living conditions, it is necessary to identify the causes of the nutritional problems in the population. Figure 5 shows the primary factors causing nutritional problems, all of which are based on secondary causes. It can be observed from the problem tree that a low nutrient intake (01) **and/or** a high prevalence of infectious and carrier-borne diseases (02) are responsible for a poor nutritional status (0). Similarly, both causes result from inadequate availability of food at the household level (1), poor social relationship and caring capacity (2), inadequate health services (3) and unfavorable environmental conditions (4).

Figure 5. Causal model of malnutrition



Generally, the probability of a cause being responsible for a poor nutritional condition becomes smaller as one progresses more deeply into the levels of causes, and as one moves further away from the core problem. Consequently, it makes little sense merely to follow one branch of the tree down to the details (e.g., supply of nutrients at the household level), if other branches remain neglected (e.g., health services or environmental conditions).

The content of the baseline survey is determined by the theoretical cause-effect-relationships of the problem tree. Care must be taken to ensure that all problems are considered before going on to the next lower level of causes.

This chapter will examine in detail the content of a nutrition survey. Nevertheless, **these are only guidelines, as the potential variables have to be examined for their relevance and necessity for each location.**

The wording of the sample questions is merely one possible way to obtain the data needed for each of the survey variables. **Obviously the development of questionnaires, the wording of questions and the selection of the answers must consider socioeconomic and cultural realities and should sound natural in the language used.** Local specialists and project staff can be of great assistance in this area.

The variables presented here are divided into two groups:

- 1.) Variables 1 - 40 (sub-chapters 3.2.1 - 3.2.8) that are related to the **household level**.
- 2.) Variables 41 - 82 (sub-chapters 3.2.9 - 3.2.12) that are related to the **individual level**.

3.2.1 Information on survey organization

Each questionnaire should begin with a cover page that helps to relate the questionnaire to the survey, the enumerators and the household.

1.) Household number

The household number should be filled into the questionnaire by the survey leader already before the forms are distributed to the survey teams as they leave to the households. This ensures that all visited household have only one unique household number.

Variable code: HOUSEHNO

2.) Survey team number

The survey team number should be filled into the questionnaire by the survey team at the begin of the survey before visiting the households.

Variable code: SURVTNO

3.) Supervisor number

In case of larger surveys in which the survey teams are coached by supervisors, the number of the corresponding supervisor should be filled in.

Variable code: SUPERVNO

4.) Date of survey

The date of survey should be filled in by the survey team before starting the data collection in the households. The date of the survey is needed to calculate the age of the surveyed children.

Variable code: SURVDATE

5.) Location of household (village, suburb)

The code of the village or suburb should be filled in before the survey team visits the households.

Variable code: HSHLOCAT

3.2.2 Demographic data of household

The demographic situation of a household is documented in a table. The table is used as an information source for several items. Once all relevant data have been extracted from the table, the page with the table must be destroyed to guarantee the anonymity of the respondent.

The name of each person who belongs to and is found in the household is written on the table. Although the names will not be used afterwards, providing each name helps remind the interviewee how many persons live in the household. Based on the name list, the number of persons living in the household will be determined later.

In various cultural situations the number of family members is not constant and the definition of who is attached to the household is different from our way of thinking. Temporary visitors in the household staying with the family may be considered family members. Also the father may work outside the home for several weeks at a time, and/or the children may leave home when very young. Furthermore, in some societies children who are not yet baptized would not be counted.

Definition: A household includes all persons:

- for whom meals are prepared using the same cooking facilities and who eat together at least once a day and
- who over the last 30 days have slept at least 3 nights per week under the same roof.

The second part of this definition may not be applicable in rural areas, as in agricultural societies other household arrangements may exist.

The age of different household members may contribute important information about possible causes of malnutrition. In particular, infants from mothers who are younger than 16 or older than 40 have a higher risk of low birth weight. Furthermore, birth frequencies less than two years are also associated with a higher risk of low birth weight.

The age of children, and also of adults, is often unknown (see section 3.2.9.2). In such societies, a suitable way of asking this question must be found, or the question must be left unanswered for all household members except the age of the mother and the children under five years.

The question whether the household member has earned money during the last three months applies particularly in urban areas, as in rural areas most family members take part in agricultural work and it is difficult to distinguish between working and non-working members. However, this question could be relevant for landless rural families.

No.	Name	Family status	Sex	Age (years)	Stay in the household	Earning money
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						

14						
15						
16						
17						
18						
19						
20						

Family status:

- 1) Father 4) Grand parents 7) Others
 2) Mother 5) Aunt/uncle 9) No answer
 3) Children

Gender:

- 1) Male 2) Female

Stay in household:

- 1) Stays permanently
 2) Does not stay permanently, but >8 months in the household
 3) Does not stay permanently, but 4-8 months in the household
 4) Does not stay permanently, but <4 months in the household
 5) Moved away but sends money
 8) Don't know
 9) No answer

Earning money:

- 1) Earned no money in the last 3 months
 2) Earned no regular income in the last 3 months
 3) Earned regular cash income in the last 3 months
 8) Don't know
 9) No answer

6.) Observation: How many persons live in the household?

Variable code: HSHMEMNO

The information is calculated from data in the household table.

7.) Observation: How many children under 5 years live in the household?

Variable code: NOCLDMEM

The information is calculated from data in the household table.

8.) Observation: Child number

Variable code: CHILDNO

The household table indicates the children under five years from whom the data for the individual questionnaire will be collected. In case that a household has more than one child younger than five years and information from all of these children shall be collected, the number of individual questionnaires should be attached to the household questionnaire. Each child of this age group should be indicated with a number starting from number 1. The numbers are then filled into the attached individual questionnaires corresponding to each child to be surveyed.

9.) Observation: Is the head of the household male or female?

1) Male 2) Female 9) No information

Variable code: HSHHDSEX

The information is collected from the household table.

10.) Observation: How old is the mother who lives in the household?

Variable code: AGEMOTHE

The answer is given in years and is collected from the household table.

11.) Observation: How old was the mother at the birth of the oldest child?

Variable code: AGEOLDCH

The information is calculated from data in the household table.

12.) Observation: How old was the mother at the birth of the youngest child?

Variable code: AGEYOUNG

The information is calculated from data in the household table.

13.) Observation: How many cases exist with birth spacing less than 2 years?

Variable code: BIRTHSPA

The information is calculated from data in the household table.

14.) Observation: How many household members earned money in the last 3 months?

Variable code: HSHMMNO

The information is collected from the household table.

15.) Observation: Has the mother earned money during the last 3 months?

1) Yes 2) No 9) No answer

Variable code: MOTHMONE

The information is collected from the household table.

3.2.3 Ranking of problems by the observed household

One function of the baseline survey is to assist in the identification of appropriate interventions to solve the problems faced by the target group. Consequently, the baseline survey should obtain a complete (holistic) description of reality. In addition to scientifically based observations and investigations, the perceptions of the target group are an important part of this reality.

F	The sustainability of the results of an intervention program is drastically reduced if the opinion of target groups is not included in the diagnosis of the living conditions and nutritional situation and in planning the intervention. For this reason, it is essential that the survey reflects the viewpoint of the community.
---	--

Questions concerning nutritional and health problems should gradually move from general aspects to specifics, thus enabling the ranking of different nutritional problems to be explored. This technique also prevents the interviewer from assuming that the interviewee has a particular nutritional problem.

The following problems can only function as examples and have to be changed according to each region. This requires an accurate knowledge of the local area through study and reports on the experiences of others.

No generally applicable rule can be given for obtaining a general assessment of the living situation during the interview. However, it has often been shown that this question should be asked later in the interview, because at the beginning of an interview the interviewee is often reluctant to express an opinion on these matters.

16.) Question: Which are the major problems in your daily life?

The respondent shall identify up to three main problems.

In rural areas:

Problems (not more than 3 items)	Answers
1) No or little land 2) Low yield from the land 3) Widely scattered fields 4) Little income 5) Poor living conditions 6) Disputes with neighbors 7) Educational problems for the children 8) Frequently ill 9) Little food 10) Poor or inadequate water supply 11) Inadequate energy supply (wood, electricity, etc.) 12) Other problems 13) No problems	

1) Yes 2) No

In urban areas:

Problems (not more than 3 items)	Answers
1) No or unclear right of residence 2) Unemployment or under-employment 3) Much time spent on getting to work 4) Little income 5) Poor living conditions 6) Disputes with neighbors 7) Educational problems for the children 8) Frequently ill 9) Little food 10) Poor or inadequate water supply 11) Inadequate energy supply (wood, electricity, etc.) 12) Other problems 13) No problems	

1) Yes 2) No

Before conducting the survey the relevant answers that can be expected in the survey area must be identified.

Variable codes:

1) PROBLE1 5) PROBLIVC 9) PROBFOOD
 2) PROBLE2 6) PROBDISP 10) PROBWATE
 3) PROBLE3 7) PROBEDUC 11) PROBENER
 4) PROBINCO 8) PROBILLN 12) PROBOTHE
 13) PROBNO

3.2.4 Socioeconomic household data

17.) Question: Who is mainly responsible for bringing up the children?

- 1) Mother
- 2) Father
- 3) Both, mother and father
- 4) Sister/brother
- 5) Grandmother/grandfather
- 6) Other relative
- 7) Other non-relative
- 9) No answer

Variable code: CARERESP

18.) Question: What occupation has the head of the household mainly engaged in during the last three months?

- 1) No occupation
- 2) On daily wages
- 3) Domestic servant
- 4) Industrial worker
- 5) Farmer
- 6) Fisherman
- 7) Craftsman
- 8) Dealer or trader
- 9) Salesperson
- 10) Civil servant
- 11) Military or police
- 77) Other
- 99) No answer

Variable code: OCCUPACI

In urban areas, there are often strict distinctions between occupations. If the head of the household has more than one occupation, the occupation category with which he/she most identifies should be entered into the questionnaire.

19.) Question: Were you born in this town/city or from which part of the country did you come?

Variable code: ORIGIN

This question is intended **primarily** for **urban areas**, where large ethnic and cultural differences in the community can exist due to a high migration rate. The question should also be asked in rural areas if there is a high migration rate from other areas in the country. Before conducting the survey, the possible answers must be identified.

20.) Question: To which ethnic (or religious) community do you belong?

Variable code: ETHNIREL

Before conducting the survey the possible answers must be identified

21.) Question: How much formal education have the parents had?

- 1) < 3 years of schooling (illiterate)
- 2) 3 - 5 years of schooling (can read and write)
- 3) 5 - 11 years (attended secondary school)
- 4) Higher education (> 11 years)

Father Mother

Variable code: EDUCFATH, EDUCMOTH

The UNESCO definition stipulates that a minimum of 3 years of uninterrupted schooling is required for a person to achieve a sustainable level of reading and writing ability.

22.) Question or observation: The walls of the room in which the children sleep are constructed of what material?

- 1) Timber
- 2) Mud
- 3) Stone
- 4) Brick
- 5) Pasteboard
- 6) Cement/concrete
- 7) Other
- 9) No answer

Variable code: WALL

The decision must be made before the survey whether this will be a question or an observation.

23.) Question or observation: How many bedrooms are there in the house or residence?

Variable code: NBEDROOM

24.) Calculation: How many persons on average sleep in one bedroom?

Variable code: PERSOBED

Total household members / bedroom

This variable shall not appear in the questionnaire.

25.) Question: From where was the household drinking water obtained yesterday?

- | | |
|----------------------------|----------------|
| 1) Own public water supply | 5) Well/spring |
| 2) Public supply outside | 6) River/canal |
| 3) Water traders | 7) Other |
| 4) Rain water | 9) No answer |

Variable code: WATER

26.) Question: Are there especially critical months when water is scarce?

In which month does it start?

In which month does it end?

- | | | |
|----------------------|--------------|----------------|
| 0) No supply problem | 5) May | 10) October |
| 1) January | 6) June | 11) November |
| 2) February | 7) July | 12) December |
| 3) March | 8) August | 88) Don't know |
| 4) April | 9) September | 99) No answer |

This information is used to fill in the chart below.

Month	Answer
January	
February	
March	
April	
May	
June	
July	
August	
September	
October	
November	
December	

Answer: 1) Yes 2) No

Variable code: WAJANUAR, WAFEBRUA, WAMARCH, WAAPRIL, WAMAY, WAJUNE, WAJULY, WAAUGUST, WASEPTEM, WAOCTOBE, WANOVBEMB, WADECEMB

27.) Question: How was sewage/human waste disposed of yesterday?

- | | |
|--|---------------|
| 1) Connection to a public
sewage system | 5) River/lake |
| 2) Latrine | 6) Sea |
| 3) Garden | 7) Other |
| 4) Field/woods | 8) Don't know |
| | 9) No answer |

Variable code: SEWAGE

28.) Question or observation: How was garbage/household waste disposed of yesterday?

- | | |
|------------------------------|-----------------------------------|
| 1) Public garbage collection | 2) Disposed of openly (street,..) |
| 3) Burned | 4) Buried |
| 7) Other | 9) No answer |

Variable code: GARBAGE

29.) Question or observation: What form of energy was used for cooking yesterday?

- | | |
|-------------------------|---------------------------|
| 1) Electricity | 2) Wood, bought |
| 3) Wood free collection | 4) Wood from own property |
| 5) Petroleum | 6) Dried animal manure |
| 7) Other | 9) No answer |

Variable code: ENERCOOK

30.) Question or observation: Does the house have electricity?

- 1) Yes, directly from the public supply
- 2) Yes, via a neighbor
- 3) No
- 7) Other
- 9) No answer

Variable code: ELECTRIC

The following questions are applicable in rural areas.

31.) Question: How large is your agricultural setting?

Variable code: FARMAREA

Size in hectares or local units. Experience shows that this question is not always accurately answered, as farmers are often apprehensive that the answers will be used by government offices for other purposes (e.g., tax assessment). In agricultural operations where a farmer raises livestock on his own land, the size of the pasturing land should also be asked.

32.) Question: What is the ownership status of the land?

- | | |
|--------------------------|---------------|
| 1) Own land | 7) Other |
| 2) Leased land | 8) Don't know |
| 3) Owned and leased land | 9) No answer |
| 4) Public land | |

Variable code: LANDOWN

33.) Question: Which are the most important crops you cultivate?

The table is completed to collect information on crop cultivation. Questions are asked on the four most important staple crops (e.g., wheat, rice, maize, potato) and their predominant use. The pilot study is used to identify the four crops and before the survey begins, the names and code numbers of the crops are entered in the first column. In the last column the number code of the predominant use is entered.

Cultivations	Use

- 1) For own consumption
- 2) For sale
- 3) Both of approximately equal importance
- 4) Not cultivated
- 9) No answer

Variable code: CROP1, CROP2, CROP3, CROP4

Each of the four surveyed main crops needs its own variable code. It is recommended to call them:

34.) Question: Which are the most important types of livestock that you raise?

A table is completed while obtaining data on raising livestock. Questions are asked concerning the four most important species of animals (e.g., buffalo, pig, goat) and their predominant uses. The pilot study is used to identify the animal species, and before the survey begins the animal species and code numbers are entered in the first column. The response code of the predominant use is then entered in the last column.

Animal species	Use

- 1) For own consumption
- 2) For sale
- 3) Both of approximately equal importance
- 4) Not raised
- 9) No answer

Variable code: ANIMAL1, ANIMAL2, ANIMAL3, ANIMAL4

Each of the four surveyed main livestock needs its own variable code. It is recommended to call them:

If there are other important agricultural products in the region (i.e., fruits, vegetables, trees, shrubs, fisheries etc) additional questions should enquire about the importance of these for the household.

3.2.5 Dietary pattern

Nutrient intake can be studied using several different methods; two commonly used ones are the weighing method and the 24 hour recall method. In the **weighing method**, dietary intake is determined by calculating the net amount of food and drink consumed for each person over a 24-hour period (the difference between the weight of the items offered to the

individual and the weight of the items left over). In the **24-hour recall method**, specially trained interviewers ascertain which foods and drinks have been consumed in the last 24 hours and the amount of each item consumed.

The nutrient intake from the food and drink consumed can then be calculated using nutrient value tables or more commonly now by using computer software packages. If the nutrient intake is compared to nutrient requirements (see chapter 6.4), it is then possible to hypothesize about the probable causes of nutritional problems. In the Nutrition Baseline software optionally a quantitative Food Recall is integrated which can also be used for the weighing method and the 24 hour recall. If the mean food intake for the mother and/or the child is entered the program calculates automatically the nutrient intake and the nutrient density for all nutrients which are selected in the main program.

Unfortunately, the weighing method and the 24-hour recall method are very time consuming and extensive training of the survey personnel is necessary. Also, in order to obtain representative data, many days of observations are required, particularly for some important nutrients (e.g., vitamin A). Additionally, the reproducibility of the data can also be affected in other ways, such as seasonal fluctuation in the availability of foods.

After considering the advantages and disadvantages, neither the weighing method nor the 24-hour recall method should be employed in this type of nutrition survey. **It is much more important that the frequency of nutrient intake be determined. This method does not allow to obtain an exact picture of the nutrient intake, but it is possible to derive qualitative statements on the potential nutritional problems within a household.**

The nutrient intake in the family can provide insight into the usual nutritional practices of the target community. This information is important if supplementary food or nutrients are necessary so that usual nutritional practices are considered as far as possible.

35.) Question: Which foods are eaten in your household?

Food sources	Frequency of Consumption
Staples (grains, tubers, legumes): Mixed or processed foods Snacks Meat (large livestock, e.g. cow, pig, sheep) Meat (small animals, e.g. poultry, rabbit) Fish, seafood Egg, egg products Milk, milk products Oils Plant fats Animal fats Sugars Fresh green leafy vegetables Other fresh vegetables Fruits	

- 0) Never
- 1) Strong seasonal fluctuations
- 2) Monthly, once
- 3) Monthly, more than once
- 4) Weekly, once
- 5) Weekly, more than once
- 6) Daily, once
- 7) Daily, more than once

Food items: Variable codes:

Starches (grain, tubers, legumes) STAPLE1, STAPLE2, STAPLE3, STAPLE4
 Pre-prepared food PREPARED, SNACKS
 Animal proteins MEATLARG, MEATSMAL, FISH, EGG, MILK

Energy foods (fat, oil, sugar) OIL, PLANTFAT, ANIMALFT, SUGAR
 Fruits and vegetables GREENVEG, OTHERVEG, FRUITS

The following questions provide information on the seasonal nature of food supplies and nutritional status. The nutritional condition of rural communities can vary widely during a year, especially if agricultural production is unevenly distributed for climatic reasons (e.g., large variations in rainfall distribution) and if storing food or earning supplementary income is not possible.

36.) Question: Are there especially critical months for food supplies?

In which month does it start?

In which month does it end?

- | | | |
|-----------------------|---------------|----------------|
| 00) No supply problem | 05) May | 10) October |
| 01) January | 06) June | 11) November |
| 02) February | 07) July | 12) December |
| 03) March | 08) August | 88) Don't know |
| 04) April | 09) September | 99) No answer |

This information is used later to fill in the chart below.

Month	Answer
January	
February	
March	
April	
May	
June	
July	
August	
September	
October	
November	
December	

Answer: 1) Yes 2) No

Variable codes: FOJANUAR, FOFEBRUA, FOMARCH, FOAPRIL, FOMAY, FOJUNE, FOJULY, FOAUGUST,

3.2.6 Nutrition intervention

This group of questions should provide information on existing nutrition intervention programs and on the efficiency of health services.

37.) Question: Has the household received supplementary food through a food program during the last four weeks?

1) Yes 2) No 9) No answer

Variable code: FOODAID

This question should only be asked in regions where food assistance or feeding programs have been carried out.

38.) Question: Has one or more of the children participated in a school feeding program during the last four weeks?

1) Yes 8) Don't know

2) No 9) No answer

Variable code: SCHOOLFD

This question should only be asked if a feeding program is conducted in schools.

3.2.7 Value and norms related to gender

39.) Question: If you were to have another child, would you like it to be a boy or a girl?

1) Boy 8) Don't know

2) Girl 9) No answer

3) Boy or girl, it does not matter

Variable code: GENDPREF

In some societies girls are valued less than boys, which may indicate the presence of gender discrimination.

3.2.8 Participation in social activities

40.) Question: During the last 7 days, how often have you frequented a meeting with more than 5 persons?

Variable code: SOCIALIF

In some communities a poor nutritional status is caused by poor social relationships. This question should give information about the social life in the community. The answer is given as frequency of participation of meetings.

3.2.9 Anthropometry

The use of anthropometric data for assessing the nutritional condition of community groups has been adopted internationally as a standard practice (World Health Organization (1983), Measuring Change in Nutritional Status, WHO, Geneva). This is based on the concept that an improperly nourished body is lighter or heavier than one provided with adequate nutrients. On the one hand these data can show that weight is too high or too low in relation to height, while on the other hand they can show that the genetic potential for height has not been attained.

Anthropometric indices can be used for all members of the community, i.e., children as well as adults. Although anthropometric data on the total population can give information on both present and past nutritional, ecological, and overall development status of the community under investigation, one usually focuses on the most vulnerable segments of the population: preschool children and, to a lesser extent, women of reproductive age.

To assess the nutritional status of preschool children, ideally both weight and height (length or stature) should be measured. The term length is used for children who cannot walk yet. Their height is measured lying down. One generally refers to stature from when children can and will stand alone, i.e. around 2 years of age onward. Without precise information on age, weight by itself is of little value, as it is highly age dependent. Therefore, weight can only be interpreted when age or height is known. When surveys are being carried out among communities, in which no records of

age, such as birth registration, baby welfare cards, family register, etc., are kept, it is essential that weight and height are measured. If height cannot be measured for the lack of a suitable instrument, mid-upper-arm-circumference (MUAC) should be measured.

If age is known, weight provides an excellent indicator of the child's nutritional status. With increasing age of the child, weight alone becomes progressively less sensitive in detecting undernutrition, since stunting, i.e., reduced linear growth, occurs with both chronically low food intakes and high (infectious) disease prevalence. A low age related weight (weight-for-age) may not necessarily spell danger, if the child is also short, suggesting chronic undernutrition whereby the weight may be physiologically adequate for the height of that given child, i.e., its body composition is "normal." There is evidence to suggest that a population with weight-for-age of 80% or more of the NCHS median shows only little if any association with functional disability, provided that no nutritional deficiency such as vitamin A, iodine or iron deficiency prevails.

A low weight-for-age may also be a reflection of temporary loss of fluid, such as resulting from diarrheal disease (DD), or of a combination of DD and undernutrition. When one carries out a cross-sectional survey, it is very difficult to assess how much of the low weight is due to low body tissue content caused by low energy intake and how much to loss of fluid. Considering that at any given time approximately 6% of children have diarrheal disease and that as many as 20-30%, or even more, may have suffered from a DD episode within the last seven days, the plotted weights-for-ages of a group of preschool children may in fact represent a somewhat grimmer situation, especially if the survey was carried out at the peak of the diarrheal season.

Age related height (height-for-age) alone tends to be a poor indicator of nutritional status in the very young. The older the child, the better the child reflects the combined effects of infectious disease prevalence and undernutrition on linear growth. Since, however, in an unhygienic environment, where multiple and repeated infectious are the rule, the child may have little chance to catch up on its (linear) growth deficit, height-for-age says little, if anything about the current nutritional status and whether the child is at acute risk of disease or death from malnutrition. A low height-for-age tells us only that in the past the child either has had less to eat than his/her physiological state required, i.e., suffered from chronic food shortage, or has been subjected to a high infectious disease prevalence, or both. Therefore, a low height-for-age does not necessarily indicate a disease state. It may, for instance, indicate that growth has adapted physiologically to the prevailing situation, i.e., by slowing down. A small-for-age child may be perfectly healthy and have the appropriate body composition in terms of its weight-for-height, although it appears to be malnourished both from its weight-for-age and height-for-age.

To assess nutritional status, it is therefore necessary to find out:

- **weight,**
- **height**
- **gender,** and
- **in the case of a child, age.**

3.2.9.1 Gender

41.) *Question* or *observation*: Is the child a boy or a girl?

1) Boy 2) Girl

Variable code: SEX

3.2.9.2 Age

42.) *Question* or *observation*: When was the child born?

Variable code: BIRTHDAT Day/Month/Year

In countries in which the birth of children is registered, there is normally no difficulty in determining their age. To confirm age, in certain situations an enumerator should ask to see a baptismal or birth certificate or a clinic registration card. If the exact date of birth is not known, the month of birth can be estimated from a preestablished local "calendar of events." In agrarian societies, established festivals or agricultural events (harvesting of a particular fruit, bad weather, etc.) can be used to fix points in time. In urban areas, public holidays (e.g., national holidays) or political events (e.g., elections) can also be useful.

The age of a child has to be known or estimated in months in order to calculate the anthropometric indices.

To do this, the precise age of the child on the day of the survey must be acquired. There are often problems in this process, and consequently it is necessary to agree upon established international regulations for the calculation of age.

A child has fully ended the first month of his life on the first day of the following month (month 1). In the period of half a month before and after the completion of the first month (i.e., in the case of a 30-day month, from 16 to 45 days after birth) the child is one month old.

If for example a child were born on February 24, 1989, the child's age would be 5 months if it were visited between July 9, 1989 (9.Jul) and including August 8, 1989 (9.Aug).

As in practice errors inevitably slip into the calculation of age, it is recommended that the date of birth be asked. If the birthdate is known the Nutrition Baseline software calculates automatically the age in months. These data can also be used to check the mother's knowledge of the age of the child.

43.) Calculation: [Age of the child]

Variable code: AGE

3.2.9.3 Weight

44.) Measurement: Weight of the child (00.1 kg)

Variable code: WEIGHT

The weight of children under six years of age is usually measured with a spring scale (figure 6). The prevailing first choice for this is the "Salter spring scale" (Model 235 PBW). This scale can be ordered through UNICEF (stock no.: 01-455-50, *UNICEF Procurement and Assembly Centre (UNIPAC), UNICEF PLADS, Freeport, DK-2100 Copenhagen O, Denmark*)

This scale can measure to the nearest 100 g the weight of children up to 25 kg. The child is weighed in a specially cut sack attached to the end of the spring scale. This model is light and easily transportable.

Figure 6. Spring scale for weighing small children (Salter spring scale)



Another more modern scale is the UNICEF scale model 890 produced by SECA® which is a digital, solar energy operated scale with a range from 2 to 150 kg in graduations of 100 g. The scale can be ordered from UNICEF (stock no.: 01-410-00).³ The scale is powered by long-lasting lithium batteries. These will complete at least one million weighing cycles, or 400 weighings every working day for a minimum of ten years. The batteries and the electronics are in a sealed unit to withstand better humidity, heat, and dust. Additionally, the scale has a solar cell that is used only to turn the scale on and to tare the scale.

The advantages of this scale are the readability of the measurement and the ability to weigh infants and small children together with their mothers. However, the child must weigh at least 2 kg. First, the mother is weighed alone on the scale, then the automatic tare button is pressed. The child is then weighed in the mother's arms. It is important that the mother holds the child in her arms while standing in an upright position on the scale. To ensure that the mother will remain in the

same position, it is recommended that the shape of two feet be drawn on the rubber mat of the scale.

The UNICEF Scale 890 is not a medically calibrated scale. It can give variations of over 100 g. Medically calibrated digital scales are much more difficult to use and more expensive and are out of the question for use in surveys. As these calibrations are set in relation to measured weights, the indicated weight can be corrected by means of calculation.

The scale weighs approximately 3-4 kg and should not be stored or transported at temperature of below 0°C or above 45°C and protected against excess humidity or wetness.

1. **In preparing for weighing, the scale should be turned on by covering the solar cell for less than one second. The display should show 188.8 first, and then 0.0.**
2. **Now the mother can step on the scale and in case the weight of the mother should be noted the measurement can be taken from the display. Care should be taken that the solar cell is not covered by a foot or a long rope of the mother.**
3. **For the weight measurement of the child the solar cell should be covered again for less than a second while the mother is still standing still on the scale. The display will read again 0.0. The mother can get off the scale the scale to get the child or the child can be handed over to the mother. In case the mother gets off the scale the display shows --,-. After the mother steps back onto the scale and holds the baby, only the weight of the infant will be displayed.**
4. **In case another baby should be weight with the same mother (or helper), the infant be handed back and another child can be weighed without taring the scale, since the weight of the adult has been memorized automatically. If another mother (or helper) is standing on the scale, the solar cell has to be covered again for less than a second for taring.**

Note: Scales can go out of adjustment during a survey. Therefore, the scale should be checked routinely, preferably at the beginning of each day. First, check the zero setting (the weight reading without any load applied) and then weigh a bucket of a known weight filled with exactly 10 L of water.

Care should be taken that during weighing the child wears no shoes and as little clothing as possible. Sometimes, however, a child must wear certain items of clothing for climatic or cultural reasons. In these cases, the weight of the clothing should be deducted from the measured weight. The average weight of clothing worn by children should be established during the pilot study. The weight is recorded to the nearest 0.1 kg.

Following the procedures outlined earlier, the infant is weighed together with his/her mother. The **weight of the mother**, when put into relation with her height, can be a valuable additional source of information on the social situation of women in the project area, as well as for determining the causes of malnutrition in small children. Women living in extreme poverty, underfed, frequently ill, and poorly educated, indicate a poor nutritional situation. Furthermore, underweight mothers are at high risk of giving birth to underweight babies (< 2500 g), which in turn carries a high risk of permanent poor anthropometric data for the child.

To **assess the social situation of women in the project area**, it is desirable to record the weight of the mother. The weight is recorded to the nearest 0.1 kg.

45.) **Measurement: Weight of the mother (000.1 kg)**

Variable code: MOWEIGHT

46.) **Question: Is the mother pregnant?**

- 0) No 5) Yes, 8 months
 1) Yes, 0-2 months 6) Yes, 9 months
 2) Yes, 3-5 months 8) Don't know
 3) Yes, 6 months 9) No answer
 4) Yes, 7 months

Variable code: PREGNANT

3.2.9.4 Height

47.) **Measurement: Height of the child (cm).**

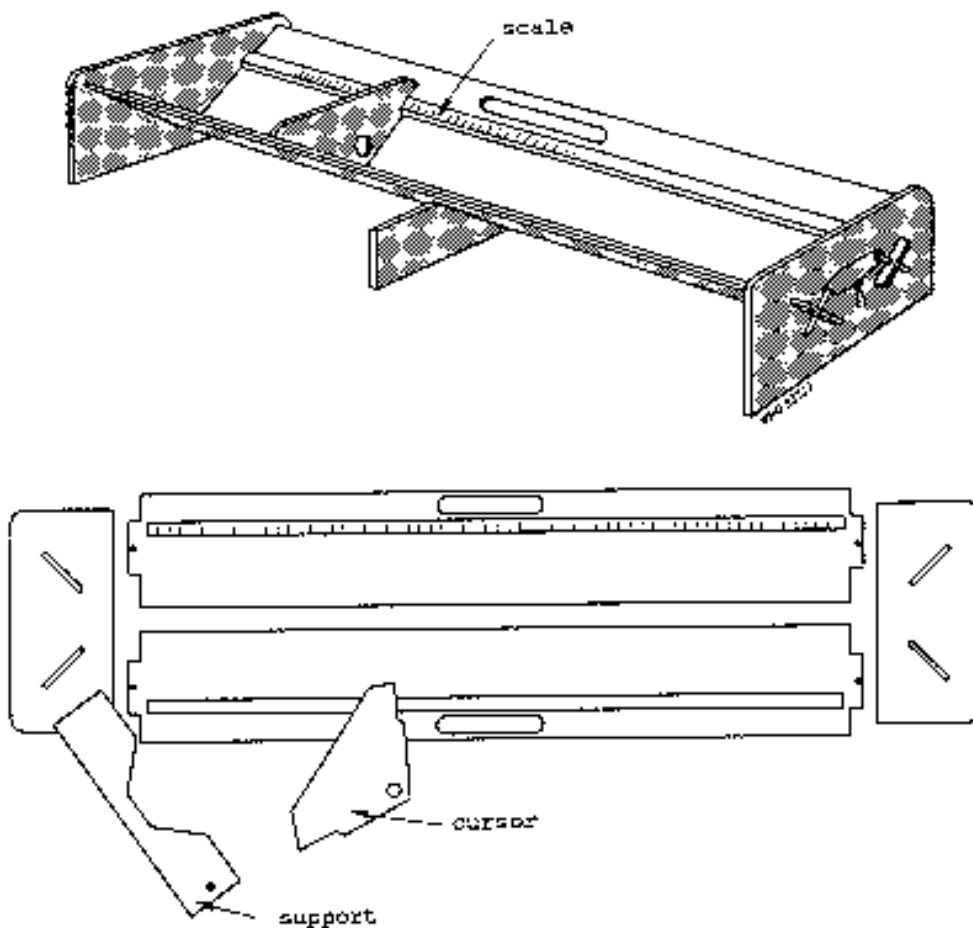
Variable code: HEIGHT

Measurement of height (length or stature) requires somewhat more effort than that of weight. Children under two years of age (i.e., up to and including 23 months) are measured in a lying position. For length measurements, a specialized wooden device ("anthropometer") should be made by a cabinet maker. An example of a device for this purpose developed by the Appropriate Health Resources and Technologies Action Group, Ltd. (AHRTAG, 85 Marylebone High Street, London, W1M 3DE England) for the WHO is illustrated in figure 7. Another option offers the "Rollametre" of the Child Growth Foundation (Raven Equipment Limited, Unit 4, Ford Farm Industrial Complex, Braintree Road, Dunmow, Essex, CM6 1HU, England)

In some studies mothers have refused to have the length of their children measured because they associate the anthropometer with a child's coffin. In these cases, success has been achieved by painting or pasting colorful flowers or animals on the wooden components.

The child is placed on its back between the slanting sides. The head should be placed so that it is against the top end. The knees should be gently pushed down by a helper. The cursor is then moved toward the child until it presses softly against the soles of the child's feet and the feet are at right angles to the legs. The length is then read in centimeters.

Figure 7. Anthropometer for the length measurement of children under two years of age.



If the child is over two years of age, stature is measured in a standing position. The child stands without shoes on a level floor. As shown in figure 8, it is recommended that during measuring the child leans with its back against a wall. The legs are placed against each other, as also are the heels. The buttocks, shoulder blades and head should rest against the wall. The child should look straight ahead so that an imaginary plane that would connect the eyes and ears are parallel to the floor. The arms hang loosely by the sides. The best instrument for stature measurement is the microtoise. The microtoise has to be fixed on a straight wall precisely 2.00 m above a flat floor.

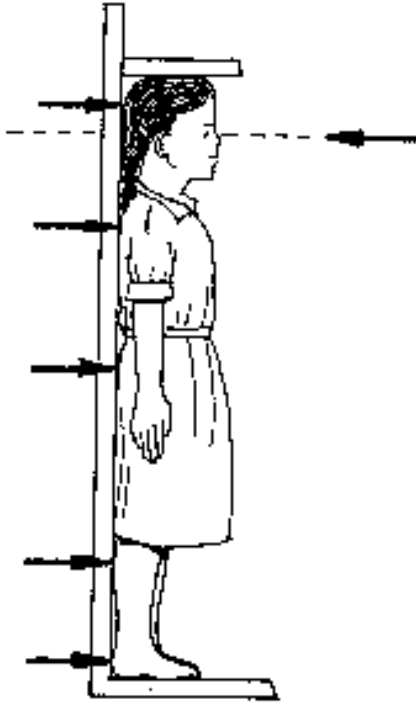
The stature measurement is taken with a Stanley-Mabo "Microtoise" that can be purchased by UNICEF (stock no.: 01-144-00).³

A wooden rule or a measuring tape (preferable a tape made out of fiberglass) is placed against the wall.

Measuring tapes are sometimes calibrated in inches and centimeters on the same side. These can be confusing during measurement.

A wooden or metal right angle is employed in measuring. This instrument is placed lengthwise against the measuring tape on the wall and is pressed gently against the head so that the stature can be read on the measuring tape in cm.

Figure 8. Stature measurement for children aged two years and older.



The Z-scores of the following anthropometric indices are calculated automatically with the Nutrition Baseline software. The principle of these indices are explained in chapter 4.2.

48.) Calculation: [Z-score height-for-age]

Variable code: HFA

This variable shall not appear in the questionnaire

49.) Calculation: [Z-score weight-for-height]

Variable code: WFH

This variable shall not appear in the questionnaire

50.) Calculation: [Z-score weight-for-age]

Variable code: WFA

This variable shall not appear in the questionnaire

If the mother was weighed, her height should also be obtained. The same rules apply for measuring the **height of a mother** as for children able to stand.

51.) Measurement: Height of the mother (cm).

Variable code: MOHEIGHT

52.) Calculation: [Body mass index of mothers]

Variable code: BMI

Body weight of the mother (kg) / Body stature of the mother (m)²

This variable is calculated automatically by the Nutrition Baseline software and shall not appear in the questionnaire

3.2.9.5 Mid-Upper-Arm-Circumference (MUAC)

For the measurement of the mid-upper-arm-circumference (MUAC) a special slotted "insertion" tape is used (figure 9). This tape can be purchased from UNICEF (stock no.: 01-456-00).

The best position for the enumerator measuring MUAC is sitting because the enumerator's eyes are at the level of the measurement. Before the measurement the mother should remove any clothing that covers the child's left arm. During the measurement the child can be held by the mother.

According to figure 10, the measurement of MUAC has to be taken at the middle of the left upper arm. Therefore, the enumerator must first identify the tip of the shoulder ¹, and the tip of the elbow ^f and mark the midpoint between the two tips. The child should bend its elbow to a right angle Once the tip of shoulder has been located the arm circumference "insertion" tape should be placed on the top of the tip at zero which is indicated by two arrows ,, . The tape should then be pulled down past the tip of the elbow and the number at the tip of the elbow should be read to the nearest centimeter The midpoint of the upper arm is determined by dividing this number by two. The midpoint should be marked on the skin of the child before removing the tape from the arm † .

Instead of the tape a string can be used for the identification of the midpoint. After the identification of the two tips one end of a string is fixed by one hand on the tip of the shoulder. With the other hand the string is pulled down to the tip of the elbow. Once the distance has been identified, the two point on the string will be brought together on the tip of the shoulder and held with the hand already holding one end of the string. The end of the doubled string is brought to the middle arm and marks the midpoint.

For the measurement of the circumference, the left arm needs to be straightened. The tape should be wrapped around the arm at the midpoint with its numbers right side up. It is important that the tape is flat around the skin † and neither too tight so that it notches the skin ^ nor too loose so that the tape loses its contact with the skin %.

When the tape is in the correct position on the arm with the correct tension, the measurement can be read to the nearest 0.1 cm and recorded into the questionnaire.

53.) *Measurement: MUAC of the child (00.1 cm)*

Variable code: MUAC

Figure 9. Tape for the measurement of the mid-upper-arm-circumference

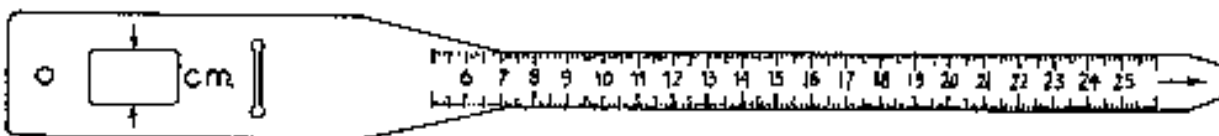
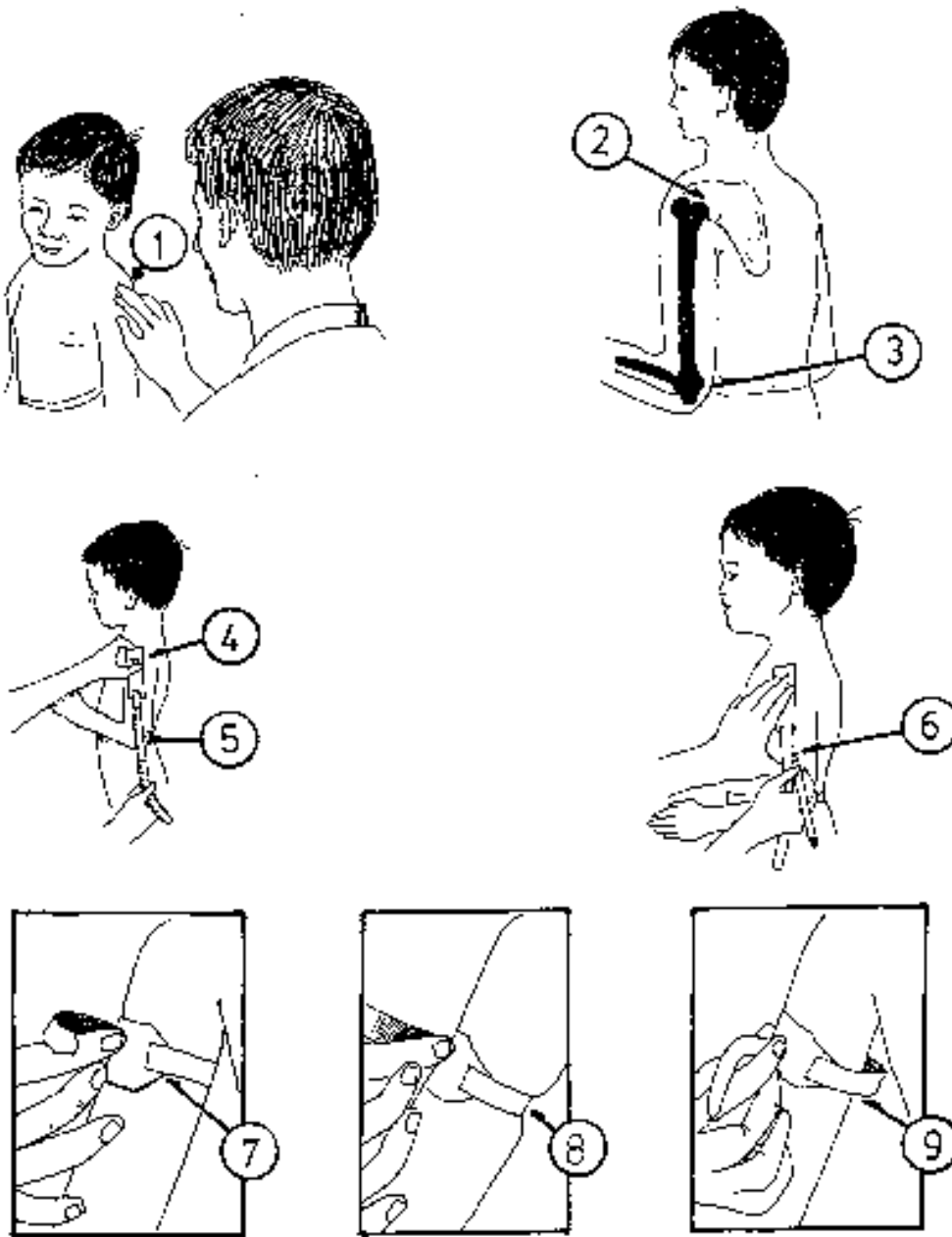


Figure 10. Mid-upper-arm-circumference measurement for children



3.2.10 Morbidity information

A child's anthropometric data reflects the overall nutritional condition. In addition the possible presence of nutrition-related diseases with specific symptoms should be investigated (e.g., anemia, vitamin A deficiency, iodine deficiency).

If a person is identified as ill or there is reason to suspect illness, assistance should be provided. The mother, or the person responsible in case of illness, should be advised to visit the nearest health post or health assistant.

3.2.10.1 Anemia

One consequence of reduced iron intake is reduced levels of red blood cells (erythrocytes) in the blood. The erythrocytes are responsible for the transportation of oxygen. The medical term for erythrocyte (Ery) deficiency is "anemia." Iron deficiency is detected by the red blood cell count or the concentration of the oxygen binding molecules of hemoglobin (Hb) in the blood.

Anemia leads to a reduced degree of physical activity in an individual and increases his/her vulnerability to infection.

To diagnose iron deficiency, it is necessary to take blood. The worldwide spread of the immune-deficiency disease AIDS has brought the risk of infection by blood transmitted diseases when taking blood to the forefront of public attention.

Before deciding to take blood samples in a baseline survey, it is necessary to weigh carefully the risk of infection. This must be done in cooperation with the local health authorities.

If in the local setting, where safety cannot be assured, it is better to skip taking blood as the risk of infection, especially with HIV or hepatitis, is too high.

If the answer to any of the following questions is "no" or "don't know," blood should **not** be taken!

- Automatic finger prick is available
- Disposable lancets are available for every single individual to be sampled
- The use of disposable lancets is being supervised
- At least three pairs of water- and airtight protective (plastic or latex) gloves are available for each individual taking blood
- Water- and airtight protective gloves are checked regularly before beginning blood sampling.

Taking blood samples is always a critical point in a survey. It is associated with pain and crying. Most people have a natural aversion to the sight of blood. It is necessary to give a participant an understandable explanation why blood samples are needed.

Before taking the blood sample, the child should be kept on the lap of his/her mother or laid down and his sight turned away from his fingers. The blood sample should not be taken from the fingertip but from the side, as there are considerably more nerves in the fingertip and therefore more pain is felt at this location. An automatic finger prick apparatus should be used for the following reasons:

- the risk of communicable diseases is reduced, since the lancet need not be touched after the prick,
- the velocity of prick is fast and smooth and therefore less painful,
- the depth of penetration of the lancet into the finger is more uniform and therefore the amount of confounding tissue water is less variable.

In the field the Autoclix® or the newer Softclix® apparatus has proved its reliability (*Boehringer Mannheim GmbH, Germany*). Packages of 200 sterile lancets can be purchased.

If despite all explanations the mother refuses to allow blood to be taken, this decision must be respected and no blood should be taken. In these cases **999** is entered into the code field.

The most exact method of measuring the hemoglobin concentration in the blood is by photometry. There are various quick test systems for this purpose.

The Compur® Minilab 1/2/3/ Photometer Systems enables the Hb concentration and Ery content in blood to be measured quickly, easily and accurately in the field (*Bayer Diagnostic GmbH, Weißenseestraße 101, D-81539 München, Germany*). With the Minilab 1 and 2 systems concentrations of other blood constituents, such as glucose (Gluc) and bilirubin (Bili), can also be measured. Each version of the equipment has built-in programs for the methods to obtain the results for Hb, Ery, Gluc and Bili and is calibrated by the respective Instant M End-test Cuvettes from Bayer Diagnostic + Electronic. The results are given in units and mass concentrations, which can be self-selected by the user.

The equipment is powered by either electricity (220 V - 50/60 Hz: Article No. 608925; 110 V - 50/60 Hz: Article No. 608990) or heavy duty 1.5 volt batteries. The battery power supply allows field use. The value is recorded in units of g/L.

54.) Measurement: The serum hemoglobin concentration of the child. g/L

Variable code: HEMOGLCH in case of hemoglobin measurement of the child

HEMOGLMO in case of hemoglobin measurement of the mother

With the Minilab equipment, the Hb concentration is determined using the hemoglobin-cyanide method. To do this, the INSTANT M (40 complete tests) quick test Article No. 605749 must be used.

If the Compur rapid test is used, the Ery count can also be reported, and thus more information on the cause of anemia is obtained. Otherwise, a separate erythrocyte measurement is not recommended.

3.2.10.2 Vitamin A deficiency

The most common vitamin deficiency in developing countries is that of vitamin A. This deficiency is responsible for stunted growth, greater risk of infection, various skin and eye diseases and can also lead to blindness.

Unfortunately it is currently possible to detect vitamin A deficiency at an early stage only by using expensive biochemical analysis techniques. These methods of analysis have no place in routine investigations. Consequently, it is necessary to base observations on indirect indications and signs of extreme vitamin A deficiency.

Studies have shown that the existence of a commonly used word for night blindness and the extent to which it is known in a community can indicate the presence of vitamin A deficiency. The first step is to find out whether there is a specific word for night blindness about which it is possible to ask a question.

55.) Question: Does your child stumble unusually often or have difficulties seeing or distinguishing objects at dusk or dawn?

1) Yes 8) Don't know, not sure

2) No 9) No answer

Variable code: NIGHTBLI

3.2.10.3 Iodine deficiency diseases (IDD)

Another far more widespread micronutrient deficiency is iodine deficiency. It can lead to retarded mental development and cretinism.

Iodine deficiency is most easily recognized by an enlarged thyroid gland, but not every case of an enlargement can be traced to iodine deficiency. If there are many persons with swollen thyroid glands in a certain area, however, it can be concluded that there is an endemic iodine deficiency.

Since it is difficult to diagnose enlargement of a thyroid gland in small children, mothers or older schoolchildren should be checked for goiter in order to obtain information about the prevalence of possible iodine deficiency in the surveyed area.

56.) Observation: Does the mother have a visible enlarged thyroid gland or one that can be felt?

1) Yes, visibly enlarged (Grade 2) 8) Don't know, not sure

2) Yes, palpable (Grade 1) 9) No observation made

3) No (Grade 0)

The simplified classification of goiter consists of three grades:

- Grade 0: No (palpable or)* visible goiter.
- Grade 1*: A mass in the neck that is consistent with an enlarged thyroid that is palpable but not visible when the neck is in the normal position. It moves upward in the neck as the subject swallows. Nodular alternation(s) can occur even when the thyroid is not visibly enlarged.
- Grade 2: A swelling in the neck that is visible when the neck is in a normal position and is consistent with an enlarged thyroid when the neck is palpated.

* Mothers' thyroid should only be palpated by experienced personnel. Otherwise, thyroid gland changes should be controlled visually.

Variable code: MOGOITRE

In several countries it has been proven that IDD disappears as a public health problem if iodization of salt is carried out adequately. Therefore, the quality of the salt is a valid, simple, indirect indicator about IDD situation in the area. The next two variables are dealing with salt quality in the household.

57.) Observation: Could you please show me which kind of salt you use currently in cooking and as table salt?

- | | |
|--|-------------------------------|
| 1) Packaged iodized salt | 3) Coarse, rock or brick salt |
| 2) Packaged salt, without label about iodization | 8) Don't know, not sure |
| | 9) No observation made |

Variable code: SALTYPE

The presence of iodine in salt can be easily monitored using a rapid-test kit. Details about the availability of the rapid-test kits may be obtained from UNICEF⁶ or local authorities of Ministry of Health. The observer places one or two drops of the solution on a small salt sample (one teaspoon is adequate). The intensity of the blue color which develops indicates the salt iodine level. However, most of the test kits can detect the presence of iodine only. The expiration date of the test-kits should be checked.

58.) Measurement: Presence of iodine in tested sample

- | | |
|-----------------------------|-------------------------|
| 1) No color change | 8) Don't know, not sure |
| 2) Blue color change occurs | 9) No observation made |

Variable code: SALTIOD

3.2.10.4 Diarrheal diseases

The nutrient intake of a child drops off sharply during periods of diarrhea because of loss of appetite and/or vomiting. In addition absorption of nutrients from the digestive tract can decrease as much as 70%. Therefore, there is a direct relationship between the frequency of diarrheal diseases and undernutrition, and it is important to measure the prevalence of diarrhea.

59.) Question: During the last 24 hours did your child have more than 4 liquid stools?

- | | |
|--------|-------------------------|
| 1) Yes | 8) Don't know, not sure |
| 2) No | 9) No answer |

Variable code: POINTDD

The answers to this question enable the determination of point prevalence, i.e., the proportion of children suffering diarrheal disease at a certain point in time.

60.) Question: Has the child suffered from diarrheal disease during the last 7 days?

- | | |
|--------|-------------------------|
| 1) Yes | 8) Don't know, not sure |
| 2) No | 9) No answer |

Variable code: PERIODDD

The answers to this question will enable the determination of the period prevalence of diarrheal disease. The period prevalence thus derived is not identical to the above observed point prevalence, which is the reason that specific questions should be asked concerning both indicators. Many studies have shown that a mother's recollection drops sharply after a period of one week. Therefore, the question is not posed concerning a longer period.

3.2.10.5 Acute respiratory infections (ARI)

Several studies have demonstrated a link between undernutrition and acute respiratory infections (ARI). Due to the widespread presence of these infectious diseases it is necessary to determine their prevalence.

61.) Observation: Is the child currently suffering from running nose, cough, cold, earache, or sore throat?

- | | |
|--------|-------------------------|
| 1) Yes | 8) Don't know, not sure |
| 2) No | 9) No answer |

Variable code: POINTARI

The survey team should determine the response directly from the child and not by asking the mother. If the child suffers at least one of the following symptoms: common cold, earache, sore throat, cough, raspy and/or rapid breathing (breathing rate > 50 breaths per minute), acute respiratory infection is likely.

It is not necessary to go into any further classification of ARI. In case of any sign of disease, the child should be sent to the next health service for an adequate treatment and no therapy can and should be provided by a non-medical enumerator.

The answers to this question enable the determination of the point prevalence of acute respiratory infections.

62.) Question: Has the child suffered from running nose, cough, cold, sore throat or earache during the last 7 days?

- 1) Yes 8) Don't know, not sure
2) No 9) No answer

Variable code: PERIOARI

The answers to this question will enable the determination of the period prevalence of acute respiratory infections. The answer should be given by the mother.

3.2.10.6 Other infectious diseases

As explained earlier, infectious diseases can be responsible for poor nutritional status. In developing countries, the most prominent diseases in this area are acute respiratory infections and diarrheal diseases. In some regions measles or other infectious diseases such as malaria, tuberculosis, etc. are endemic and thus negatively influence the nutritional status.

In some areas special attention is needed concerning AIDS in small children. As the disease progresses the child's body constantly wastes away, resulting in visibly worsening anthropometric data.

Problems with infections in the surveyed region must be identified during the pilot study and the questions on the questionnaire adapted to the respective problems.

The following question applicable to measles serves as an example of a supplementary question for the measurement of period prevalence of infectious diseases.

63.) Question: Has the child suffered (e.g., measles) within the past year?

- 1) Yes 8) Don't know, not sure
2) No 9) No answer

Variable code: PERIODIS

3.2.10.7 Mortality of preschool children

The number of children that were born alive and died is a very important indicator of the general living and health conditions of the community. Although this number is not identical with the statistics of infant or child mortality, it gives useful indirect information about child mortality.

64.) Question: How many children have you born alive?

**Of these children how many are still alive today?
How many of the children that died, died before the age of 5 years?**

Variable code: CHILDDTH

It is advisable not to ask straight forward how many children died before the age of 5 years, but for the sake of clarity it is better to lead with several questions to the wanted information.

3.2.11 Infant nutrition

A common cause of nutritional deficiencies in small children can be found in inadequate infant nutrition. Improper feeding practices during the first two years of life can lead to many functional disorders and irreversible stunting.

Because of the importance of infant nutrition to nutritional status, a nutritional baseline survey should contain a number of questions on this area of nutritional practices.

3.2.11.1 Breast-feeding practices

Breast-feeding is still the prevailing practice in many communities. It is known that there is no more suitable source of nutrients for an infant up to four months of age than exclusive breast-feeding. Early weaning of babies drastically increases the risk of contracting infectious diseases.

65.) Question: Have you breast-fed your child during the last 24 hours?

1) Yes 2) No 9) No answer

Variable code: BREASTFE

66.) Question: If your child is not currently breast-fed, how long did you breast-feed your child?

Variable code: BREASTDU

If currently breast-fed the response is 66; if never breast-fed the response is 00. Otherwise, the response is reported in months.

67.) Question: Did your child receive colostrum?

1) Yes 8) Don't know
2) No 9) No answer

Variable code: COLOSTRU

In all cultures, a local word is used for colostrum. This term should be identified to be used for questioning. Colostrum is the first breast milk of the mother that is fed to the child. Due to its high content of nutrients and immunoglobulins the first milk has a more intense color than the later breast milk. As a result, in many cultures this milk is often diluted with other fluids or even discarded.

68.) Question: How many hours after birth did you put your baby to the breast?

1) Immediately 4) After 12 hours
2) 1-4 hours 8) Don't know
3) 5-12 hours 9) No answer

Variable code: STARTBF

69.) Question: Did your child receive any other fluid besides breast milk during the first days after birth?

1) Yes 8) Don't know
2) No 9) No answer

Variable code: ADDITBF

In some cases, the newborn infant receives other fluids beside breast milk. Thus after the first hours after birth, the infant has not yet produced larger amounts of protective enzymes and acids in the intestine and the membranes are still vulnerable to be penetrated by larger molecules. Therefore, the administration of other fluids than colostrum during the first hours of life carry a high risk of infectious diseases.

70.) Question: Within the last 24 hours has your child drunk anything in addition to breast milk?

1) Yes 8) Don't know
2) No 9) No answer

Variable code: ADDDRINK

71.) Question: If your child receives solid food, at what age did you begin feeding the child solid food?

1) < 4 months 8) Don't know
2) > 6 months 9) No answer

3.2.11.2 Supplementary feeding and weaning practices

Before the survey it must be established beyond doubt that mothers are prepared to answer the following questions. For example, in a survey in Pakistan questions concerning types of feeding for small children were considered an affront, and the interviewee subsequently broke off the dialogue.

72.) Question: Regardless of whether your child is breast-fed or not, how often has your child eaten any solid food in the last 24 hours?

- 1) Yes 8) Don't know
2) No 9) No answer

Variable code: EATSOLID

The response is recorded in number of occurrences.

73.) Question: In the last 24 hours has your child eaten fruits or vegetables?

- 1) Yes 2) No 9) No answer

Variable code: EATGREEN

74.) Question: During the past 24 hours has your child been bottle-fed?

- 1) Yes 2) No 9) No answer

Variable code: BOTTLE

75.) Question: Regardless of whether your child is breast-fed or not, how often was your child given something to eat yesterday?

- 1) Yes 8) Don't know
2) No 9) No answer

Variable code: EATFREQU

3.2.12 Formal under-fives health services

The following questions should give some information about the accessibility and quality of formal under-fives health services related to nutrition.

3.2.12.1 Weight monitoring

Surveying the proportion of households possessing weight monitoring cards, it should be possible to determine the effectiveness of under-fives health services in the area of nutritional intervention.

76.) Observation: Does the mother possess a weight chart for the child?

- 1) Yes 2) No 9) No observation possible

Variable code: WHTCHART

The mother should present the child's weight chart.

77.) Observation: Has the child been weighed during the first year of life at intervals of not more than 3 months?

- 1) Yes 2) No 9) No observation possible

Variable code: WEIGHING

3.2.12.2 Immunization

To arrive at a second indicator for the effectiveness of under-fives health services, a survey should establish the proportion of households possessing immunization cards, and also the proportion of children immunized after the age given in the immunization plan.

78.) *Observation:* Does the mother possess an immunization record for the child?

1) Yes 2) No

Variable code: IMMUNCRD

3.2.13 Acceptance of a survey

Finally, an enumerator should ask the community members about their opinions concerning the type and format of the survey.

In cultures in which community members are comfortable with making critical statements, the survey may be used to obtain information on the opinion of the interviewees about the implementation of the survey. Otherwise, community opinion should be ascertained from unstructured interviews.

Valuable information can be obtained for the planning of future interventions from the evaluation of this survey. The degree of participation in the survey can be a useful indicator of the acceptance of a survey. If only a few people want to be informed about the results of the survey, then only a few will be interested in participating in the planning and implementation of the intervention. Furthermore, asking about the acceptance of the survey will instill confidence that the institution in charge of the nutrition survey is genuinely interested in the participation of the target community.

79.) *Question:* Would you be prepared to take part again in a similar survey?

1) Yes
2) Only if _____
3) No, because _____

Variable code: SURVPART

80.) *Question:* Are you interested in a discussion on the findings?

1) Yes 3) No
2) Eventually 8) Don't know

Variable code: SURVDISC

If the community is inadequately organized and/or the members attend different activities, which often happens in newly developed urban areas, it is advisable to ask during an interview about the most convenient time and place for a future meeting with members of the community.

81.) *Question:* Which would be for you the most opportune day of the week to receive the information about the survey and to discuss it with your neighbors?

1) Monday 5) Friday
2) Tuesday 6) Saturday
3) Wednesday 7) Sunday
4) Thursday 8) Don't know

Variable code: INFODAY

These questions on the day of the week and the time of day are only provided here as examples. It is definitely not applicable in all cultural situations. More often, these questions must be asked in relation to normal living habits.

82.) *Question:* What would be the best time for the discussion with your neighbors?

1 - 24 hours 88) Don't know 99) No answer

Variable code: INFOTIME

3.3 Reliability check for a survey

The reliability of data collection in a survey essentially depends on

- the survey method
- the precision of the instruments used
- the ability of the enumerators
- the supervisor

The preceding chapters deal with these points in detail. Nevertheless, it is only possible to assess objectively the reliability of collected data if the recorded measurements, observations and answers are compared with the actual situation and the proportion of correct to incorrect values obtained. However, it is often difficult to ascertain the "real" situation.

In practice, a supervisor is appointed to ascertain the "real" situation in a survey. The rationale for this is that a supervisor is better trained and has more experience than the enumerators. The degree of variance in the collected data provides an indication on the reliability of data collection (for more details, see chapter 4.6.).

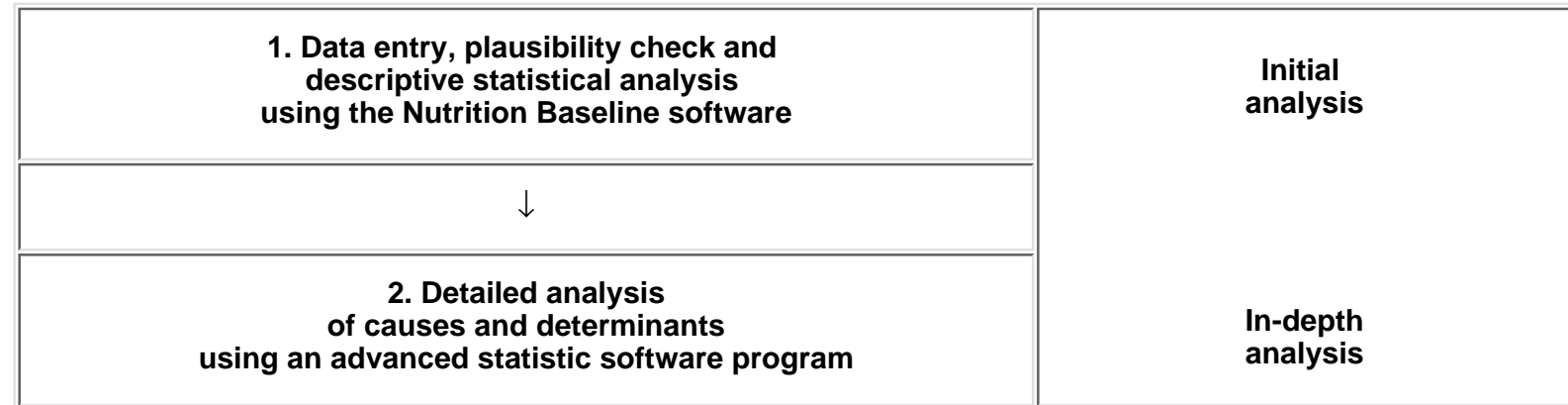
During the course of a survey, the supervisor collects data on the variables with the highest risk of yielding unreliable results. The selection of these variables should be made after the pilot study (see sub-chapter 3.1.6). In all cases, the supervisor should take measurements of height and weight so that anthropometric data can be calculated and compared to that obtained by the survey team. An example of a questionnaire for a supervisor is presented as an appendix in sub-chapter 6.1.4.

Altogether **about 10% of the households visited by enumerators** should be selected at random for a cross-check. In addition to serving the purpose of data collection for a reliability check, the cross check also provides a supervisor an excellent opportunity to observe first hand the difficulties of the enumerators in recording data in order to be able to introduce subsequent countermeasures during the survey.

4. Analysis and interpretation of data

The statistical analysis of data should take place in two stages, as shown in figure 11.

Figure 11. Overview of Data Entry and Calculation



For preparing the questionnaire, entering and descriptive analysis of data the Nutrition Baseline Software is recommended. For further information please read the help in this program. The idea behind this program is to work only with one file for preparing the questionnaire, entering and analysing the data. It is also especially designed for performing a Nutrition Baseline survey. Compared to other procedures the computer work and possible errors are reduced.

For a more in-depth analysis of data a statistical program such as SPSS or SAS is recommended, since multivariate analyses such as multi-factorial analysis of variance or analysis of variance with a co-variant cannot be carried out with the Nutrition Baseline Software.

Note: One objective of nutrition surveys (see chapter 1.2) is that data should also be used for **cross-sectional comparisons** by country and measures. Consequently, data should be stored in a secure but accessible place.

An agreement has been reached with the Nutrition Unit of the WHO to professionally store the results of the anthropometric data from population-based nutritional surveys. It is highly recommended to send the results to the following address using a form attached in Annex 6.10.

*Nutrition Unit
WHO
20 Avenue Appia
CH-1211 Geneva 27
Switzerland*

4.1 Data analysis

4.1.1 Data entry

Data entry should also be carried out using the Nutrition Baseline software. This program is suitable for this purpose because it is user-friendly and tests the entered data for its validity. The most important reason, however, is that it can calculate, as already mentioned, anthropometric indicators and is useful for descriptive analysis.

Furthermore it is easy to export the data files into programs such as D-Base, Excel or SPSS so that the possibility exists for switching to other computer packages later on.

For data entry first a questionnaire has to be created. These file contain the variable names, the question, the

description of the variable name and the possible answers. It is strongly recommended to use the variable names provided in this handbook

Note: It is extremely important that **in each questionnaire a variable HOUSEHNO** (a unique number given to each surveyed household) **is included**. This variable is the so-called "**unique identifier**". Furthermore, the **data from the child(ren) must contain a variable CHILDNO**, which enables one to distinguish between two or more children from the same household.

4.1.2 Plausibility check

A plausibility check must be carried out immediately after data input in order to correct erroneous data.

Despite meticulous preparation and data input, erroneous data always appears in the database. Before any further processing of raw data, the data must be checked for plausibility. In part this can be done with the Nutrition Baseline software. For further information about the plausibility check in this program please read the help in this program and check the option sheet. The following procedures are recommended:

1. The frequency breakdown of all noncontinuous variables helps to identify possible errors due to inconsistency or non-homogeneity.
2. Reliability and consistency can be measured by comparing the data entered from the household form with that entered from an individual form. For example, the age of the child should be the same on the household and the individual forms.
3. The quality of age reporting of children and/or sampling can be checked by the age frequency expressed in months and presented as a bar histogram (i.e., were approximately the same number of infants studied at each age?).
4. Comparison of data obtained by the enumerators with that obtained by the supervisors provides important information about the general reliability of the survey.

If unexplainable data entries are identified, these must be checked with the entries on the questionnaires. Erroneous data in the database should then be replaced by correct data obtained from the questionnaires. If no satisfactory explanation for a value can be derived from the information in the questionnaires, either additional information must be obtained from the household, or the information must be excluded. It is better to obtain a lesser amount of correct information than false information.

4.2 Anthropometric indices

The following are internationally used key indicators for determining the nutritional condition of children:

- **Weight-for-age (wt/age),**
- **Height-for-age (ht/age),**
- **Weight-for-height (wt/ht).**

A child lacking in energy or nutrients in relation to his height will not gain weight corresponding to his genetic potential. Conversely, an overfed child will be overweight. In addition, when a child is undernourished and/or suffers repeated infections over an extended period of time, the body growth is retarded and the genetic potential for height will not be reached.

In the population as a whole, there are always some individuals with unusual nutritional intakes who are heavier or lighter, or taller or shorter than others. If for example, the weight-for-height ratio for an adequately nourished community is determined, the ratio will have a biologically typical normal Gaussian distribution. Such a distribution has been derived for the weight-for-age, height-for-age and weight-for-height indicators for children in the USA aged from birth to 18 years of age. Separate curves have been developed for boys and for girls. These distributions are available from the National Center of Health Statistics (NCHS) for use as reference data.

If the distribution of the height-for-age ratios of the surveyed community group lies to the left of the corresponding distribution for the reference group, or if the distribution of the weight-for-height ratio lies to either side of that of the

reference group, there is evidence of health or nutritional problems in the surveyed child population. Often this is estimated by determining the proportion of children at or below -2 Z-score units of the NCHS reference standard (or for weight-for-height ± 2 Z-score units). It must be kept in mind, however, that 2.3% of the children in the reference population fall naturally outside 2 Z-score units of the mean.

When plotting anthropometric measurements of groups of children, it is important to determine:

1. the proportion of those below or above the "acceptable" thresholds,
e.g. in the case of weight-for-age, height-for-age, and weight-for-height for children under five years of age:

- below -2 Z-score or above +2 Z-score units of the NCHS reference standard (the later only in the case of weight-for-height)

in the case of mid-upper-arm-circumference (MUAC) of children:

- below 13.0 cm for children from 8 to 11 months
- below 13.5 cm for children from 12 to 23 months
- below 14.0 cm for children from 24 to 36 months

in the case of body-mass-index of non-pregnant women:

- below 18.5 kg/m² and above 27.5 kg/m²

2. whether in the observed children their proportion above or below thresholds is about equal throughout the five years or whether it changes perceptively for any of the age groups.

The following rules-of-thumb can be used to interpret anthropometric indices in children:

1) Height-for-age

Children with a Z-score below -2 compared to the NCHS height-for-age reference are considered stunted (-2 Z-score is the value -2 standard deviations below the median of the reference population. By definition 2.3% of the reference population is below -2 Z-score).

The proportion of stunted children relative to all children examined is a valid reflection of the prevalence of the combination of disease prevalence and dietary inadequacy in light of physiological requirements in the whole community. The proportion of "stunted" children in most developing countries usually ranges between 20% and 33%. Higher figures are indicative of an "abnormal" nutritional situation, such as may arise because of long-term civil disorders, severe and chronic food shortage, or may reflect the combination of genetic selection and an abnormal geographic location, e.g., life in the Himalayas or the Andes.

2) Weight-for-height

Children with a weight-for-height less than -2 Z-score of the NCHS reference population are probably badly malnourished. They are only probably so, because in the "healthy" North American reference population from which the NCHS standards were derived, 2.3% were found to have this weight-for-height. If one finds significantly more than 2.3% of the children below this line, the children of the community are suffering from wasting. Since "wasting" has clearly been found to be associated with a depressed metabolism and decreased functional capacity, it is a serious sign. Wasted children experience higher mortality, probably because of reduced immune competence, from higher morbidity and from substantially reduced physical and mental abilities.

3) Weight-for-age

The third index used internationally as an indicator of undernutrition is the weight-for-age (wt/age) index. Most children below the threshold (-2 Z-score units below the mean for NCHS standards) are undernourished, those at or above the threshold are of normal nutritional status. This indicator combines both the ht/age and wt/ht indices. A child weighing too little for his age is too small and/or too lean (Gomez classification).

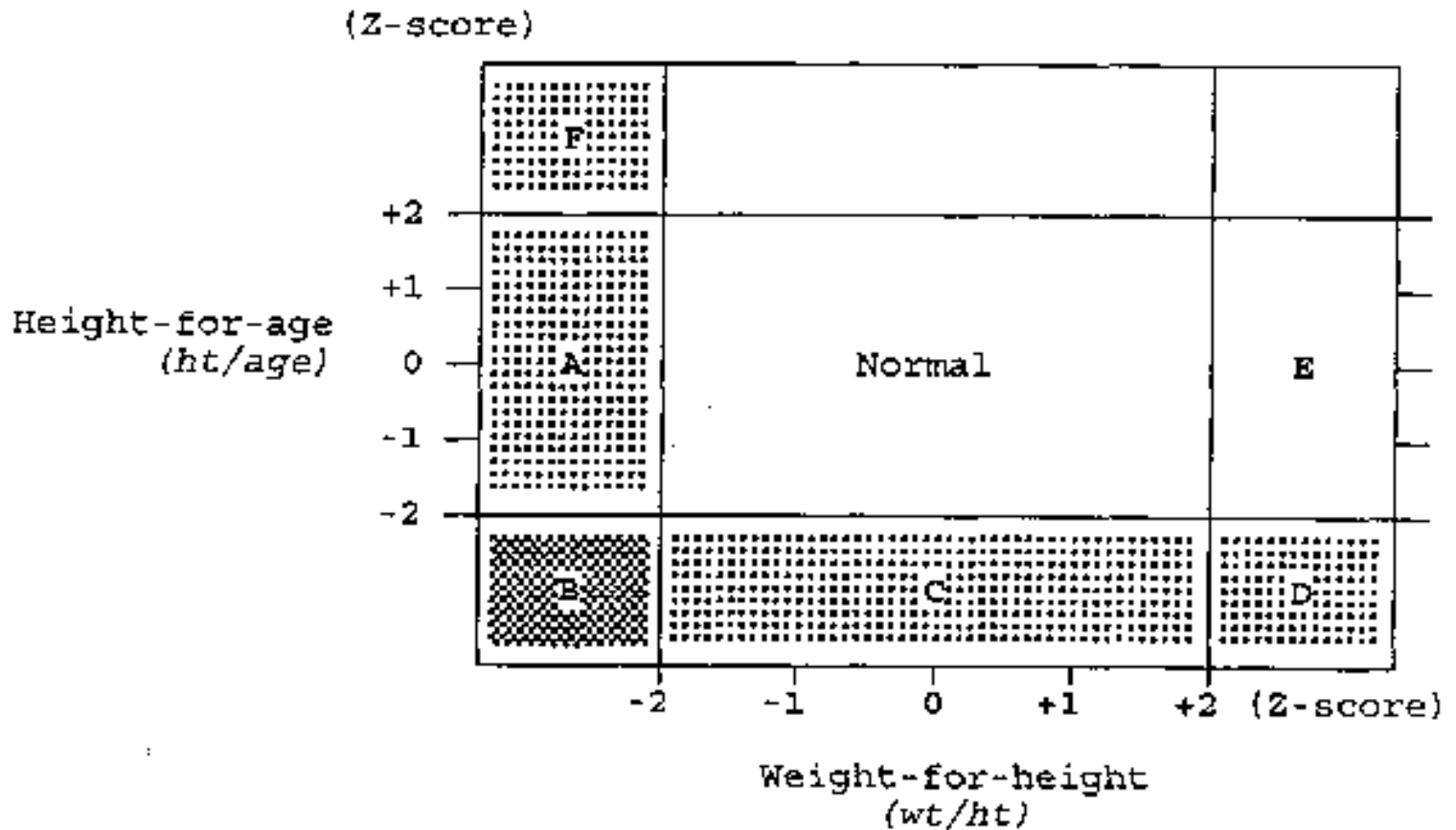
In the US reference population, the proportion of children falling below -2 Z-score units is 2.3%; however, in most developing countries in the absence of a severe food crisis the proportion is 20-40%. Higher proportions warn of a "worse-than-usual" situation.

It should be emphasized that these three indices are very useful for the classification of populations, but must be interpreted with care and require additional information for the diagnosis of the nutritional status of an individual.

4) Combination height-for-age and weight-for-height

Figure 12 presents an overview of the thresholds of malnutrition using ht/age and wt/ht indices based on the Waterlow classification.

Figure 12. Thresholds of malnutrition based on the Waterlow classification (Z-scores height-for-age and weight-for-height)



stippled pattern: stunting or wasting

checkered pattern: stunting and wasting

WATERLOW CLASSIFICATION SCHEME

Code	Combination of indices		Interpretation of nutritional status
	Height/age	Weight/height	
A	normal	low	wasted
B	low	low	stunted + wasted
C	low	normal	stunted
D	low	high	stunted + obese
E	normal	high	obese
F	high	low	wasted

wasting: lean condition due to acute nutritional and/or health problems
 stunting: reduced linear growth due to chronic nutritional and/or health problems

5) Mid-upper-arm-circumference (MUAC)

The Mid-Upper-Arm-Circumference (MUAC) is easier to measure but suffers from a higher measurement error especially if the investigator has little experience or takes insufficient care during measurement. MUAC may be quite useful to rapidly screen for severely malnourished children in emergency situations, in refugee camps, under severe drought conditions, etc, or may serve in the context of a rapid assessment of the health situation of an area. Its sensitivity, i.e. the ability of the test to detect malnutrition, is quite high if the higher threshold value (13.5 cm) is used. At this level one may, however, miss borderline cases, i.e. those moderately malnourished or at risk of becoming severely malnourished. Raising the threshold to 14.5 cm will increase sensitivity but reduce specificity, i.e. the ability of the test to correctly identify those not at risk. Arm circumference has the advantage that it varies relatively little between one and three years of age, i.e. it is relatively age-independent, hence does not require knowledge of the precise age, as do weight-for-age, or height-for-age. Above three years and below one year of age, especially below 6 months, however, it is of limited value and should be used and interpreted only with caution.

4.3 Clustering

The forming of clusters or groups based on a variable, say age, can help to identify statistical variations or influences on nutritional indicators.

F	Clustering is carried out from functional and statistical viewpoints.
---	--

If clusters are to be formed, care must be taken to ensure that there is enough variation and that the number of individual cases in each group is roughly the same. If marital status is to be used as the basis for clustering and of all adults 42% are married, 30% single, 16% separated, 8% widowed and 4% divorced, the three smallest sample sizes are too small to build meaningful clusters since they are too small for statistical interpretation. Either these three groups should be excluded from the statistical analysis or they should be consolidated into one group. In this example that would be the group of the separated + widowed + divorced = 28%. In clustering it is first necessary to carry out a descriptive statistical analysis. This is easy to do with the Nutrition Baseline Software

With some variables, the basis for clusters can easily be selected. This allows the clusters to be established from the beginning of the project.

Variable	Cluster Division
Gender	male, female
Age (Months)	0-5, 6-11, 12-17, 18-23, 24-35, 36-47, 48-59
Intervention	before, after

Once the clusters have been formed, they can then be compared statistically with respect to the nutritional indicators. An example is shown below:

Indicator	Male (%)	Female (%)
wasting	12.3	18.7
stunting	43.8	61.5
wasting + stunting	5.7	9.1

4.4 Food intake

In order to draw conclusions on the adequacy of nutrition, it is necessary to determine the individual requirements for a healthy nutrient intake. Such a relationship is, however, in practice very difficult to determine during a routine field survey because of

1. the difficulty of measuring the exact quantities of nutrients consumed and
2. the difficulty in determining the exact nutrient requirements of individual persons (see chapter 6.4).

Nutrient intake can be calculated from dietary intake data, using food composition tables. When these intake data are considered in relation to nutrient requirements, potential nutrient deficiencies can be identified. Food composition tables have been produced by international and regional organizations, and also in many countries.

With the Nutrition Baseline software it is possible to calculate the nutrient intake for the mother and the child but the food weighing method or the 24-hour-recall method are not recommended as part of the surveys discussed in these guidelines. Based on previous experience, the usability and accuracy of the findings do not justify the expense involved. Therefore, only the typical food customs in a country are documented via a food frequency recall. Consequently, **only qualitative conclusions concerning nutrient supply can be drawn, but it is possible to derive qualitative statements on the possible nutrition problems within a family.**

Before analyzing a survey on feeding practices, inquiries should be made to the health authorities concerning the nutrient value tables used in their country.

FAO/WHO recommendations for nutrient requirements are generally used for developing countries. Chapter 6.4 in the Appendix contains an overview of nutrient recommendations for children up to six years. However, authorities of many countries have published their own recommendations.

4.5 Breast-feeding, supplementary feeding, and weaning practices

A major cause of undernutrition and malnutrition in developing countries lies in improper breast-feeding, supplementary feeding, and weaning practices. The following principles are recommended:

- A newborn should be given colostrum from its mother's breast immediately after birth.
- Infants should be exclusively breast-fed until the end of the fourth month. Until then supplementary feedings are unnecessary and serve only to increase the risk of infections.
- A child must be given supplementary feeding not later than the sixth month.
- The supplementary feeding must consider the frequency of feeding and the energy and nutrient requirements of the child.
- In many instances it is desirable for most infants to be breast-fed until the end of the second year of life.

The analysis and interpretation of breast-feeding and supplementary feeding practices therefore have particular significance. Important breast-feeding and supplementary feeding concepts are defined in table 8.

Table 8. Definition of breast-feeding categories according to WHO

Category	A child <u>must</u> be given:	A child <u>may</u> be given:	A child <u>may not</u> be given:
Exclusive breast-feeding	Human breast milk	Medicines, vitamins, trace elements	Anything else
Predominant breast-feeding	Mostly human breast milk	Fluids (water, or water based fluids)	Anything else (including substitutes for human breast milk)
Complementary feeding	Human breast milk and semi-solid or solid foods	Usual foods and beverages	
Bottle feeding	Usual fluids or semifluid foods from bottles with nipples	Also human breast milk from a bottle	

The following indicators are generally used for breast-feeding, supplementary feeding, and weaning practices:

Exclusive colostrum feeding rate

The proportion of infants reported to have received exclusively colostrum during the first 12 hours after birth.

(Infants <12 months (<365 days) of age reported to have been exclusively breast-fed with colostrum in the first 12 hours after birth) /

(All surveyed infants <12 months (<365 days) of age)

Exclusive breast-feeding rate

The proportion of infants under 4 months of age exclusively breast-fed.

(Infants <4 months (<120 days) of age who were exclusively breast-fed in the last 24 hours) /

(All surveyed infants <4 months (<120 days) of age)

Predominant breast-feeding rate

The proportion of infants under 4 months of age predominantly breast-fed.

(Infants <4 months (<120 days) of age who were predominantly breast-fed in the last 24 hours) /

(All surveyed infants <4 months (<120 days) of age)

Timely, complementary feeding rate

Proportion of infants 6-9 months of age receiving breast milk *and* complementary foods

(Infants 6-9 months (180-299 days) of age receiving complementary foods *in addition to breast milk* in the last 24 hours) /

(All surveyed infants 6-9 months (180-299 days) of age)

Continued breast-feeding rate (1 year)

Proportion of children 12-15 months of age who are breast-feeding

(Children 12-15 months of age breast-fed in the last 24 hours) /

(All surveyed infants 12-15 months of age)

Continued breast-feeding rate (2 years)

Proportion of children 20-23 months of age who are breast-feeding

(Children 20-23 months of age breast-fed in the last 24 hours) /
(All surveyed infants 20-23 months of age)

Bottle-feeding rate

Proportion of infants less than 12 months of age who are receiving any food or drink from a bottle

(Infants <12 months (<365 days) bottle-fed during the last 24 hours) /
(All surveyed infants <12 months (<365 days) of age)

4.6 Reliability of a survey

There are three basic types of variables, and the method used to check the reliability of a survey depends on the type of variables. Reliability is a measure of the repeatability or reproducibility of the results.

Variables with continuous values of measurement

For variables with continuous values, such as height, weight, or hemoglobin levels, the mean and the standard deviation of the difference between the recorded measurements of the enumerators and the supervisor should be calculated. A small mean and small SD are desirable. In annex 6.7 an example of the calculation of an intra- and inter observation is described.

Variables with yes/no answers

For variables permitting only yes/no answers, such as the presence of goiter, anemia, or undernutrition (Z-score < 2), the inter and intra observer errors of the surveying of these variables should be calculated according to the following overview:

		Supervisor	
		yes	no
Enumerator	yes	a	b
	no	c	d

a: number of identified observations detected jointly by the enumerator and the supervisor

b: number of observations not detected by the enumerator but detected by the supervisor

c: number of observations detected by the enumerator but not detected by the supervisor

d: number of observations neither detected by the enumerator nor and the supervisor

Sensitivity of finding (proportion of true positive): $a / (a + c) \times 100$

The sensitivity indicates the proportion of surveyed individuals actually possessing an observed attribute (undernourishment, belonging to a certain income group, etc.) who were correctly identified.

Specificity of finding (proportion of true negative): $d / (b + d) \times 100$

The specificity indicates the proportion of surveyed individuals **not** possessing an observed attribute who were correctly identified.

Ideally, both sensitivity and specificity should be 100. The lower the value, the less precise was the surveying of the data.

Variables allowing more than two answers

In determining the reliability of answers to questions with more than two answers, the percentage deviation between the enumerators and the supervisor is calculated. The smaller the deviation, the better the survey.

% deviation = (Number of answers with differences between the responses obtained by enumerators and those obtained by the supervisor) / (Number of all answers with responses) x 100

4.7 Analysis of causes and predictors

With statistical methods it is possible to identify the relationship between the variables investigated in the survey. If there is a statistically significant association between two variables, it is called a predictor. A predictor suggests a causal relationship between two variables, but does not prove that one exists.

Three goals can be achieved in the **analysis of predictors**.

1. Identification of social risk groups

Significant associations between a nutritional indicator and a socioeconomic indicator can help to identify social risk groups, such as the landless and illiterates.

It is also possible to arrive at predictors based on observed socioeconomic data in which several individual predictors are included. Thus it was possible in the slums of a Brazilian city to find a higher risk of malnutrition in young children from families who obtain their electrical power supply from neighbors. Undoubtedly the cause of the malnutrition is not in the type of electrical power supply, and therefore an improvement in type of electricity supply would not result in an improved nutritional condition for the children. Rather, there are other causal factors involved in these predictors that are responsible for the poor nutritional conditions, such as low income and little education. Therefore, although the means of obtaining electrical power is not the cause of the malnutrition, defining these predictors can help the consultants to identify risk groups more quickly and at less cost. For example, in this way families who have no electrical supply for their households can be selected for individual discussion on health and nutrition.

2. Identification on indicators for monitoring

Predictors can be helpful in identifying indicators suitable for use in monitoring the impact of intervention measures.

3. Information of causal relationships

Predictors can also provide important information regarding causal relationships and form the first steps for analysis of causes.

Three procedures can be employed for **analysis of causes**:

Statistically significant relationships between variables do not automatically provide information concerning the cause of nutritional problems. For this a separate analysis of causes is necessary.

1. Multiple statistical analysis of causes

In principle, in a statistical investigation of causes in order to obtain a clearer picture of a relationship, consideration should be given to the fact that a cause which cannot be eliminated has an integral part in the relationship. A check must therefore be made as to whether the available statistical information provides sufficient basis to be able to assume a relationship. Therefore data of all potential confounders must be available. Some important tests with the related assumptions are presented in the table of annex 6.8.

Special attention should be given to multiple regression analysis and multiple ANOVA. These most used statistical techniques allow among others the investigator to examine the effect of one factor while other factors in the regression equation are held constant mathematically.

2. Analyses of causes by comparison of literature

A second important source for analysis of causes is literature. A cause-effect relationship can only be

discussed with greater certainty, if a statistically established connection has been defined in another similar situation.

3. Analysis of causes through specific investigations

The baseline survey must commence from the viewpoint that although nutritional problems have been solved in other locations more extensive research is needed to reveal causal relationships in the present location. The information gathered and relationships proposed in previous studies should be carefully considered during the planning for the baseline survey.

If there is no statistically significant relationship between variables, either no association exists or one or more of the following factors may have influenced the results:

- Inadequate statistical methods were used
- The sample size was too small
- Confounding factors occurred (see following overview)
- Inappropriate indicators were measured in the follow-up survey
- Intervention measures were irrelevant and unsuitable for solving the problems
- The surveyed group was not appropriately similar to the beneficiary group.

The last three points are applicable only to follow-up surveys.

If there is a **statistically significant relationship** between two variables, the following questions must be considered:

- Is the significance due to confounders or external factors?
- Is this a causal relationship?
- Which direction is the causal relationship? What is the range of the effects?
- Can the causal relationships observed in the surveyed group be extrapolated to the beneficiary groups, target groups and general community?

The following list summarizes possible confounding factors that could influence the results of a survey:

1. Differences in the survey teams and their equipment

A survey must be implemented by a several survey groups. Although the teams along with their equipment should randomly select households for the survey, in practice the surveys by a given team will be limited to one geographical area to save time. Thus, differences in the results can result from different teams and equipment.

2. Changes in demographic distribution

It is possible that during the project/program segments of the population in the designated region emigrate or immigrate. Those segments might not be representative of the general population. An example, they might be the poorest with the highest nutritional risk.

3. Decreases or increases in the beneficiary group

During the project members of the beneficiary group enter or exit. This shortens the time available for the intervention, and the project/program measures cannot be sustained long enough to take effect.

4. Excessive representation of socioeconomic data from families with more than one child under 5 years

Many households have more than one child under the age of 5 years. To secure the representation of all children under five years of age and to increase the coverage of sampling, a survey has to be taken of all children in a household. If the socioeconomic data of households is used in a statistical relationship to the socioeconomic data of the children, the data from the families with more than one child will be over-represented.

5. Changes in external conditions

It is not always possible to arrange for a comparison group to evaluate the impact of intervention measures on the nutritional condition of a target group (see sub-chapter 3.1.3.3.). Without data from a comparison group, the interpretation of the impact of nutritional intervention based on longitudinal comparisons of baseline and follow-up surveys can be exceedingly difficult and must be undertaken with extreme caution, as other factors outside the control of the project/program can also have a

bearing on nutritional status.

6. Changes in the age distribution of the surveyed group

The nutritional status of babies from zero to five months is often better than that of babies from twelve to seventeen months. If the age distribution of the examined babies is different between the baseline and follow-up surveys, the impact of an intervention can be misrepresented.

The last two points are applicable only to follow-up surveys.

4.8 Evaluation of indicators

Nutrition surveys yield important information about the nutritional condition of an investigated population. Many conclusions can be drawn on the type and distribution of evident nutritional problems using statistical analyses of the observed nutritional indicators (anthropometric indices, xerophthalmia, anemia, goiter, breast-feeding practices, etc.). However, these do not provide answers about how these findings are to be interpreted if questions arise concerning

- at which thresholds
- with what measures
- for which risk groups

intervention should be undertaken.

There are no universally valid thresholds for nutritional indicators, which could then be used to decide which measures to apply. If one attempted to specify a certain set of economic and health conditions, a 10% stunting rate in one part of a country might be high, while in another part of the country, or in another country, it might seem low. It is therefore necessary to establish a list of criteria that can be used to evaluate the indicators.

The following criteria should be considered when evaluating nutritional indicators:

- **cross-sectional comparison of nutritional indicators** with other parts of the country (geographical comparison);
- **longitudinal comparison of nutritional indicators** with previous surveys (trend);
- **arrangement of nutritional problems by priority** with respect to general health problems;
- **evaluation of the surveyed nutritional indicators by**
 - the health and planning authorities, and
 - the participating population;
- **the possibilities for intervention in the survey area.**

Only by considering these criteria conclusions can be drawn about the indicators and thereby about the nutritional situation.

5. Reporting of survey results

5.1 Format of a technical report

A technical report should have the following structure:

Title page

Acknowledgment

Table of contents

0. Abstract

1. Introduction

- 1.1 Project/program description and overall framework
- 1.2 Nutritional situation based on previous reports
- 1.3 Objectives of the survey

2. Methodology

- 2.1 Population and area surveyed
- 2.2 Study design
- 2.3 Sampling and data collection
- 2.4 Equipment utilized
- 2.5 Statistical methods
- 2.6 Sensitivity and specificity of the survey
- 2.7 Ethical considerations

3. Results

- 3.1 Demographic and socioeconomic data
- 3.2 Food habits
- 3.3 Infectious diseases
- 3.3 Anthropometric data
- 3.5 Nutritional deficiencies
- 3.6 Existing intervention programs in the project/program area
- 3.7 Predictor analysis

4. Discussion

- 4.1 Analysis of findings
- 4.2 Problem tree

5. Recommendations

- 5.1 Possibilities for intervention
- 5.2 Proposed in-depth studies
- 5.3 Proposed indicators for monitoring and evaluation

6. List of references

7. Appendix

- 7.1 Questionnaires utilized

The report should include the following information:

1 Title page

The **purpose of the title page** is to present a concise statement of the subject of the survey and to identify the responsible personnel. The title page is the "main gate" of the survey report that invites the reader to engage him/herself to study the document. The title is the summary of the summary.

The title page should contain the following information:

- Title of the report
- Names of the principle enumerators and authors
- Date of submission of the report
- Name and address of the institution of the principle enumerators and authors

1 Acknowledgment

All persons, institutions and groups that assisted in carrying out the survey and without whose support the survey would not have been possible should be acknowledged.

1 Abstract

The **purpose of the abstract** is to summarize in less than 400 words all important parts of the survey.

The abstract should

- describe the general objective of the survey (justification);
- describe briefly the methodology used;
- report the main findings;
- discuss and analyze the main results;
- state the main conclusions and recommendations.

1 Introduction

The **purpose of the introduction** is to put the survey in perspective.

The introduction includes several sections:

- A description of the nutritional situation is based on previous reports of investigations in the country and, if there are any, in the surveyed area. Both the nutritional condition of the population and the previous intervention programs should be described.
- The project description briefly presents its objective, findings, and planned activities.
- The objectives of the survey conclude the introduction.

1 Methodology

The description of the **methodology** should be so complete that it would be possible to repeat the survey using the same methodology.

- This is particularly important to ensure the validity of any comparison between the baseline survey and follow-up survey. The description of the methods used should include details of procedures that differed from those given in these guidelines and details of procedures for which this handbook only makes vague recommendations.
- Special attention should be given to the description of **sampling**. The calculation of the sample size and details of the sampling procedure should be described. Furthermore, the equipment utilized in the survey should be described.
- The methodology section should also report the sensitivity and specificity of the variables monitored by the supervisors.

1 Results

When describing findings, data should be presented objectively without any comment or commentary.

The following tables, arranged according to communities or urban districts, should be included in the results section:

- Demographic and socioeconomic data, such as:
 - The number of household members
 - The number of working household members
 - The number of children under five years
 - The number of residences
 - The number of people per residence
 - The percentage of residents with electricity
 - Educational level of parents
- Crop land area and production of agricultural products for family's consumption and for sale
- Prevalence of nutritional problems classified by:
 - Distribution of ht/age, wt/ht, and wt/age
 - Underweight (wt/age: threshold for medium to severe malnutrition is < -2 Z-score)
 - Waterlow's classifications (ht/age: threshold for stunting is < -2 Z-score; wt/ht: threshold for wasting is $<$

-2 Z-score)

- Obesity (wt/ht: threshold for obesity is $> +2$ Z-score)

- Prevalence of medical problems, broken down by community:

- Prevalence of anemia in relation to age (threshold: for anemic children is < 110 g/L Hb and for severely anemic children is < 95 g/L Hb)
- Prevalence (point prevalence and period prevalence) of diarrheal disease and acute respiratory infections
- Prevalence of fever
- Prevalence of other infectious diseases

- Frequency of food consumption in the surveyed households

The results section should contain the following diagrams:

- height vs. age compared to the reference group
- weight vs. height compared to the reference group
- weight vs. age compared to the reference group
- frequency of distribution of Hb concentration in the blood
- Exclusive breast-feeding rate (proportion of infants under 4 months of age exclusively breast-fed) vs age of mother

1 Discussion

Finally, the survey **results** should be **analyzed** in the light of other findings. The discussion of the results must be separated from their presentation. The clear separation of the presentation from the discussion of the results allows readers to draw their own unbiased conclusions from the survey findings.

Concrete information must be given concerning the survey goals described in the Introduction, as follows:

- The type and extent of the target, risk and beneficiary (intervention) groups
- The type, extent and severity of the nutritional problems
- The possible direct and indirect causes of the problems
- The interactive relationship among the possible causes (e.g., verification of the ZOPP problem tree)
- The determination of the nutritional problems of the target group with respect to normal living conditions

1 Recommendations

- Proposals for more extensive investigations of direct and indirect causes of malnutrition
- Proposals for appropriate and lasting nutritional intervention measures
- Proposals for simple, nutritional-relevant indicators to be used in designing a monitoring and evaluation system

1 List of references

This section should contain a **bibliography** of the **literature** referred to in the report.

1 Appendix section

The appendix section should include a **copy of the actual questionnaire used** in both the language of the investigators and the local language. The questionnaire is an important tool of a survey that has to be adapted to the local situation and must therefore be developed for each survey. The setting in which the data will be collected will influence the design and structure of the data recording form or questionnaire.

In addition, it is also possible to use the appendix section to include tables useful for clarification but too extensive for the main section of the report.

5.2 Considerations of style for writing the report

Tables and figures are important tools for information transfer in reports. However, there are some rules that should be considered when preparing a table or figure.

1. The main difference between tables and figures is that in tables information is presented in digital form whereas in figures it is presented visually. Often visual information is easier to comprehend than digital. Therefore, the initial decision is which format is best for data presentation.
2. Tables and figures must be self-explanatory, although they can be interpreted in the text. Each table or figure needs a header that includes the number of the table or figure followed by the title. The table or figure number must be referred to in the text. Tables and figures should be numbered separately in sequence through the report.
3. The title of a table or figure should summarize briefly the information of the table or figure.
4. Each column in a table has to have a header. The column headers should be concise so that they can be written horizontally. They may contain abbreviations. Tables can be laid out in several different formats, with lines separating columns, rows or headers, however, the same style should be used in all tables in the report.
5. Immediately beneath the column heads the precise units of measurement of the data should be shown. Units of measurement should be written in brackets, e.g., (%) or (years). If in a table or a figure there is no room for longer units, (e.g., number of infant deaths per 1000 live births and stillbirths), the details should be put in a footnote to the table. Footnotes should be placed beneath the lower boundary of the table. However, the footnote should be at least two double spaced lines above the text to distinguish it clearly from the text.
6. As a rule, tables are presented vertically on the page, although wide tables may be presented sideways (landscape). If a table is too long to fit on one page, then the table should be continued on the next page. At the bottom of the first page the word "continued..." should appear. The second page should begin with the words "Table ... continued," and the column headings should be repeated. Such larger tables should probably appear in an appendix because they will contain more detail than is necessary for the points made in the text.
7. Various types of illustrations may accompany the report as figures, such as line drawings, graphs, maps, and photographs. Drawings should be presented clearly with Indian ink on white paper. Graphs developed by computer software should be printed with ink jet or laser printers. Photographs should be printed on glossy paper.
8. If a table or figure is taken from another publication, the source must be identified.
9. Wherever percentages are to be used in tables the raw figures must similarly be provided so that the reader can both check your results as well as verify the validity of you interpretation. In the table below, and examining only percentages, the difference in the prevalence between boys and girls is quite striking. Yet if one had only found one more boy with goiter, the percentage would have similarly reached 50%.

Table 9. Schoolchildren with visible goiter

	Boys n = 4 (n) (%)		Girls n = 40 (n) (%)		Total n = 44 (n) (%)	
Visible goiter	1	25	20	50	21	48

Other style considerations include:

- The full **generic name** should be used when an insect (or animal, bacterium or plant) is first mentioned anywhere in the report. Thus the mosquito would be referred to first as *Anopheles hyrcanus* var. *sinensis*, and later as *A. hyrcanus* var., or *A.h. sinensis*, or simply *A. sinensis*.
- several organisms belong to genera having the same initial letter, and confusion is therefore possible if initials are used for them all. For example, if both *Entamoeba coli* and *Escherichia coli* are named in the same paper, it is wise to refer to both general in full throughout even at the expense of much repetition.

- in general, all Latin words should be italicized.
- Names of diseases derived from proper names should not be written with initial capital letters once they have become generally accepted, e.g., brucellosis, bilharziasis, leishmaniasis.
- Measurements should be expressed in metric units. Abbreviations for metric units should be written according to international standards.

5.3 Information for the target groups

Once the survey is completed, the target group should quickly be informed of the findings. The presentation and contents should be tailored to the culture and educational level of the people.

A place and time for the meeting should be chosen so as to include as many people as possible. The questionnaire should include a question about when and where such a meeting should be held.

The following recommendations are given concerning the presentation and discussion of the results in a community:

- The results should be presented by a person who has taken part in the survey and is known to the people. He or she should be qualified in the field and thus respected (e.g., health assistant, midwife, nurse, social worker).
- As much as possible, simple audiovisual aids should be used to present the information.
- Only essential results should be presented. **Too much information confuses rather than helps.**
- The results should be discussed with those of the target groups who are interested. This should lead to an exchange of views between the experts and the participants and lead to **recommendations for actions**.

6. Appendices

6.1. Examples of questionnaires

In nutrition baseline surveys the questionnaires are divided into community, household, individual (child) and supervisor questionnaires. The household questionnaires are further divided into samples adapted to urban and rural households, as there are some significant differences in socioeconomic and ecological descriptions of the two types of circumstances. In the Nutrition Baseline software only the questionnaires for the household and child are prepared automatically depending on the settings in the option sheet. Samples of the other two can be found in the following two chapters.

It should be emphasized here, once again, that these forms can only be used as a sample in order to become accustomed to the methods for formulating questionnaires. **Obviously, content and language must always be adapted to the circumstances of the survey area.** Item-by-item explanations for the planning and preparation of questionnaires are presented in Chapter 3.2.

6.1.1. Example of a Community Questionnaire

Community		
No. of Sub-Communities:		
No. Inhabitants:		
Major source of income:		
Infrastructure, Schools:	0 - Not available 1 - Primary School 2 - Secondary School	
Health facilities:	0 - Not available 1 - Health post 2 - Health center	
Shopping facilities:	0 - None 1 - Shop 2 - Market 3 - Kiosk (small)	
Communication facilities:	1 - Postal service 2 - Newspaper 3 - Radio 4 - Television 5 - Telephon	
Mass transportation means:	0 - Not available 1 - Pick-up/Truck 2 - Bus/Minibus 3 - Boat	
Type of road:	0 - No roads available 1 - Earth 2 - Stone 3 - Asphalt	

Meeting place:	0 - None 1 - Open air 2 - Village Hall 3 - Religious Center
Worship place:	0 - None 1 - Available
Sport facilities:	0 - None 1 - Available

6.1.2. Example of a Supervisor questionnaire

1.) Household number

2.) Supervisor

- 1) A
- 2) B
- 3) C

3.) Survey team

- 1) A 7) G
- 2) B 8) H
- 3) C 9) I
- 4) D 10) J
- 5) E 11) K
- 6) F 12) L

4.) Date of survey (day, month, year)

5.) Place of survey (village/suburb)

- 1) A 9) I
- 2) B 10) J
- 3) C 11) K
- 4) D 12) L
- 5) E 13) M
- 6) F 14) N
- 7) G 15) O
- 8) H

6.) *Question:* Name of child

7.) *Observation:* Age of the child (months)

8.) *Question:* Age of the mother (years)

9.) *Question:* How large is your farming operation? (ha)

10.) *Question:* What is the ownership status of the land?

- 1) Own land 4) Public land
- 2) Leased land 8) Don't know
- 3) Owned and leased land 9) No answer

11.) *Question:* Has your child suffered from a diarrheal disease during the last 7 days?

12.) Question: (If your child is not currently breastfed) how long did you breastfeed your child? (months)

13.) Question: How many hours after birth did you start with breast feeding?

- 1) 1-4 hours 8) Don't know
 2) 5-12 hours 9) No answer
 3) After 12 hours

14.) Question: Did your child receive any other fluid after birth besides colostrum?

- 1) Yes 8) Don't know
 2) No 9) No answer

15.) Question: Regardless of whether your child is breastfed or not, how often was your child given something to eat yesterday?

- 8) Don't know
 9) No answer

16.) Observation: Does the child possess an immunization record?

- 1) Yes 2) No

17.) Measurement: Weight of the child (kg)

18.) Measurement: Height of the child (cm)

19.) Measurement: Mid Upper Arm Circumference (cm)

6.2 List of variable codes

The following list gives all unique code names in alphabetic order. The variable number indicate the numbers of the variables that are discribed in chapter 3.2. The numbers that are marked with (*) are codes that are not considered in the forms as own variable. However, a specific code variable is given in case that these variables shall be considered in the spreadsheet for further statistical analysis.

No. Variable Code Description

1.	ADDDRINK	Fluid given to child in addition to breast-milk today
2.	ADDITBF	Fluid given to child after birth besides breast-milk
3.	*AGE	Age of child (months)
4.	AGEMOTHE	Actual age of mother
5.	AGEOLDCH	Age of mother when oldest child was born
6.	AGESOLID	Age child was first given solid foods
7.	AGEYOUNG	Age of mother when youngest child was born
8.	ANIMALFT	Food frequency of animal fats
9.	ANIMAL1	Use of animal 1
10.	ANIMAL2	Use of animal 2
11.	ANIMAL3	Use of animal 3
12.	ANIMAL4	Use of animal 4
13.	BIRTHDAT	Birthdate of the child
14.	BIRTHSPA	Number of cases with birth spacing of < 2 years
15.	*BMI	Body mass index of mother
16.	BOTTLE	Status of bottle-feeding of child
17.	BREASTDU	Months child was breast-fed
18.	BREASTFE	Current breast-feeding status
19.	CARERESP	Identification of person who takes care of children
20.	CHILDDTH	Preschool children mortality
21.	CHILDNO	Child number
22.	COLOSTRU	Child received colostrum
23.	CROP1	Use of crop 1
24.	CROP2	Use of crop 2
25.	CROP3	Use of crop 3

26.	CROP4	Use of crop 4
27.	EATFREQU	Eating frequency of child per day
28.	EATGREEN	Vegetables or fruits as supplementary feeding
29.	EATSOLID	Solid food as supplementary feeding
30.	EDUCFATH	Formal schooling of father
31.	EDUCMOTH	Formal schooling of mother
32.	EGG	Food frequency of eggs and egg products
33.	ELECTRIC	Electricity supply of household
34.	ENERCOOK	Kind of energy used for cooking
35.	ETHNIREL	Ethnic or religious affiliation of mother
36.	FARMAREA	Area of farming operation (ha)
37.	FISH	Food frequency of fish and other seafood
38.	FOAPRIL	Food shortage in April
39.	FOAUGUST	Food shortage in August
40.	FODECEMB	Food shortage in December
41.	FOFEBRUA	Food shortage in February
42.	FOJANUAR	Food shortage in January
43.	FOJUNE	Food shortage in June
44.	FOJULY	Food shortage in July
45.	FOMARCH	Food shortage in March
46.	FOMAY	Food shortage in May
47.	FONOVEMB	Food shortage in November
48.	FOOCTOBE	Food shortage in October
49.	FODAID	Participation on feeding program
50.	FOSEPTEM	Food shortage in September
51.	FRUITS	Food frequency of fruits
52.	GARBAGE	Kind of garbage disposal
53.	GENDPREF	Gender preference regarding the next child
54.	GREENVEG	Food frequency of green leafy vegetables
55.	*HFA	Height-for-age of child (z-score)
56.	HEIGHT	Height of child (cm)
57.	HEMOGLCH	Hemoglobin level in blood of child (g/L)
58.	HEMOGLMO	Hemoglobin level in blood of mother (g/L)
59.	HSHHDSEX	Gender of head of household
60.	HSHLOCAT	Location of household (name of village or suburb)
61.	HSHMEMNO	Number of household members
62.	HSHMMNO	Number of household members earning money
63.	HOUSEHNO	Household number
64.	IMMUNCRD	Presence of immunization record of child
65.	INFODAY	Suggested week day for survey meeting
66.	INFOTIME	Suggested time of day for survey meeting
67.	LANDOWN	Ownership of land
68.	MEATLARG	Food frequency of meat from large animals
69.	MEATSMAL	Food frequency of meat from small animals
70.	MILK	Food frequency of milk and milk products
71.	MOGOITER	Goiter in mother
72.	MOHEIGHT	Height of mother (cm)
73.	MOTHMONE	Money earned by mother during the last 3 months
74.	MOWEIGHT	Weight of mother (0.1 kg)
75.	MUAC	Mid upper arm circumference
76.	NBEDROOM	Number of bedrooms
77.	NIGHTBLI	Nightblindness of child
78.	NOCLDMEM	Number of members of household who are children
79.	OCCUPACI	Occupation of head of household
80.	OIL	Food frequency of oils
81.	ORIGIN	Geographical origin of mother
82.	OTHERVEG	Food frequency of other than green leafy vegetables
83.	PERIOARI	Period prevalence of acute respiratory diseases
84.	PERIODDD	Period prevalence of diarrheal disease of child
85.	PERIODIS	Period prevalence of other important disease

86.	*PERSOBED	Number of persons per bedroom
87.	POINTARI	Point prevalence of acute respiratory diseases
88.	POINTDD	Point prevalence of diarrheal disease of child
89.	PLANTFAT	Food frequency of plant fats
90.	PREGNANT	Time of pregnancy of mother
91.	PREPARED	Food frequency of pre-prepared, processed food
92.	PROBDISP	Household with neighbor disputes
93.	PROBEDUC	Household with unsatisfactory school situation
94.	PROBENER	Household with problems of energy supply
95.	PROBFOOD	Household with problems of food supply
96.	PROBILLN	Household with frequent disease problems
97.	PROBINCO	Household with too little income
98.	PROBLE1	Household with land tenure problems
99.	PROBLE2	Household with employment/yield problems
100.	PROBLE3	Household with time problems to get to work
101.	PROBLIVC	Household with bad living conditions
102.	PROBNO	Household without problems
103.	PROBOTHE	Household with other problems
104.	PROBWATE	Household with problems of water supply
105.	SALTIOD	Presence of iodine in salt sample
106.	SALTYP	Kind of salt used in cooking and as table salt
107.	SCHOOLFD	Participation on schoolfeeding program
108.	SEWAGE	Kind of sewage disposal
109.	SEX	Gender of child
110.	SNACKS	Food frequency of snacks
111.	SOCIALIF	Participation in social meetings
112.	STAPLE1	Food frequency of staple food 1 (grains, tubers)
113.	STAPLE2	Food frequency of staple food 2 (grains, tubers)
114.	STAPLE3	Food frequency of staple food 3 (grains, tubers)
115.	STAPLE4	Food frequency of staple food 4 (grains, tubers)
116.	STARTBF	Start of breast-feeding after birth
117.	SUGAR	Food frequency of sugars
118.	SUPERVNO	Supervisor
119.	SURVTNO	Survey team number
120.	SURVDATE	Date of the survey
121.	SURVDISC	Interest in discussion about results of survey
122.	SURVPART	Acceptance of survey by responder
123.	WAAPRIL	Water shortage in April
124.	WAAUGUST	Water shortage in August
125.	WADECEMB	Water shortage in December
126.	WAFEBRUA	Water shortage in February
127.	WAJANUAR	Water shortage in January
128.	WAJUNE	Water shortage in June
129.	WAJULY	Water shortage in July
130.	WALL	Material of walls of children's bedroom
131.	WAMARCH	Water shortage in March
132.	WAMAY	Water shortage in May
133.	WANOVEMB	Water shortage in November
134.	WAOCTOBE	Water shortage in October
135.	WASEPTEM	Water shortage in September
136.	WATER	Source of drinking water
137.	WEIGHING	Weighing status of child
138.	WEIGHT	Weight of child (0.1 kg)
139.	*WFA	Weight-for-age of child (z-score)
140.	*WFH	Weight-for-height of child (z-score)
141.	WHTCHART	Presence of weighing chart of child

6.3 Anthropometric Reference Tables

Sometimes a nutrition survey must be made without being able to calculate anthropometric data using a personal computer. In this instance, one can use the age, weight and height data for a child to determine if the child is within the normal variation of the population. These anthropometric standard values are based on the NCHS/CDC reference values as recommended by the WHO. Threshold values are given for stunting, wasting, and obesity. Thresholds are given for plus or minus two standard deviations from the reference population. In addition to values for stunting, wasting and obesity according to height, thresholds for obesity vs. age are also given.

6.3.1 Children

Thresholds for stunting (ht/age) and underweight (wt/age) in boys and girls (age : <2 years) in lying position

	BOYS		GIRLS	
AGE (Months)	Stunting (Z-score: -2) Height in lying position (cm)	Underweight (Z-score: -2) Weight (kg)	Stunting (Z-score: -2) Height in lying position (cm)	Underweight (Z-score: -2) Weight (kg)
0	45.9	2.4	45.5	2.2
1	49.7	2.9	49.0	2.8
2	52.9	3.5	52.0	3.3
3	55.8	4.1	54.6	3.9
4	58.3	4.7	56.9	4.5
5	60.5	5.3	58.9	5.0
6	62.4	5.9	60.6	5.5
7	64.1	6.4	62.2	5.9
8	65.7	6.9	63.7	6.3
9	67.0	7.2	65.0	6.6
10	68.3	7.6	66.2	6.9
11	69.6	7.9	67.5	7.2
12	70.7	8.1	68.6	7.4
13	71.8	8.3	69.8	7.6
14	72.8	8.5	70.8	7.8
15	73.7	8.7	71.9	8.0
16	74.6	8.8	72.9	8.2
17	75.5	9.0	73.8	8.3
18	76.3	9.1	74.8	8.5
19	77.1	9.2	75.7	8.6
20	77.9	9.4	76.6	8.8
21	78.9	9.5	77.4	9.0
22	79.4	9.7	78.3	9.1
23	80.2	9.8	79.1	9.3

Thresholds for stunting (ht/age) and underweight (wt/age) (age: 2 - 5 years) in upright position

	BOYS	GIRLS

AGE (Months)	Stunting (Z-score: -2) Height in upright position (cm)	Underweight (Z-score: -2) Weight (kg)	Stunting (Z-score: -2) Height in upright position (cm)	Underweight (Z-score: -2) Weight (kg)
24	79.2	10.1	78.0	9.4
25	79.9	10.2	78.8	9.6
26	80.6	10.3	79.6	9.8
27	81.3	10.4	80.3	9.9
28	82.0	10.5	81.0	10.1
29	82.7	10.6	81.7	10.2
30	83.4	10.7	82.5	10.3
31	84.1	10.9	83.2	10.5
32	84.7	11.0	83.8	10.6
33	85.4	11.1	84.5	10.8
34	86.0	11.2	85.2	10.9
35	86.7	11.3	85.8	11.0
36	87.3	11.4	86.5	11.2
37	87.9	11.5	87.1	11.3
38	88.6	11.7	87.7	11.4
39	89.2	11.8	88.4	11.5
40	89.8	11.9	89.0	11.6
41	90.4	12.0	89.6	11.8
42	91.0	12.1	90.2	11.9
43	91.6	12.3	90.7	12.0
44	92.2	12.4	91.3	12.1
45	92.7	12.5	91.9	12.2
46	93.3	12.6	92.5	12.3
47	93.9	12.8	93.0	12.5
48	94.4	12.9	93.5	12.6
49	95.0	13.0	94.1	12.7
50	95.5	13.1	94.6	12.8
51	96.1	13.3	95.1	12.9
52	96.6	13.4	95.6	13.0
53	97.1	13.5	96.2	13.1
54	97.7	13.8	96.7	13.2
55	98.2	13.9	97.2	13.3
56	98.7	14.1	96.6	13.4
57	99.2	14.2	98.1	13.5
58	99.7	14.2	98.6	13.6
59	100.2	14.3	99.1	13.7

Thresholds for wasting (wt/ht) and obesity (wt/ht) (length in lying position: 49 - 100 cm)

	BOYS	GIRLS

Height (cm)	Wasting (Z-score: -2) Weight (kg)	Obesity (Z-score: +2) Weight (kg)	Wasting (Z-score: -2) Weight (kg)	Obesity (Z-score: +2) Weight (kg)
49	2.5	4.2	2.6	4.0
50	2.5	4.4	2.6	4.2
51	2.6	4.6	2.7	4.4
52	2.8	4.8	2.8	4.7
53	2.9	5.0	3.0	4.9
54	3.1	5.3	3.1	5.2
55	3.3	5.6	3.3	5.4
56	3.5	5.9	3.5	5.7
57	3.7	6.1	3.7	6.0
58	3.9	6.4	3.9	6.3
59	4.1	6.7	4.1	6.6
60	4.4	7.1	4.3	6.9
61	4.6	7.4	4.6	7.2
62	4.9	7.7	4.8	7.5
63	5.2	8.0	5.0	7.8
64	5.4	8.3	5.3	8.1
65	5.7	8.7	5.5	8.4
66	6.0	9.0	5.8	8.7
67	6.2	9.3	6.0	9.0
68	6.5	9.6	6.3	9.3
69	6.8	9.9	6.5	9.6
70	7.0	10.2	6.8	9.9
71	7.3	10.5	7.0	10.2
72	7.5	10.8	7.2	10.5
73	7.8	11.1	7.5	10.7
74	8.0	11.4	7.7	11.0
75	8.2	11.6	7.9	11.2
76	8.4	11.9	8.1	11.4
77	8.6	12.1	8.3	11.7
78	8.8	12.4	8.5	11.9
79	9.0	12.6	8.7	12.1
80	9.2	12.9	8.8	12.3
81	9.4	13.1	9.0	12.6
82	9.6	13.3	9.2	12.8
83	9.7	13.5	9.4	13.0
84	9.9	13.7	9.6	13.2
85	10.1	14.0	9.7	13.4
86	10.3	14.2	9.9	13.6
87	10.5	14.4	10.1	13.9
88	10.6	14.7	10.3	14.1
89	10.8	14.9	10.5	14.3

90	11.0	15.1	10.7	14.5
91	11.2	15.3	10.9	14.8
92	11.4	15.6	11.1	15.0
93	11.6	15.8	11.3	15.3
94	11.9	16.1	11.5	15.6
95	12.1	16.3	11.8	15.9
96	12.3	16.6	12.0	16.1
97	12.5	16.8	12.2	16.5
98	12.8	17.1	12.5	16.8
99	13.0	17.4	12.8	17.1
100	13.3	17.7	13.1	17.4

Thresholds for wasting (wt/ht) and obesity (wt/ht) (stature, upright position: 75 - 127 cm)

Height (cm)	BOYS		GIRLS	
	Wasting (Z-score: -2) Weight (kg)	Obesity (Z-score: +2) Weight (kg)	Wasting (Z-score: -2) Weight (kg)	Obesity (Z-score: +2) Weight (kg)
75	7.9	12.7	7.7	12.3
76	8.1	12.9	7.9	12.5
77	8.3	13.2	8.1	12.7
78	8.5	13.4	8.3	13.0
79	8.7	13.6	8.5	13.2
80	8.9	13.9	8.7	13.4
81	9.2	14.1	8.9	13.6
82	9.4	14.3	9.1	13.9
83	9.6	14.6	9.3	14.1
84	9.7	14.8	9.5	14.3
85	9.9	15.0	9.7	14.6
86	10.1	15.3	9.9	14.8
87	10.3	15.5	10.1	15.1
88	10.5	15.7	10.3	15.3
89	10.7	15.9	10.5	15.6
90	10.9	16.2	10.7	15.8
91	11.1	16.4	10.8	16.1
92	11.3	16.7	11.0	16.3
93	11.5	16.9	11.2	16.6
94	11.7	17.2	11.4	16.9
95	11.9	17.4	11.6	17.2
96	12.1	17.7	11.8	17.5
97	12.4	17.9	12.0	17.8
98	12.6	18.2	12.2	18.1
99	12.8	18.5	12.4	18.4

100	13.0	18.8	12.7	18.7
101	13.2	19.1	12.9	19.0
102	13.5	19.4	13.1	19.3
103	13.7	19.7	13.3	19.6
104	13.9	20.0	13.5	20.0
105	14.2	20.4	13.8	20.3
106	14.4	20.7	14.0	20.7
107	14.7	21.1	14.3	21.0
108	14.9	21.4	14.5	21.4
109	15.2	21.8	14.8	21.8
110	15.4	22.2	15.0	22.2
111	15.7	22.6	15.3	22.5
112	16.0	23.1	15.6	23.0
113	16.3	23.5	15.9	23.4
114	16.6	24.0	16.2	23.8
115	16.9	24.4	16.5	24.3
116	17.2	24.9	16.8	24.8
117	17.5	25.4	17.1	25.3
118	17.9	26.0	17.4	25.8
119	18.2	26.5	17.7	26.4
120	18.5	27.1	18.1	27.0
121	18.9	27.6	18.4	27.6
122	19.2	28.2	18.8	28.3
123	19.6	28.9	19.1	29.0
124	20.0	29.5	19.5	29.7
125	20.4	30.2	19.9	30.5
126	20.7	30.9	-	-
127	21.1	31.6	-	-

6.3.2 Women

Thresholds for Wasting (BMI<18.5) and Obesity (BMI>27.5)

Stature (cm)	Wasting (BMI: 18.5) Weight (kg)	Obesity (BMI: 27.5) Weight (kg)
145	38.9	57.8
146	39.4	58.6
147	40.0	59.4
148	40.5	60.2
149	41.1	61.1

150	41.6	61.9
151	42.2	62.7
152	42.7	63.5
153	43.3	64.4
154	43.9	65.2
155	44.4	66.1
156	45.0	66.9
157	45.6	67.8
158	46.2	68.7
159	47.4	69.5
160	47.4	70.4
161	48.0	71.3
162	48.6	72.2
163	49.2	73.1
164	49.8	74.0
165	50.4	74.9
166	51.0	75.8
167	51.6	76.7
168	52.2	77.6
169	52.8	78.5
170	53.5	79.5
171	54.1	80.4
172	54.7	81.4
173	55.4	82.3
174	56.0	83.3
175	56.7	84.2
176	57.3	85.2
177	58.0	86.2
178	58.6	87.1
179	59.3	88.1
180	59.9	89.1
181	60.6	90.1
182	61.3	91.1
183	62.0	92.1
184	62.6	93.1

6.4 Nutrient requirements

Nutrient requirements depend on the biological status of a person (gender, age, build, pregnancy, breastfeeding, etc.), health and nutritional conditions, physical activities and the body heat produced by the person. In addition to these, allowance must be made for external variables, such as ambient temperature and nutrient reserves, and increased needs under some environmental conditions - for example in order to counteract increased attacks by infections or irregular feeding.

Even if these conditions have been accurately determined, there is not always agreement at the international level. Nutritional recommendations are not consistent from one country to another. These differences are evident in the nutrient recommendations published over the last ten years.

The nutrient requirements listed on the following pages have been adapted from FAO/WHO recommendations. These recommendations are accepted in most developing countries.

Table 11. Average Energy and Protein Requirements of Infants and Small Children

Age	weight ^a (kg) ^c	Energy Requirements				Protein Requirements ^b	
		kcal/kg	kJ/kg	kcal/day	kJ/day	g/kg ^c	g/day ^c
Months:							
3-6	7	100	418	700	2300	1.85	13
6-9	8.5	95	397	810	3400	1.65	14
9-12	9.5	100	418	950	4000	1.50	14
Years:							
1-2	11	105	439	1150	4800	1.20	13.5
2-3	13.5	100	418	1350	5700	1.15	15.5
3-5	16.5	95	397	1550	6500	1.10	17.5

^a Average weight for boys and girls at the mean age of the age group according to NCHS.

^b Based on the protein quality (amino acid content and digestibility) of eggs or milk.

^c Rounded to the nearest 0.05 or 0.5

World Health Organization (1985), Energy and protein requirements, Report of a Joint FAO/WHO/UNU Expert Consultation, Technical Report Series 724, WHO, Geneva

6.5 Randomized number table

The randomized number table on the following two pages consist of the 5,000 digits zero to nine in random order. From the point of view of statistical accuracy, if such tables are used repeatedly they cannot be considered "random." However, for practical use in evaluating surveys they are quite sufficient. It is advisable to obtain a new set of random numbers from time to time to replace the old ones.

Statistical textbooks contain random number tables for determining random sequences. If you have such tables available, these also can be used.

The digits in the tables may either be read from left to right or from top to bottom. When a row of numbers is finished then the next one down is taken. Similarly when using columns take the next one right. Assume that a randomly selected number between one and five is required. Go arbitrarily to any position in the table and read right for the next number between one and five. When you find such a number that is your randomly selected number. If you need another such number then start one over from where you finished last time, no matter where in the group of digits that may be. If you want a number with two digits then the first digit is in the ten's place and the second in the unit's place.

Every time a new number is sought you should start immediately after the previous identified number.

Therefore mark the last digit used each time with a pencil.

Table 12. Randomized numbers

	0	1	2	3	4	5	6	7	8	9
0	59894	12161	60017	54948	45889	84002	53390	00386	09974	42942
1	36638	57682	82157	75236	15013	04478	24344	20134	03219	16422
2	18134	34678	81756	91082	64920	84396	86973	41828	01084	54335
3	08971	20750	47001	25140	82781	21128	91527	54397	37148	83053
4	77858	82288	15606	69731	64180	06684	59604	83386	85501	59111
5	28155	21474	24559	42851	68312	78638	07337	36209	88222	36321

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6	64244	55237	79445	67676	38589	21596	69454	33332	62103	71010
7	84527	81383	39580	97882	34713	07567	62000	54562	99003	47527
8	60637	95417	01655	24389	47676	10846	51697	41868	89061	92304
9	67185	14448	65666	15129	98140	11435	56872	61624	75319	86429
10	84867	34444	48296	30314	46645	97312	00382	31990	19571	87550
11	67726	35108	02092	28688	69855	67782	80856	44613	81416	25652
12	22590	53549	53132	13576	89810	38804	12742	63263	07314	77356
13	98256	69696	37975	65444	91969	15821	18313	52475	57442	40871
14	96887	07346	22199	05775	38284	56418	68081	88167	57441	72314
15	41726	17042	84357	36789	87063	74298	77368	07509	20477	44428
16	02478	79787	24505	04336	64329	36714	95953	99966	64670	94482
17	60665	90351	47623	94771	38658	34888	61333	25702	77802	55660
18	05633	69585	62760	46055	36368	64071	61925	66912	62756	68569
19	23268	92767	23349	18108	97470	82625	53859	30831	57548	00430
20	75667	13924	93820	32535	71745	33648	88736	53869	94335	73074
21	88723	45432	33459	09728	20055	91780	26544	40596	96749	33488
22	52869	76944	33982	14236	44819	92626	63955	34411	10628	11044
23	20472	60192	40431	48094	63991	69972	97926	94290	86854	24325
24	27138	05002	16419	16862	38965	91742	62237	33525	05062	36222
25	01372	91112	38460	08183	54099	27957	22380	80641	00536	18372
26	93123	34477	54515	71820	68076	48672	45203	52246	86073	37355
27	03329	83243	40113	41306	39158	74316	78975	70461	96806	78551
28	81932	57206	19496	65044	62464	85314	02335	82652	21065	90751
29	57795	15755	01736	24770	53011	57617	35043	49201	60833	75054
30	71541	44832	57657	78895	58013	80311	90970	88068	67880	52318
31	09450	88811	04243	20173	23783	86761	17666	44034	74815	71084
32	17776	01586	41633	54126	68224	82168	26743	49436	77304	82753
33	59654	06792	38986	91957	96697	33195	71024	20167	03048	68769
34	48299	47003	14745	38254	19621	24271	49653	65723	17507	64233
35	80783	93479	41019	12446	65966	73456	62851	90802	86619	80305
36	26589	39905	50295	52587	14356	22968	62598	39239	27332	66725
37	40703	76909	23212	82165	03971	02166	18643	14031	60420	53829
38	74702	66799	38493	41793	81902	88827	17551	04772	76847	68755
39	66750	16069	61482	27006	33612	23763	08634	07805	68651	33737
40	61242	06100	76487	52698	89181	79142	87077	60174	62738	94121
41	88168	86400	25680	03749	31223	02079	83426	75777	61584	56781
42	69487	45373	65467	06945	41539	63272	12192	35054	52066	90316
43	78180	88305	47987	29043	36868	98199	33931	03067	16052	75936
44	36313	03238	96836	11401	12431	33405	68153	91732	60871	77374
45	41405	13690	42314	08362	76226	08231	15919	82774	43572	62708
46	33185	14776	80559	08194	13535	01485	14233	94568	62409	84853
47	79689	56567	08561	05145	55956	19365	47294	99096	69428	17084
48	00113	02735	15268	03053	16466	75174	26704	45636	75908	90351
49	68222	85394	92000	73983	76136	20113	89236	87045	82930	04874
50	62111	70722	57056	47585	00578	77467	07900	04571	15488	83241
51	29928	39172	01938	39455	50717	87896	40990	83711	77947	08851
52	30974	61120	76749	65525	33742	66239	67961	32244	35861	23069
53	10049	04919	43742	05962	35709	77620	19039	75262	71003	80510
54	16587	24521	78973	64749	05300	12098	29144	54273	54338	43210
55	70895	44988	61256	82653	85303	83948	47351	94740	66865	78579
56	48472	84667	76880	00619	52843	04277	58294	56581	00253	72628

57	42529	79302	02240	79696	84366	42578	15240	67261	92166	21444
58	27394	66619	67608	33847	59586	56855	86950	05393	57594	52381
59	62415	83740	63241	17745	54207	27869	39010	11525	53274	84799
60	54532	44091	73936	09518	89543	58504	39431	56486	03832	64946
61	78971	66966	80259	24884	06339	37323	14763	26180	20626	87571
62	95032	43376	39938	20533	37634	29350	89984	68156	24941	01919
63	65516	02756	61982	40975	85222	91496	08482	27210	84989	74300
64	29970	10457	09977	25385	35707	01233	88818	31091	07100	49416
65	57984	18260	00511	28018	75217	03440	55231	85288	12683	61001
66	63736	89304	45416	14741	36506	70550	97706	83552	18358	02563
67	30916	19423	09633	53579	08788	44088	88278	02525	50545	63449
68	51554	74283	76308	43434	76771	88946	26086	89791	26818	90261
69	79340	81968	72766	49425	41586	51206	20675	14483	39131	47028
70	81685	11194	99495	28687	12385	03790	43830	52507	71625	82031
71	66594	57141	67847	87676	48832	45372	52958	32789	09071	26854
72	21445	83978	20693	78887	65156	22693	01957	89570	10880	23311
73	90181	29051	28483	65332	41777	42892	14840	64637	91223	12317
74	66669	35441	10416	77461	21342	68673	53101	27800	68670	15737
75	43396	48778	58343	44660	84910	80247	52922	92061	92823	89883
76	89263	28259	46385	68675	79244	80185	60179	01706	19352	20590
77	42769	81513	15432	39177	01788	74086	95010	32458	42006	42795
78	33039	24721	14463	10998	11901	04946	10670	45655	32885	56112
79	46153	53563	21084	29060	00647	81078	22411	23836	49568	98037
80	24264	62462	06936	81280	88554	63782	20191	13671	88837	57297
81	92829	12186	63959	78781	08419	88129	61302	40327	43046	17133
82	03871	31824	86163	47071	27718	33294	61583	07292	06049	46615
83	50979	29404	46052	45405	31699	27667	29955	15782	55318	29629
84	47755	17473	06336	14946	37813	45510	04863	58784	69084	12211
85	12258	74583	54811	22496	04953	92625	72800	14781	33974	62312
86	46605	83284	22740	33859	64186	03284	18958	16192	57526	22377
87	30395	70848	07873	65017	22859	65542	63883	49837	10588	20820
88	73905	15889	75418	83779	20966	48399	68894	29540	93319	56823
89	79202	07223	78401	29604	97469	27280	97388	98613	01872	55238
90	91147	39885	89998	72536	66987	57720	87624	27202	40171	61132
91	21082	94493	55337	78026	33981	08379	49774	37766	98289	34855
92	68775	15044	86329	70704	50754	99486	76101	93925	78272	19697
93	22402	26521	77779	57262	03856	48537	72373	84189	48273	97408
94	93273	84243	51177	05234	97835	96216	97046	19287	10932	09939
95	94033	66709	35126	49775	35020	63683	49408	27152	89896	01254
96	08628	46815	05455	16317	23667	42309	71775	41364	21980	53140
97	16929	21982	66287	88184	58914	18579	67526	10938	66656	94138
98	58207	85243	45426	45711	46807	17143	24243	87845	98620	80280
99	47124	77314	31839	99604	75720	95879	04290	14776	41652	44083

6.6 Sample presentations of survey findings in technical reports

The following pages give examples of the presentation of findings in technical reports. The results are presented as vividly as possible. As a rule, a technical report is also aimed at readers who are not nutritional experts. To accomplish this, the text and presentation must be set out in such a manner that non-experts in the field are able to understand its contents. Tables and graphs should be self-explanatory. Information in visual form in graphs can often be much more

informative and more readily understood than digital information given in tables. The following pages give some examples of tables and graphs.

6.6.1 Tables

Table 13. Demographic and socioeconomic characteristics of two low income urban communities in Belo Horizonte, Brazil (1986).

Characteristic	"Serra"	"St. Lucia/Vila Rita"	Total
Families surveyed	80	60	140
Children < 6 years	153	101	254
Household members:			
Total			
Employed ¹	6.1±2.7	6.0±2.6	6.1±2.7
Length of residence (years)	1.9±1.1*	1.8±1.1*	1.9±1.1*
Living conditions:			
Brick houses (%)			
Bedrooms (n)	96.3	88.3	92.9
Piped drinking water (%)	3.2±2.0*	3.8±1.5*	3.4±1.7*
Flushing toilets (%)	45.0	76.7	58.6
Public garbage collection (%)	23.3	25.0	24.3
Electricity connection (%)	16.3	16.7	16.5
	92.5	98.3	95.0

¹ Working: the number of members of the household who contribute financially to the household.

* Mean and standard deviation

Table 14. Educational level of parents in the Morro Sul suburb of Rio de Janeiro (1986)

Educational level	Mother		Father	
	(n)	(%)	(n)	(%)
No formal education (< 3 years schooling)	58	22.1	47	17.9
3-5 years schooling(a)	102	38.6	85	32.1
6-11 years schooling(b)	87	32.9	94	35.7
> 11 years education	11	4.2	8	2.9
No answer(c)	6	2.2	-	-
	-	-	30	11.4

(a) Primary schooling

(b) Secondary schooling

(c) Female headed households

Table 15. Prevalence of anemia among children in the two urban communities in Belo Horizonte (1986)

	"Serra"		"St. Lucia/Vila Rita"		Total children	
	(n)	(%)	(n)	(%)	(n)	(%)
Anemia (Hb < 110.0 g/L)	48	33.8	19	23.2	67	29.9
Severe anemia (Hb < 0.95 g/L)	20	14.1	4	4.9	24	10.7
Total children	142	100.0	82	100.0	224	100.0

Table 16. Prevalence of undernutrition among children of the observed villages in West Sumatra (1994)

Village	Height-for-age ^a	Weight-for-height ^a	Weight-for-height ^a
Gando Koto Baru T Balai	39.5	31.6	10.5
Gadang	47.7	34.1	15.9
Badus	48.8	43.9	9.8
Merapi	55.3	52.6	7.9
Piliang	45.5	48.5	15.2
B	39.5	23.7	15.8
Batu	35.0	30.0	15.8
Tebal	29.3	31.7	7.3
Padang	38.9	41.7	16.7
Luar S	32.4	24.3	2.7
Lubuk Gadang	40.8	35.4	10.1
Silayang			
All villages			

^a Percentage of children who show a z-score lower than -2

Table 17. Relationship between anthropometric indices and age in under-five children of West Sumatra, Indonesia (1994)

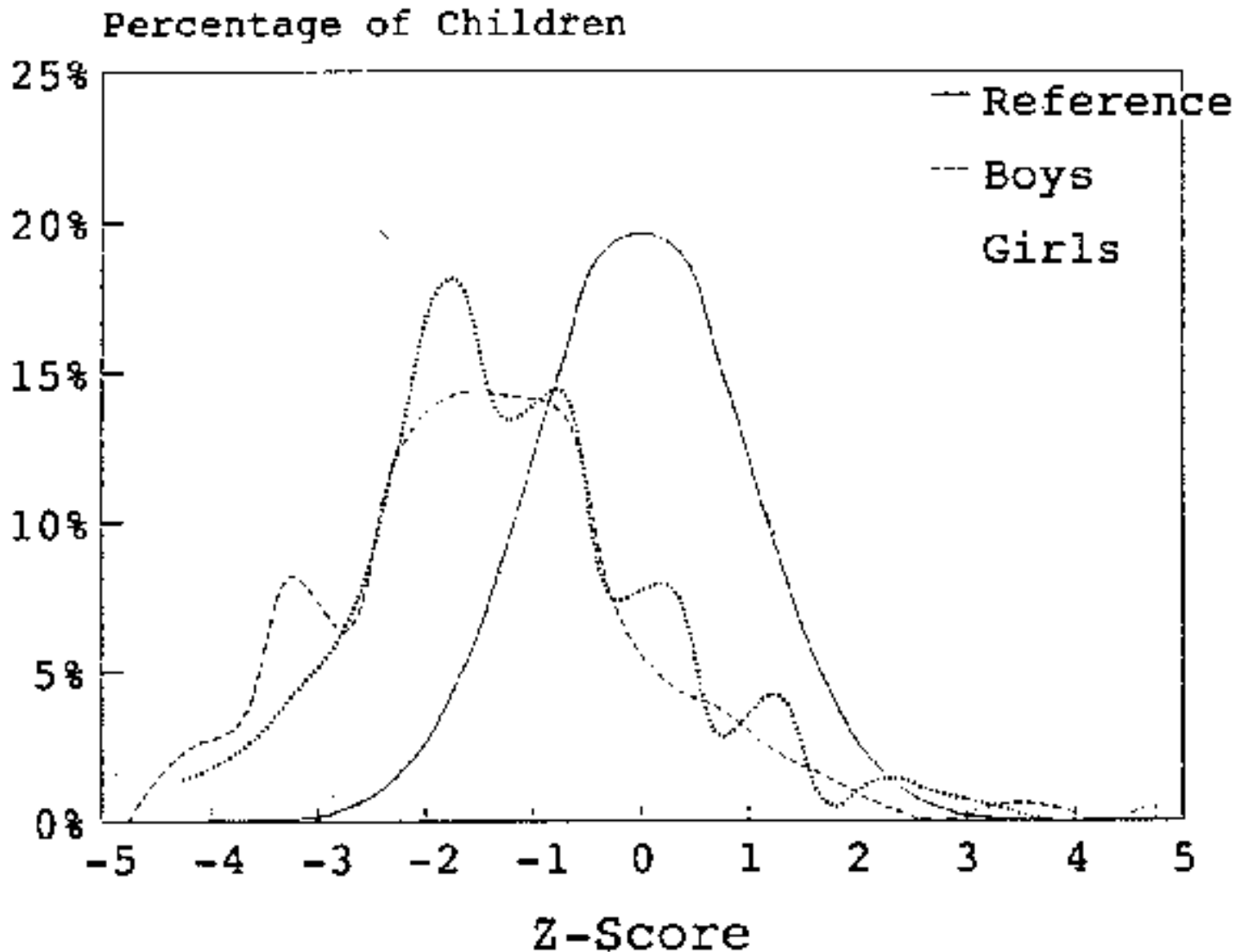
Age (months)	Children (n)	Height-for-age (mean: Z-score)	Weight-for-height (mean: Z-score)	Weight-for-age (mean: Z-score)
<6	54	-0.15±1.49	-0.15±1.84	-0.33±0.99
6-12	66	-0.94±1.12	-0.76±1.08	-1.34±1.04
12-18	51	-1.53±1.63	-0.88±1.45	-1.72±1.25
18-24	39	-1.85±1.33	-1.19±1.32	-1.86±1.16
24-36	69	-2.03±1.79	-0.59±1.21	-1.74±1.27
> 36	108	-2.59±1.18	-0.54±1.04	-1.94±0.93

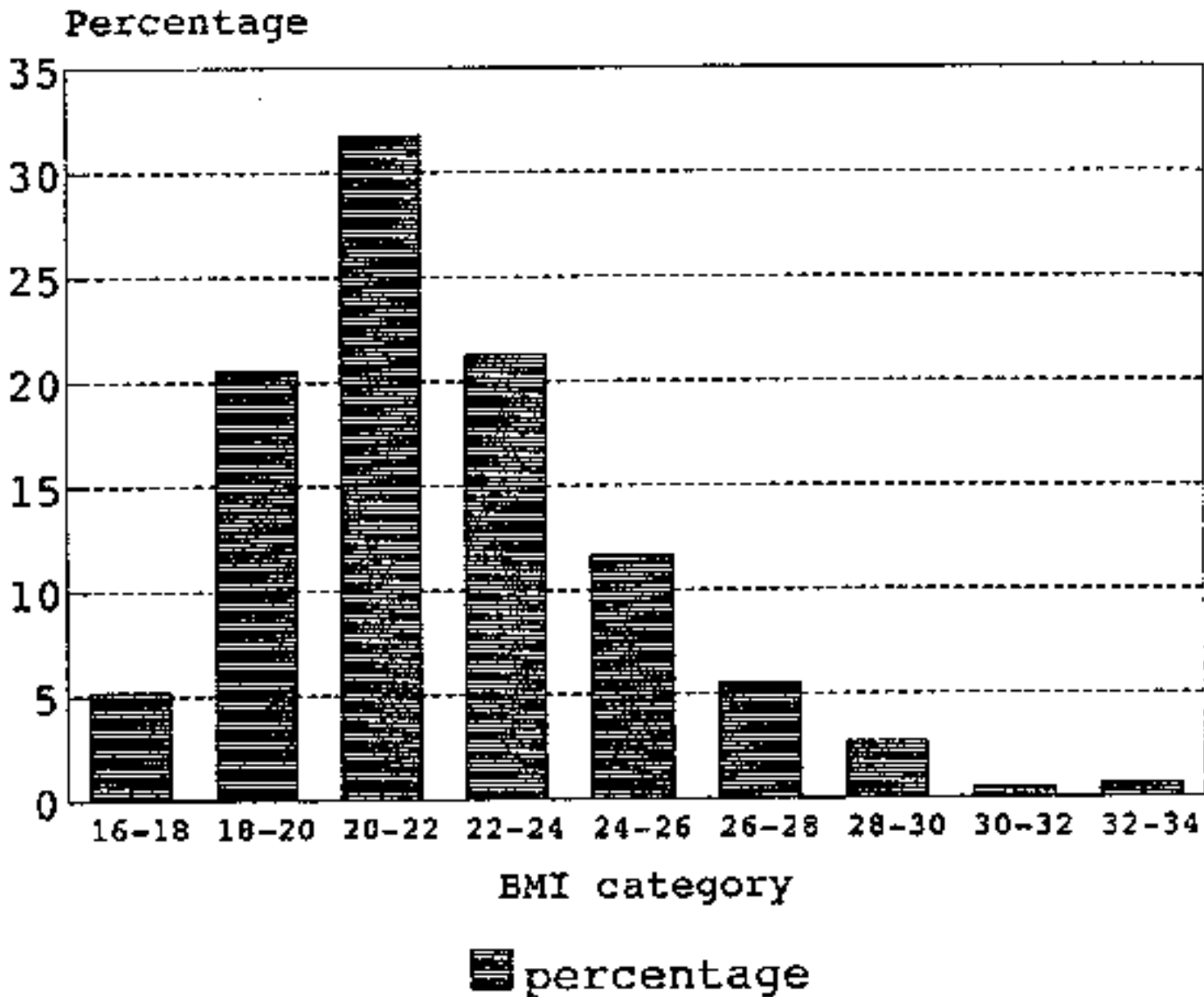
Table 18. Relationship between the presence of acute respiratory infections (ARI) and anthropometric indices in children under-five children of West Sumatra, Indonesia (1994)

ARI	Children (n)	Height-for-age (mean: Z-score)	Weight-for-height (mean: Z-score)
Yes	196	-0.81±1.24 ^a	-1.62±1.69
No	182	-0.44±1.40	-1.65±1.57

a p=0.003 ; corrected for village and age differences

6.6.2 Figures

Figure 13. Weight-for-height Z-scores of Indonesian children (N=168) from high-income families living in East-Jakarta (1994).**Figure 14.** Frequency of body-mass-index of mothers from West-Kalimantan (1994)



6.7 Determination of intra- and inter observer errors.

Basically two types of errors can occur by taking anthropometric measurement of subjects during the survey:

1. Occasional errors which happen at random because of wrong filling out of a form, incorrect reading of the weighing scale etc. These occasional errors sometimes can be detected afterwards because the measured value does not appear to be logic or consistent with other data.
2. Systematical errors, due to differences between measuring equipment or surveyors. These errors are often difficult to detect because they occur in every measurement. For example a weighing scale may underestimate a person's weight with 0.5 kg at each measurement.

Before starting the survey it is important to check whether systematic errors are likely to occur.

Therefore the quality of the equipment, and the performance of the surveyors needs to be examined. This can be carried out by using the methodology as described in the following example.

Example:

A survey which will be carried out in 15 villages plans to use 5 enumerators for weight measurements and 5 weighing scales. The 5 weighing scales and 5 enumerators should be compared, using 5-10 subjects. Weighing scales will be numbered W1 through W5, and enumerators will be numbered E1 through E5.

First, Enumerator 1 should weigh all subjects (S1- Sn) on weighing scale 1, E2 weighs all subjects on W2, E3 on W3 and so forth. To ease the weighing process, the subject that has been weighed in from E1 will pass to E2, then to E3, until the last enumerator. In a second round, E1 will weigh again all subject now with W2, E2 with E3 and finally E5 with E1. This process continues until all enumerators have weighed all subjects with all scales. Each enumerator fills out the following form with the results of the weighing.

Enumerator 1					
Subject	W1	W2	W3	W4	W5
1 kg kg			
2 kg				
3					
n					

The results will then be analyzed using analysis of variance (ANOVA) with weight as dependent variable, and weighing scale (1 to 5), enumerator (1 to 5), and subject (1 to n) as factors. No significant effect should exist for weighing scale and for enumerator, and there should also be no significant interaction between these two factors.

In case there will be a significant difference between weighing scales the faulty weighing scale should be identified and replaced. In case one of the enumerators should weigh differently from the others, the enumerators should be trained again in taking measurements.

6.8 Statistical methods

The diagram on the following page provides an overview of the most relevant statistical tests. Before selecting a suitable statistical test for analysis of data, it is necessary to first determine some of the characteristics of the data.

The more information contained in the output data, the more clearly three steps can be distinguished :

1. **Frequency:** The data are of equal value (e.g. sex: male = 1, female = 2; or place of origin: South = 1, Central = 2, North = 3).
2. **Ranking:** The data have a rank order but the size of an interval cannot be assessed (e.g. educational level: None = 1, literate = 2, completed primary education = 3, completed secondary education = 4).
3. **Measurements:** The data extend over a scale with constant intervals (e.g. height, weight, age, hemoglobin level).

Furthermore, the data must be tested as to whether or not they fall within the normal range. Here, descriptive statistics, such as skewness and kurtosis, are useful. Both values should lie between +2 and -2, indicating that the values fall with the range of normal.

Finally, the eventual selection of statistical methods depends on whether the statistics deal with only two factors (e.g. male-female, yes-no), or with more than two. Furthermore, the selection also depends on whether or not the data were collected from the same subject (e.g. a measurement for the same individual is taken at a different time).

If these characteristics are clearly understood, the suitable statistical test can be selected from the following table.

Table 19. Important Statistical Tests

		Frequency	Ranking	Measurement values	
				non-normal distribution	normal distribution
Tests for 2 factor steps	independent sampling	Chi ² -Test	Siegel-Tutzey-Test U-Test	Kolmogoroff Smirnof-Test	F-test b-test
	joint sampling	Tests for indications	Wilcoxon-Test Spearman-Order Correlation Coefficient		t-Test Product-moment Correlation Linear regression
Tests for > 2 factor steps	independent sampling	Chi ² -Test	H-test		Variance analysis Student-Newman-Keuls-Test
	joint sampling	Q-test	Friedman-Test multiple comparison between Wilcoxon and Wilcox		Variance analysis Multi-various methods

For further guidance the following statistical handbook is recommended :

B.R. Kirkwood
Essentials of Medical Statistics
Blackwell Scientific Publications
Oxford, London, Edinburgh

6.9 Addresses of national and international institutions

Scientific and technical institutions:

[Department of Health, Community Development and Nutrition](#)

*Deutsche Gesellschaft für Technische Zusammenarbeit GmbH (GTZ)
PO Box 5180
65 726 Eschborn
Germany*

[Department of Human Nutrition](#)

*London School of Tropical Medicine and Hygiene.
Keppel Street (Gower Street)
London, WC1E 7 HT
England*

Department of Human Nutrition

[Agriculture University](#)
*Postbus 8129
6700 EV Wageningen
Netherlands*

Department of Nutrition
[School of Hygiene and Public Health](#)
615 N. Wolfe Street
Baltimore, Maryland 21205
USA.

Department of Tropical Paediatrics and International Health
[Liverpool School of Tropical Medicine](#)
Pembroke Place
Liverpool, L3 SQA
England

[Division of Nutritional Sciences](#)
Cornell University
Ithaca, New York 14853-0001
USA

[Institute of Child Health](#)
Centre for International Child Health
30 Guilford Street
London, WC1N 1EH
England

Institute of Food Economy
University of Kiel
Olshausenstr. 40
D-24098 Kiel
Germany

Instituto de Nutricion de Centro America y Panama (INCAP)
Calzada Roosevelt Zona 11
Guatemala
Guatemala, C.A.

[International Food Policy Research Institute](#)
1776 Massachusetts Avenue, N.W.
Washington, D.C. 20036
USA.

Program in International Nutrition
Department of Nutrition
University of California
Davis CA 95616 USA

[SEAMEO-TROPMED Center for Community Nutrition](#)
University of Indonesia
JI Salemba Raya 6
Jakarta 10430
Indonesia

Multilateral organizations:

United Nation Administration Committee on Coordination - [Subcommittee on Nutrition](#) (ACC/SCN)
c/o World Health Organization
20, Avenue Appia
CH-1211 Geneva 27
Switzerland

Food and Agriculture Organization of the United Nations System ([FAO](#))
Food Policy and Nutritional Division,
Via delle Terme di Caracalla

*I - 00100 Rome
Italy*

and the following FAO regional sub-organizations:

*Latin American region
Regional Office for Latin America and the Caribbean (RLAC)
Avda. Santa Maria 6700
Santiago
Chile*

*African region
Regional Office for Africa (RAFR)
PO Box 1628
Accra
Ghana*

*Asian region
Regional Office for Asia and the Pacific (RAPA)
Maliwan Mansion
Phra Atit Road
Bangkok 10200
Thailand*

*World Health Organization ([WHO](#))
[Nutrition Unit](#)
20, Avenue Appia
CH-1211 Geneva 27
Switzerland*

and the following WHO regional sub-organizations:

*American region
Regional Officer on Nutrition
Pan-American Health Organization (PAHO)
525 Twenty-Third Street, N.W.
Washington, D.C. 20037-2895
USA*

*Northern African region
Regional Nutritional Advisor
WHO/EMRO
P. O. Box 1517
Alexandria 21511
Arab Republic of Egypt*

*Africa, south of the Sahara
Regional Nutritional Advisor
World Health Organization/AFRO
Regional Office for Africa
Boite Postale 6
Brazzaville
Congo*

*Southern and Southeast Asian region
Regional Advisor in Nutrition
World Health Organization
Regional Office for South East Asia*

*World Health House
Indraprastha Estate
Mahatma Gandhi Marg
New Delhi - 110 002
India*

*Pacific region
WHO/WPRO
United Nations Avenue
P.O. Box 2932
12115 Manila
Philippines*

*European region
WHO/European Office for Europe
8 Scherfigsvej
DK-2100 Copenhagen O
Denmark*

United Nations Children's Fund ([UNICEF](#))

*UNICEF House
3 United Nations Plaza
New York, N.Y. 10017
USA*

and its regional sub-organizations

*American region
UNICEF Americas and Caribbean Office
Apartado Aereo 7555
Bogota
Columbia*

*Northern African and Middle East region
UNICEF Middle East and North Africa Regional Office
P.O. Box 811 721
Amman
Jordan*

*Western and Central African region
UNICEF West and Central Africa Regional Office
Boite Postale 443
Abidjan 04
Ivory Coast*

*Eastern and Southern African region
UNICEF Eastern and Southern Africa Regional Office
P.O. Box 44145
Nairobi
Kenya*

*South Central Asian region
UNICEF Regional Office for South Central Asia
73 Lodi Estate
New Delhi 110 003
India*

*Southern and Eastern Asian region
UNICEF East Asia and Pakistan Regional Office*

P. O. Box 2-154
Bangkok 10200
Thailand

World Food Programme ([WFP](#))

Via Cristoforo
Colombo, 426
I-00145 Rome
Italy

United Nations Development Programme ([UNDP](#))

One New York Plaza
New York, N.Y. 10017
USA

United Nations High Commissioner for Refugees ([UNHCR](#))

Center William Rappard
154, Rue de Lausanne
CH-1202 Geneva
Switzerland

United Nations Education and Culture Organization ([UNESCO](#))

7, Place de Fontenoy
F-75700 Paris
France

International Found for Agriculture Development ([IFAD](#))

Via del Serafico 107
I-00142 Rome
Italy

The World Bank

[Population, Health and Nutrition Department](#)

1818 H Street N.W.
Washington, D.C. 20433
USA

and regional development banks, such as

Asian Development Bank

P. O. Box 789
Manila
Philippines

African Development Bank

01 P.O. Box 1387
Abidjan
Ivory Coast

Bilateral Organizations:

Australia

AIDAB
G.P.O. Box 887
Canberra A.C.T.
Australia 2601

Canada

Canadian International Development Authority (CIDA)

*Place du Centre
200 Promenade du Portage
Hull, Quebec, K1A 0G4*

Denmark

*Ministry of Foreign Affairs
Q. Asiatisk
TLADS
DK 1448 Copenhagen*

Germany

*Ministry of Economic Cooperation and Development
Friedrich-Ebert-Allee 114-116
D- 53113 Bonn
Germany*

Italy

*Department of Development Cooperation
Ministry of Foreign Affairs
I-00100 Rom*

Norway

*Nutritional Consultant
c/o HEFA
Royal Norwegian Ministry of Development Cooperation
P.O. Box 8142
N-033 Oslo 1*

Sweden

*Swedish International Development Agency (SIDA)
Birger Jarlsgatan 61
S-10525 Stockholm*

The Netherlands

*Coordinator of Food and Nutrition
Ministry of Foreign Affairs
Bureau DST/PI(a)
P.O. Box 20061
NL-2500 EB Den Haag*

United Kingdom

*The Secretary
Overseas Development Association (ODA)
1 Stag Place
London SW1 5DH
England*

United States of America

*Director of Nutrition
Agency of International Development (USAID)
Department of State
23 and C Street, N.W.
Washington, D.C. 20001*

Non-governmental organizations:

*[American Public Health Association \(APHA\)](#)
Cleaning House of Infant Feeding and Maternal Nutrition
1015 15th Street N.W.
Washington, D.C. 20005
USA*

AMREF
P.O. Box 30125
Nairobi
Kenya

[Médecins Sans Frontières France](#)

Département Médical
8, rue Saint-Sabin
F-7544 Paris Cedex 11
France

[OXFAM](#)

Medical Unit
274 Banbury Road
Oxford OX2 70Z
England

[Save the Children](#)

54 Wilton Road
Westport, CT 06880
USA

6.10 WHO global database on child growth

Description:

Growth assessment is the best single measure for defining the health and nutritional status of children, while serving as an indirect indicator of the quality of life of entire populations. The goal of reducing, by the year 2000, severe and moderate protein-energy malnutrition in children under five years of age by half of 1990 prevalence levels has been endorsed in numerous international forums. The *WHO Global Database on Child Growth*, which is a standardized compilation of anthropometric data from population-based nutritional surveys conducted around the world from 1960 onwards, permits monitoring progress towards achieving this goal. The aim is to describe the worldwide distribution of child growth failure, to provide an accurate picture of child growth as a basis for intercountry and interregional comparisons, and to facilitate monitoring of national, regional and global trends. The standardized presentation of data by country in the database includes: a) systematic use of the NCHS/WHO international reference population, b) display of growth retardation prevalences for preschool children, as measured by the proportion of weight-for-age (underweight), height-for-age (stunting) and weight-for-height (wasting) below -2 (moderate) and -3 (severe) standard deviations (SD) from the median of the reference population, c) display of the prevalence of overweight, as measured by the proportion of children with weight-for-height above +2 SD, d) display of Z-score means and SD for the three indices, and e) stratification of the results according to age, sex, region, and rural/urban. This detailed account of data on child malnutrition will be relevant to national authorities in planning and evaluating nutrition interventions; it will also serve as a baseline for child nutritional status worldwide for all who are concerned with protecting and promoting optimal child growth. It is hoped that continual updating of the database will stimulate the gathering and sharing of new information, particularly in those countries and regions thus far scarcely investigated. At present the database covers over 80% of the total population of under-5-year-olds worldwide.

Source:

WHO programme information derived from population-based nutritional surveys.

Notes on usage:

Queries are received via all forms of communication. Responses are dispatched as print-outs of the relevant country data/references. Dissemination via WHO/LAN is being implemented.

Responsible Unit:

Please address any comments or suggestions concerning the contents to:

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6.11 Construction plan for an anthropometer

6.12 Literature for further study

Beaton G, Kelly A, Kevany J, Martorell R, & Mason J. Appropriate uses of child anthropometry. ACC/SCN (SOA No.7). Geneva, Switzerland, 1990.

Beghin I, Cap M, & Dujardin B. A guide to nutritional assessment. WHO. Geneva, Switzerland, 1988.

Bennet S, Woods T, Liyanage WM, & Smith DL. A simplified general method for cluster-sample surveys of health in developing countries. Rapp trimest statist sanit mond 1991; 44:98-106.

Cameron N. The measurement of human growth. Croom Helm Ltd., Provident House, Burrell Row, Beckenham, Kent, UK, 1984.

Center for Disease Control and Health Service Administration. Weighing and measuring children: a training manual for supervisory personnel. Center for Disease Control, Atlanta, Georgia, USA, 1980.

Council for International Organizations of Medical Sciences (CIOMS). International guidelines for ethical review of epidemiological studies. Geneva, Switzerland, 1991.

Fink A & Kosecoff J. How to conduct surveys. Step-by-step guide. Ninth printing. Sage Publications. Newbury Park, London, UK; New Delhi, India, 1991.

FAO. Conducting small-scale nutrition surveys. A field manual. Nutrition in Agriculture No. 5. Food and Agricultural Organization of the United Nations. Rome, 1990.

Fowler FJ. Survey research methods. Saga Publications. New York, USA, 1984.

Gibson RS. Principles of nutritional assessment. Oxford University Press. Oxford, New York, Tokyo, 1990.

den Hartog AP & van Staveren WA. Manual for social surveys on food habits and consumption in developing countries. Pudoc. Wageningen, The Netherlands, 1983.

Hendratta L & Johnston M. Manual for community based under-fives weighing programme. Yayasan Indonesia Sejahtera, Jakarta, Indonesia, 1978.

Jelliffe DB. Paediatrics in the tropics. Teaching Aids at Low Costs. TALC. St. Albans, UK, 1985.

Jelliffe DB. The assessment of nutritional status of the community. WHO. Geneva, Switzerland, 1966.

Jelliffe DB. Community nutritional assessment. Oxford University Press. Oxford, New York, Tokyo, 1989.

Jennings J, Gillespie S, Mason J, Lofti M, & Scialfa T. Managing successful nutrition programmes. ACC/SCN (SOA No.8). Geneva, Switzerland, 1991.

Katz J. Sample-size implications for population-based cluster surveys of nutritional status. Am J Clin Nutr. 1995; 61:155-160.

- Kirkwood BR. Essentials of medical statistics. Blackwell Scientific Publications. Oxford, London, Edinburgh, UK, 1988.
- List B. Ernährungsaspekte in der ländlichen Entwicklung. 2. Auflage, DSE & GTZ. Feldafing, Eschborn, Germany, 1988.
- Lohmann TG, Roche AF, & Martorell R. Anthropometric standardization reference manual. Abridged edition. Human Kinetics Books.ampaign, Illinois, USA, 988.
- Lwanga SK & Lemeshow S. Sample size determination in health studies - a practical manual. WHO. Geneva, Switzerland, 1991.
- Martorell R. Nutrition and health status indicators. LSMS Working Paper Series No. 13, The World Bank. Washington, USA, 1982.
- Médecins Sans Frontières. Nutrition Guidelines. 1st edition. Paris, 1995
- Morley D & Woodland M. See how they grow: monitoring child growth for appropriate health care in developing countries. Oxford University Press. Oxford, New York, Tokyo, 1979.
- Sahn DE, Lockwood R, & Scrimshaw NS. Methods for the evaluation of the impact of food and nutrition programmes. The United Nations University. Tokyo, Japan, 1984.
- Scrimshaw S and Hutardo. Rapid Assessment Procedures for Nutrition and Primary Health Care. The United Nations University. Tokyo, Japan, 1987.
- Sichert W, Oltersdorf U, Winzen U, & Leitzmann C. Ernährungs-Erhebungs-Methoden. Schriftenreihe der Ernährungsverhalten e.V., Band 4, Beiheft der Zeitschrift Ernährungs-Umschau, Umschau-Verlag. Frankfurt am Main, Germany, 1984.
- Mith PG & Morrow RH. Methods for field trials of Interventions against tropical diseases: a 'toolbox.' Oxford University Press. Oxford, New York, Tokyo, 1993.
- Tinibu A. Weight charting and its significance in child health. University of North Carolina, African Health Schooling Institutions Project. Chapel Hill, USA, 1978.
- United Nations. How to weigh and measure children. National Household Survey Capability Programme. New York, USA, 1986.
- Vaughan JP & Morrow RH. Manual of epidemiology for district health management. WHO. Geneva, Switzerland, 1989.
- Werner D. Helping health workers learn: a book of methods, aids and ideas for instructions at the village level. Hesperian Foundation. Palo Alto, USA, 1982.
- World Health Organization. Growth charts and home based child's records in maternal and child health care. An appropriate approach and reference manual for their evaluation. Geneva, Switzerland, 1978.
- World Health Organization. Guidelines for training community health workers in nutrition. Publication No. 59, 2. edition. Geneva, Switzerland, 1986.
- World Health Organization. Measuring change in nutritional status. Geneva, Switzerland, 1983.
- World Health Organization. Training modules for household surveys on health and nutrition. Geneva, Switzerland, 1988.
- World Health Organization. Indicators for assessing breast-feeding practices. WHO/CDD/SER/91.14. Geneva, Switzerland, 1991.
- World Health Organization. Physical status: the use and interpretation of anthropometry. Report of a WHO Expert Committee. WHO Technical Report Series 854. Geneva, Switzerland, 1995.