A MANUAL FOR THE BASIC ASSESSMENT OF NUTRITION STATUS IN POTENTIAL CRISIS SITUATIONS

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES • PUBLIC HEALTH SERVICE • Centers for Disease Control

A MANUAL FOR THE BASIC ASSESSMENT OF NUTRITION STATUS IN POTENTIAL CRISIS SITUATIONS

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In crisis situations such as famine or war, PROTEIN ENERGY MALNUTRITION (PEM) is generally the most important nutrition problem. Severe PEM, usually seen as MARASMUS, KWASHIORKOR, or a combination of the two forms (MARASMIC-KWASHIORKOR), affects broad age groups and in crisis situations often progresses quite rapidly from these acute forms to death. Other nutrition problems such as stunting, vitamin and mineral deficiencies are of lesser immediate importance when these populations are suffering from PEM. Problems of anemia, night blindness, beriberi, and scurvy should be addressed only after the extent of PEM has been characterized and programs for its relief have been undertaken.

This manual is intended for use by short-term consultants called upon to assess the nutrition status of population groups who may have been subjected to severe nutrition hardships due to events such as famine, drought or war. The guide is designed to be flexible enough for use in most situations, but quite specific so that the basic epidemiological questions of who? what? and where? can be answered and decisions can be made regarding subsequent surveys, relief efforts, and technical assistance. In this sense this guide is a first-level primer for nutrition status evaluation. Other more detailed references to nutrition, nutrition assessment, and health management in crisis situations can be found in Annex A.

Protein Energy Malnutrition

MARASMUS - This condition is most frequently seen in times of acute food shortage. Nutritional marasmus results from prolonged starvation with the primary deficiency in energy (calories). There is a severe wasting away of fat and muscle, and the clinical appearance is one of skin and bone. The severity of marasmus as measured by risk of death is related to the severity of wasting. Anthropometry is a useful guide to the severity of this condition. Other clinical signs include:

* "Old man" appearance

* No edema

* "Baggy Pants" appearance (loose skinfolds over the buttocks left as a result of fat and muscle wasting)

* Children exhibiting clinical signs of marasmus may be alert and active

KWASHIORKOR - Kwashiorkor is generally thought to be the result of lack of protein in the diet. The main sign of this condition is edema. Edema often begins in the lower extremities and continues to the arms and face. The severity of kwashiorkor is not related to the degree of fat and muscle wasting involved. Indeed, it may be absent and the picture confounded by normal body weight as a result of increased accumulated fluid. Anthropometry is not always useful in gauging the severity of

this type of malnutrition. Because of facial edema, children appear to be fat and parents frequently regard these children as well-fed. Other signs include:

* Hair changes such as depigmentation, hair curliness, increased pluckability.

* Skin lesions are progressively dry flaky skin, depigmentation, peeling skin, and, when infected, ulceration.

* Kwashiorkor children are usually apathetic and frequently have poor appetites.

MARASMIC-KWASHIORKOR - This condition may include various combinations of signs such as a marasmic appearance with lower extremity edema. This often makes the clinical picture very confusing and difficult to assess.

Protein Energy Malnutrition is frequently an ongoing problem in less developed countries, even in non-crisis situations. PEM most commonly affects children between the ages of 6 and 24 months. During this period children are weaned, and the change to an often inadequate food source, coupled with high nutrition requirements for growth and episodes of acute infection, are responsible for creating a high risk nutrition situation. Pastoral children, however, almost always develop marasmus rather than kwashiorkor and are frequently affected between 5 and 9 years of age when they are expected to join in adult herding activities. The etiology for these clinical conditions in pastoral children is not clear.

In times of widespread emergencies, acute forms of PEM are more common. In assessing nutrition status in time of crisis, care must be taken to differentiate the "background" prevalence of malnutrition from that caused by the emergency situation. One or two children with classical marasmus, or "anecdotes" of malnutrition in hospitalized patients, does not constitute sufficient evidence that there is a community problem. During a crisis, PEM is seen in broad age groups that include children under 2 years of age, primary school-age children and even young adults and the elderly. Marasmus and kwashiorkor may actually represent only about 10 percent of the acute protein energy malnutrition seen in these populations. Wasting of body fat and muscle mass, not yet clinically apparent as marasmus and kwashiorkor, may be much more widespread in these populations.

Anthropometric Assessment

Suitable methods for the quantification of both the acute and marginal cases of PEM must be undertaken early in the relief effort so that appropriate measures can be instituted and future planning decisions can be made. The anthropometric index of weight for height is the best indicator of nutrition status in crisis situations. Other indices such as weight for age, arm circumference, and arm circumference for height (QUAC stick), have been used, but they are substantially less reliable for use in emergency situations. Their lack of reliability is due to the inherent difficulties in collecting such data as age, the poor reproducibility of measures such as arm circumference, and the inability of these measures to distinguish slight children from undernourished ones.

Arm circumference and weight for age measures do have appropriate roles in the provision of health care for individual children in the identification of individuals who require further assessment or relief, and in the nutrition follow-up of undernourished individuals. These measures are, however, inappropriate in situations that require overall population estimates of nutrition status.

The index of weight for height is recommended for use in all crisis situations for the following reasons:

* Body weight is extremely sensitive to acute changes in food supply while height remains relatively constant.

* In children prior to puberty the relationship of body mass to height is nearly constant regardless of sex, race or age. Use of the weight for height index precludes the need to accurately determine a child's age, a procedure that often involves extensive interviewing and the construction of historical calendars.

* Subsequent morbidity and mortality have been shown to occur with at least twice the frequency in children who are of low weight for height as compared with normal children.

A reliable assessment of nutrition status in a field situation requires the following:

* A carefully chosen SAMPLE of the population. In most situations the population groups at risk will be too large to examine each person individually. A sample of this population group is selected, weighed and measured, and the data from that sample are used to provide estimates of the extent of PEM in the entire population group. The selection of a sample must be done using specific and rigid procedures so as not to under- or over-represent certain groups or individuals. Concerned parents bringing sick children for medical attention may over-represent the malnutrition problem, while listless children unable to leave their homes may lead to under-representation of the problem.

* ACCURATE measurements of WEIGHTS and HEIGHTS or LENGTHS. Weights must be recorded to the nearest 0.1 kilogram. Children under approximately 2 years should be measured in a recumbent position to the nearest 0.1 centimeter. Children over age 2 should be measured in a standing position, without shoes, to the nearest 0.1 centimeter. Accurate measurements to the nearest 0.1 cm are desirable, especially if the raw data may eventually be tabulated by computer. Typical field equipment for measuring weights and heights are shown in Annex B.

* ANALYSIS of the DATA. No survey of nutrition status is complete without a careful examination of the collected data and a determination of the following:

  - WHO? What population groups are primarily affected? What age, ethnic groups, sexes are most at risk of increased PEM?

  - WHAT? What are the major types of PEM found in these groups?. What is the overall prevalence of malnutrition?

  - WHERE? Where are the highest prevalences of PEM?

Conducting a Nutrition Status Assessment of a Large Population Group

The following study case is presented as an example of a simplified field survey of nutrition status. Although the case and the data presented are fictitious, they represent a realistic situation and a realistic response on the part of the consultant whose task it is to evaluate the nutrition status of this refugee group.

BACKGROUND: Country A is a tropical country located near the Equator. It has a population of about 5 million with over half being children under the age of 15. The economy is primarily subsistence farming, although about 10 percent of the GNP is attributable to coffee and tea exportation. Because of a continuing drought in the Northern State, crop yields have been 30 percent of normal during the past 3 years. This year's

harvest is predicted to be less than that because of the continuing short-fall of rains and the presence of a new tuber-destroying insect. Surplus food commodities including dried skim milk, rice, and bulgar wheat have been supplied by donor nations, but pilferage, black market activity, and poor roads have limited distribution to the rural poor of only 10 percent of the total commodities delivered at the port.

The infant mortality rate is normally between 120-140/1000. The Northern State is in a malaria zone and increased morbidity and mortality is seen during the malaria season. Some seasonal increase in PEM is seen, usually at the end of each year's dry season, concurrent with seasonal increases in measles and diarrhea.

For 5 months an estimated 50 percent of the 400,000 population in the Northern State has outmigrated. An estimated 170,000 persons have migrated to Country B. Country B has established seven refugee camps that provide a temporary residence for these immigrants. These camps range in size from 10,000 to 35,000. These camps are often overcrowded. Sanitation is poor. There are occasional outbreaks of measles in children. Newly arrived immigrants are distributed evenly to all seven camps after initial screening at the border.

Country B's limited health resources are taxed beyond capacity. Volunteer organizations have supplied teams of health workers and field hospitals to meet the immediate acute health care needs. Although rice and beans have been supplied to the camps in quantities that should be sufficient to feed the populations, recent reports from medical teams and a recent story in a national magazine detailed widespread starvation in the camps, particularly among young children.

Country B has requested technical assistance to evaluate the nutrition situation in the camps. You are asked to provide this assistance because of your fluency in the country's national language.

Because of pressing military needs, only one vehicle and one driver can be made available for the assessment. Four medical assistants are assigned. Fortunately you have brought two portable scales and two height/length measuring boards (see Annex B for illustrations of typical field equipment). You have decided to train two teams for the survey.

Survey Subjects - In the simplified field assessment technique, nutrition status is usually measured only in children between the ages of 6 and 59 months. This group of preschool children are often most vulnerable to increased morbidity and mortality during time of national crisis. Frequently children in these groups will be the first to exhibit signs of

kwashiorkor and marasmus. It is easiest to select only children who are walking but still under 110 centimeters in height. (This roughly corresponds to adult waist-height). These children are generally considered to be between the ages of 12 and 59 months. If children taller than 110 cm are measured, it is possible that some short pubescent children will be examined. Growth chart values of weight for height are not acurate for children in puberty. Children under 1 year of age, besides being more difficult to measure, are often satisfactorily nourished because they are still being breast-fed. The group of children between 12-59 months represents about 15 percent of the total population in a less developed country.

Sample Selection - The selection of an appropriate sample for a nutrition survey is a procedure that always involves compromise. The sample must be large enough so that you will be able to reliably estimate the amount of PEM in the overall population. In general populations of over 10,000, a sample size of 1,000 is generally adequate. Time and resource limitations may necessitate the reduction of sample size. While it is acceptable to conduct a survey with a smaller sample, the consultant should be aware that any reduction in sample size below 1,000 reduces the reliability of the estimate of malnutrition. In this example, a sample size of 1,000 provides a reliable estimate of the overall nutrition status for the aggregate of the seven refugee camps. Resources and time are sufficient to examine 1,000 children. (One team can weigh and measure about 200 children a day.) The sample should be selected from

individuals in all of the camps, if possible. (If some camps are not included in the sample, the reliability of the estimate decreases.) To assure that individual estimates from some camps are not over- or under-representing the extent of PEM, the sample should be selected proportionally to the population in each camp. Using rough population estimates for each camp, the number of individuals to be chosen for the weighted sample in each camp is calculated.

Total Refugee Camp Population = 170,000 Total Sample = 1,000

	Population	Ratio	Number in Sample in Camp
Camp A	10,000	10/170 X 1000	59
Camp B	35,000	35/170 X 1000	205
Camp C	20,000	20/170 X 1000	118
Camp D	30,000	30/170 X 1000	177
Camp E	17,000	17/170 X 1000	100
Camp F	30,000	30/170 X 1000	177
Camp G	35,000	35/170 X 1000	205

Based on this "weighted" sampling, if 59 individuals are randomly chosen from Camp A, 205 from Camp B, etc., the total sample will represent the entire population living in refugee camps. (Remember that new arrivals are distributed evenly among all seven camps.)

The second step in sampling is finding the starting point(s) for the survey in each refugee camp. Figure 1 is a map of refugee Camp C.

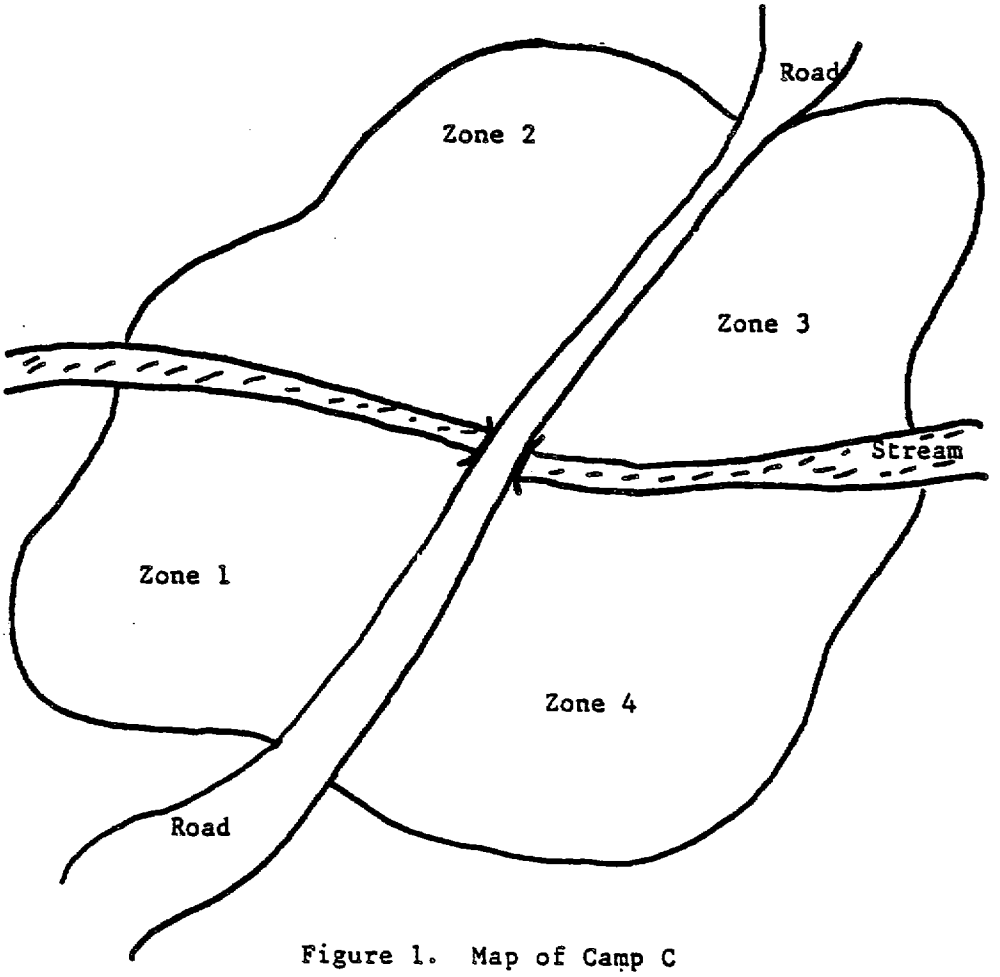


Figure 1. Map of Camp C

Camp C is naturally divided into four zones by a road and a small stream. Because the population is not evenly distributed throughout all the zones, the sample must be selected to take into account this uneven distribution. The zones and their populations are listed cumulatively and a random number is chosen between 1 and the total population of the camp. If division of the camp into existing zones is not apparent, the camp can be divided arbitrarily into discrete population groupings, or if the camp is small (less than 500 people), it can be treated as a single zone.

	Estimated Population of Zone	Cumulative Population in Camp
Zone 1	10,000	1-10,000
Zone 2	3,000	10,001-13,000
Zone 3	5,000	13,001-18,000
Zone 4	2,000	18,001-20,000

A random number between 1 and 20,000 is chosen from the Table in Annex C. The number chosen in this example is 8037. The starting point for examinations is in Zone 1.

You and your two teams (each composed of two medical assistants) proceed to Zone 1. Go to the approximate geographic center of this zone. First, choose the direction in which you will find the first household. There are many ways to make this choice. You can choose a random number from the table in Annex C that will indicate the direction (1 = north, 2 = east, 3 = south, 4 = west), or you can spin a bottle on a flat surface. The bottle points in the direction of the first household. Once you have chosen the direction, walk in that direction from the geographic center to the periphery of the extremity counting the number of housing units along this line. Then choose a random number, using Annex C, between 1 and the number of housing units you counted. That number will indicate the first household where you will begin the survey. Go to that household.

When you arrive at that housing unit, examine all eligible children there and proceed to the next closest housing unit. Always proceed to the closest housing unit, which is the household with the front door closest to the household you are currently visiting. Continue until 30 children have been examined. You have now completed the examination for the first cluster in the sample.

From your previous calculations of weighting, you know that it is necessary to examine 118 children in Camp C. You must repeat the procedure of selecting a zone and the first household in that zone until four clusters, each with 30 children, have been examined. To do this, choose another random number between 1 and 20,000, and using the cumulative population table find the zone for the starting point for the next cluster. Proceed to this zone, select a direction using a random number, walk to the periphery, counting the housing units from the center to the border, and select the starting house. Continue until another 30 children have been examined. Repeat this procedure two more times. This will complete the sampling for Camp C. The same sample selection procedures will be used in all seven camps.

Note that although random numbers were used to select zones, quadrants, and starting points, at no point in the selection procedure was the methodology "random" or haphazard. Samples must be selected using a rigid and defined methodology. Once the sample selection procedure has begun it should not be changed or modified. Selection of children for examination must never be left to the choice of the survey team members.

The children who are examined are always selected by the sampling procedure. Any exceptions to the sampling procedure will clearly bias the estimates.

Certain other procedures must be rigidly followed if an unbiased sample is to be selected:

1. Only children in households selected by the sampling procedure are to be examined.

2. All eligible children in each selected household should be examined, if at all possible.

3. The survey team members must go to the individual housing units to examine the children. Examinations should be conducted at each individual household. This will prevent children who have not been selected from being inadvertently examined.

Examination Methods - When the survey team arrives at a selected housing unit, the purpose of the examination and the weighing and measuring procedures should be explained to the parent or guardian. All eligible children (walking but less than 110 cm tall) in the housing unit should be lined up. Other children should be carefully excluded. One simple technique for aiding in the selection of eligible children is to construct a simple wooden right angle, the horizontal of which is 110 cm off the ground. Any child who can pass beneath this stick should be

included in the survey. If a child is temporarily missing but can be located for the examination, he should be found. Each child is completely examined one at a time until all eligible children in that household have been examined. If it is necessary to wait more than 15 minutes for one child to return, do not include that child in the survey. Remember to examine all children in the household. Do not exclude children because they are ill or temporarily absent.

Weighing - Suspend the scale from a branch of a tree or a house rafter. (It is helpful to have a 3 foot length of rope handy to help secure the scale.) Suspend the pants from the scale hook, turn the zero adjustment screw so that the scale reads zero. Remove the child's shoes, socks, and outer clothing. The child is to be weighed wearing only underwear. (In colder climates, it is permissible to weigh children in outer clothing.) An "average" weight of outer clothing should be subtracted from the child's total weight before calculation of the weight for height standard deviation. Place the child in the weighing pants, lifting the child's body directly, not by the loop handle of the pants, and hang the pants from the scale. Read the child's weight to the nearest 0.1 kilogram. This weight should be called out, digit-by-digit, by one team member and recorded on the data form by the other. As he transcribes the weight, this team member should repeat the weight value, digit-by-digit, to make certain that the weight has been correctly recorded.

Measuring Height - This measurement must be made with a minimum of two team members. If only one team member is present, a mother or another assistant should be used.

1. The measuring board is placed in a vertical position.

2. The child is placed on the board with his feet nearly together and his heels touching the vertical portion of the board. The child's shoulders and buttocks should be in line with his heels. Buttocks and shoulders should touch the vertical surfaces of the board.

3. The movable headpiece is carefully lowered so that it firmly touches the child's scalp. The child's head is rotated upward so that his line of sight is parallel with the ground.

4. The measurement is read digit-by-digit from the edge of the metal indicator at the top end of the headpiece.

5. The recorder then writes the height clearly on the data form in the appropriate place.

6. The measurer then looks at the data form to be sure that the measurement is recorded correctly.

Measuring length - Those children less than two years old, under 85 cm in height, or who cannot stand up unaided, must be measured lying down:

1. Position the child on the measuring device in line with the tape, supine, with the crown of the head against the immovable headboard. The child's line of sight must be perpendicular to the measuring tape (Frankfort Plane). The assistant (or parent) must apply gentle traction to ensure that the child's head is firmly against the headboard until the measurement is completed.

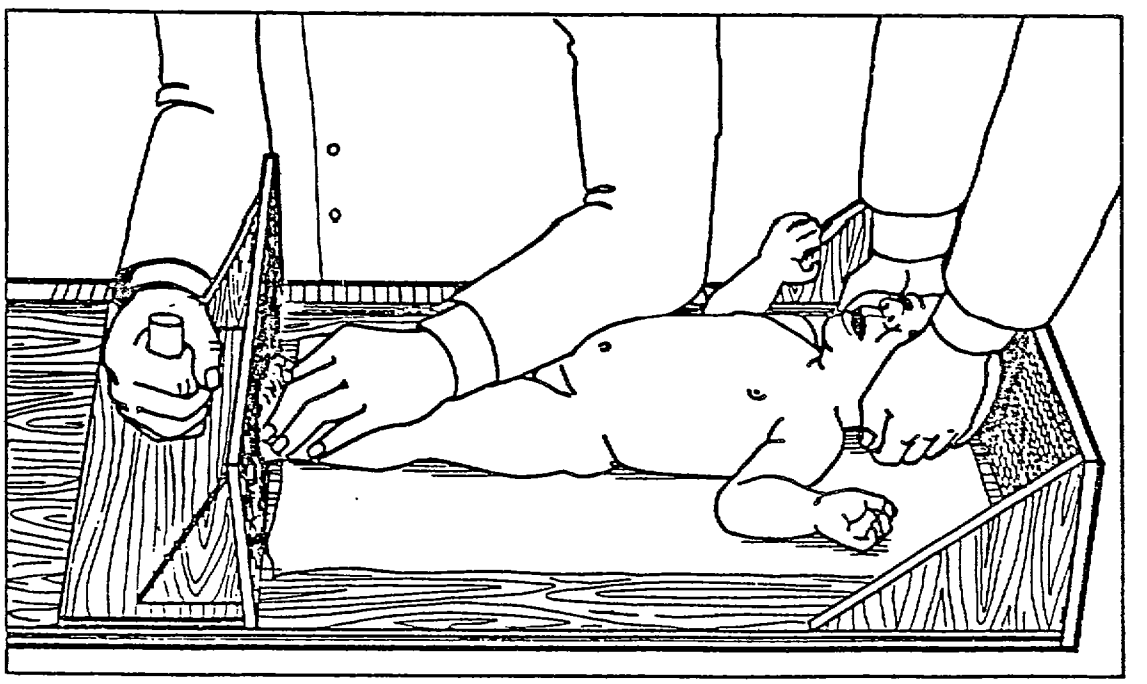
2. The measurer holds the child's knees together and pushes them down against the measuring board with one hand or forearm, fully extending the child. With the other hand, the measurer slides the movable footboard to the child's feet until the heels of both feet touch the footboard.

3. The measurer immediately removes the child's feet from contact with the footboard with one hand (to prevent the child from inadvertently kicking and moving the footboard) while holding the footboard securely in place with the other hand.

4. The measurement is read digit-by-digit (to the nearest .1 cm.) from the edge of the indicator at the end of the foot piece.

5. The recorder then writes the length clearly on the data form in the appropriate place.

6. The measurer then looks at the data form to be sure that the measurement is recorded correctly.



Bilateral Pretibial Pedal Edema - Since edema of nutritional origin is diagnostic of kwashiorkor, a simple examination for pretibial pedal edema is vital for determining community rates of kwashiorkor.* With the child in a sitting position, or being held by a parent, apply firm thumb pressure to the lower anterior surface of both legs for three seconds (count "one thousand and one, one thousand and two..."). Indentation remaining after the pressure is removed indicates edema. If edema is present, mark the data form with a "YES."

Data Form Completion - Annex D is a form suggested for use in a rapid nutrition assessment survey. Included with Annex D are instructions for its use. For each camp or village begin a separate sheet and begin numbering children with the identification number 01.

It is a good idea to include a short exercise in writing numbers as part of the training program for the survey team members. In many countries the numbers 1, 3, 7, 9 are often written in different styles.

*Not all observed edema will be edema of nutrition origin, but when it is associated with low weight for height, it is likely of nutrition origin. The simplest differential diagnosis, in individuals who can be followed, is a theraputic trial by feeding. Those children who fail to respond to the supplemental feeding should then be screened for edema caused possibly by cardiac or renal defects.

Each line on the worksheet should be examined by a survey team member for completeness and legibility before the child's examination is concluded. (The column "Weight for Height S.D. score" should not be completed by the surveyors at the time of the field examinations.) Each worksheet should be carefully examined by a senior member of the survey team at the end of each day to assure overall accuracy and completeness.

Data Tabulation - Observed values of weight and height are always converted into weight for height values and compared to a reference population. Comparison with a reference allows conclusions to be drawn regarding the extent of malnutrition in a population. The reference population currently recommended for use by the World Health Organization was developed by the United States Public Health Service from data collected during the U.S. Health Examination Surveys. These data, collected from a large representative sample of American children, have been criticized as not being applicable to the developing areas of the world. In preschool age children, however, environmental influences such as nutrition and infectious disease are of much greater importance than race or ethnicity. The growth differences in preschool age children associated with social class are usually much greater than those attributable to ethnic factors alone. Data are available to show that upper socioeconomic class preschool age children in developing countries have growth patterns that are remarkably similar to those in children from developed countries. Reference population values are correctly used only as a basis for the interpretation of survey results and are not to be used as a standard or target for growth in a particular country.

In Annex E is an abbreviated table of reference values of weight for height to assist you in the field analysis of any data. In the first column a series of height values are given. For this rapid survey round the height/length measurements to the nearest 0.5 cm. If a height/length value is between .0 and .2 cm round the value downward to the next lowest number. If the value is between .3 and .7, round to .5. If greater than .7 round to the nearest whole number upward.

EXAMPLE:

If you have measured 63.2 round to 63.0 cm

If you have measured 63.4 round to 63.5 cm

If you have measured 63.8 round to 64.0 cm

The second column of the table in Annex E shows the mean weight for that particular height. The relative proportions of children diagnosed as malnourished by using a cutoff of 80 percent median weight for height as compared to using a cutoff of -2 standard deviation changes somewhat with increasing age and size of children. For this reason, in those populations where large numbers of children fall below the lower centiles, standard deviation rather than percent of median is used to better describe the population distribution. The third column gives the weight that is -2 standard deviations below the mean. This approximates 80 percent of the reference median or the 3rd centile, weight for height. The next column is -3 standard deviations below the mean and the last column is -4 standard deviations below the mean.

Find the height of a child on the table. Read over and find the approximate range for the weight of the child. If the weight of the child is greater than or equal to -2 standard deviations from the reference mean place a check in that column of the survey form. If the weight is less than -2 standard deviations but greater than or equal to -3 standard deviations, place a mark in the next column on the form. The same procedure is used to classify children less than -3 standard deviations and -4 standard deviations. Classify each child by his weight for height value.

EXAMPLE:

A child's height is 70.2 cm and his weight is 6.3 kg. Look up the child's height on the table in Annex E and read the right columns. In this example the child's weight is between the-2 standard deviations and -3 standard deviations from the reference mean. Make a check mark in the eighth column on the worksheet ("-2").

Add the number check marks in each of the columns and calculate the percent of children in each category. (There is room for 20 children on each sheet.) Add the number of children with "1" marked in the edema column, calculate the percentage of children with edema.

Interpretation of the Data

It is important to remember in the interpretation of data that sampling errors, measurement errors, and the skill of the survey team members greatly influence the survey results. Care should be taken so as not to present the survey results as precise figures, but rather as estimates of the present nutrition condition in this population.

In a well-nourished population, between 2 and 2.5 percent of the children under age 5 will have weight for height values below -2 standard deviations. In a less developed nation without a nutrition emergency, 5 percent or more of the under 5 children may be at this level. As a rule of thumb, rates of undernutrition greater than 8 percent (as measured by percent of children less than -2 standard deviations weight for height) are cause for concern. Rates greater than 10 percent have been seen in extreme crisis situations such as in Biafra in 1969, in the Sahel during the mid-1970's, in Zaire in 1978, and in Somalia in 1980. Edema rates greater than 2 percent represent extremely high rates of kwashiorkor.

The percentage of children whose weight for height values are less than -3 standard deviations is usually very small. If this rate is above even 1 percent, there is cause for concern.

In transmitting nutrition survey data to host country governments, WHO, or CDC always present the number of children examined, the percent of children less than -2, -3, and -4 standard deviations from the reference mean (weight for height) and the prevalence of edema. It is helpful to include in this report information on recent mortality, current infectious disease morbidity, reports of any ongoing epidemics, malaria morbidity, and the number of camps.

ANNEX A

The following reference material is helpful for nutrition assessment and relief efforts:

Reading Material

deVille de Goyet, C., et al., The Management of Nutritional Emergencies in Large Populations, WHO, 1978.

Jelliffe, D.K., Nutritional Assessment of the Community, WHO, 1966.

Keller, W., et al., Measurement of Nutritional Impact, WHO, 1979. (Annex I-V)

Masefield, G.B., Food and Nutrition Procedures in Times of Disaster, FAO, 1967.

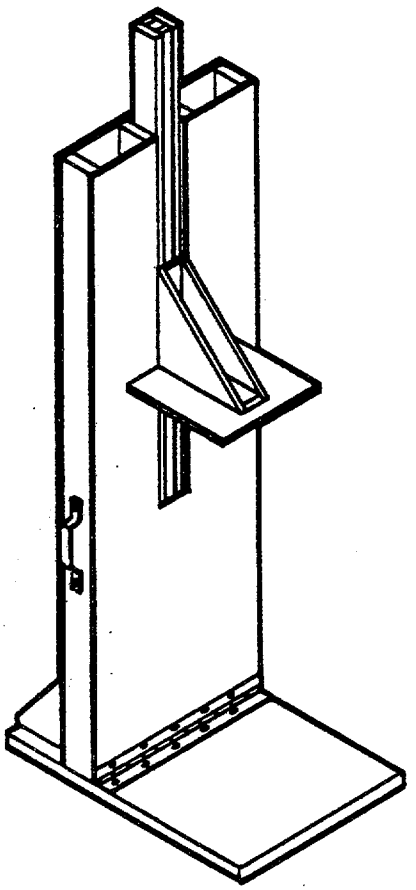
The following two books are directed at mid- and high-level personnel involved in management of relief operations:

Protein Advisory Group, A Guide to Food and Health Relief Operations for Disasters, UN, 1977.

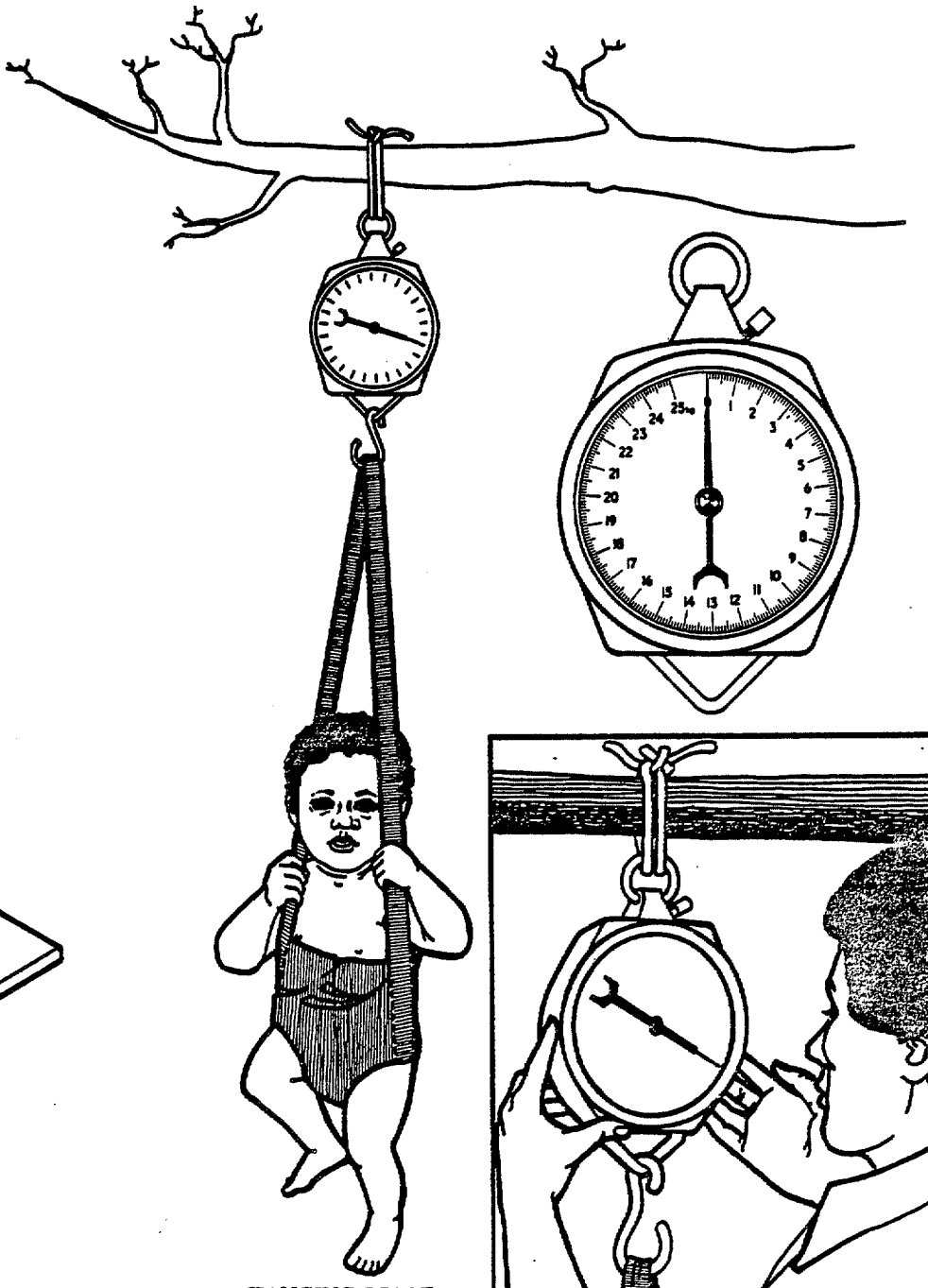
Waterlow, J.C., and Rutishauser, I.H.E., Malnutrition in Man. In: Early Nutrition and Mental Development, Sweden, 1974.

The following book is not specifically directed towards emergency situations:

Cameron, M. and Hofrander, Y., Manual on Feeding Infants and Young Children, PAG, UN, 1976.



MEASURING BOARD



HANGING SCALE

ANNEX C

Random Numbers

First Thousand

	1–4	5–8	9–12	13–16	17–20	21–24	25–28	29–32	33–36	37–40
1	83 15	75 48	59 01	83 72	50 93	76 24	97 08	36 05	23 03	07 44
2	05 56	55 30	43 10	53 76	33 08	90 81	18 37	44 10	96 22	13 43
3	14 87	16 03	50 32	49 43	62 23	50 05	10 03	22 11	54 38	05 34
4	38 97	87 49	11 44	05 17	58 53	78 80	59 01	94 32	42 87	16 95
5	07 31	20 17	18 90	75 53	08 70	94 25	12 58	41 54	88 21	05 13
6	11 74	20 93	81 44	33 93	08 72	32 79	73 31	18 22	64 70	68 50
7	43 36	12 88	59 11	01 64	56 23	93 00	90 04	99 43	64 07	40 36
8	93 80	62 04	78 38	26 80	44 91	35 75	11 89	32 58	47 55	25 71
9	49 54	01 31	81 08	42 98	41 87	69 53	82 96	01 77	73 80	95 27
10	36 76	87 26	33 37	94 82	15 69	41 95	96 86	70 45	27 48	38 80
11	07 09	25 23	92 24	62 71	26 07	06 55	84 33	44 67	33 84	53 20
12	43 31	00 10	81 44	86 38	03 07	52 35	51 01	48 89	74 29	46 47
13	01 57	00 63	60 06	17 36	37 75	63 14	89 51	23 35	01 74	69 93
14	31 35	25 37	99 10	77 91	89 41	31 57	97 64	48 62	58 48	69 19
15	57 04	83 65	26 27	79 59	36 82	90 52	95 65	46 35	06 53	22 54
16	09 24	34 42	00 68	72 10	71 37	30 72	97 57	56 09	29 82	76 50
17	97 95	53 50	18 40	89 48	83 29	52 23	08 25	21 22	53 26	15 87
18	93 73	25 95	70 43	78 19	88 85	56 67	16 68	26 95	99 64	45 69
19	72 62	11 12	25 00	92 26	82 64	35 66	65 94	34 71	68 75	18 67
20	61 02	07 64	13 45	37 12	07 94	95 91	73 78	66 90	53 61	03 78
21	97 83	96 54	74 33	95 59	17 18	45 47	35 41	44 22	93 48	20 00
22	89 16	09 71	92 22	23 29	06 37	35 05	54 34	89 88	43 81	03 01
23	25 96	68 82	20 62	87 17	92 65	02 82	35 28	62 84	91 95	48 83
24	81 44	33 17	19 05	04 95	48 06	74 60	00 75	67 65	01 71	65 45
25	41 32	85 49	31 42	36 23	43 86	08 62	49 76	67 42	24 52	32 45

Second Thousand

	1–4	5–8	9–12	13–16	17–20	21–24	25–28	29–32	33–36	37–40
1	64 75	58 38	85 84	12 22	59 20	17 69	61 56	55 95	04 59	59 47
2	10 30	25 22	89 77	43 63	44 30	38 11	24 90	67 07	34 82	33 28
3	71 01	79 84	95 51	30 85	03 74	66 50	10 28	87 53	26 56	91 49
4	60 01	25 56	05 88	41 03	48 79	79 65	59 01	69 78	80 05	36 66
5	37 33	09 46	56 49	16 14	28 02	48 27	45 47	55 44	55 36	50 09
6	47 86	98 70	01 31	59 11	22 73	60 62	61 28	22 34	69 16	12 22
7	38 04	04 27	37 64	16 78	95 74	39 32	34 93	24 88	43 43	87 06
8	73 50	83 09	08 83	05 48	00 78	36 66	93 02	95 56	46 04	53 36
9	32 62	36 64	74 84	06 10	43 24	20 62	83 73	19 32	35 64	30 69
10	97 59	10 95	49 36	63 03	51 06	02 00	00 20	75 05	12 05	77 34
11	74 01	23 19	53 50	79 00	69 82	66 22	42 40	15 96	74 90	75 89
12	56 75	42 64	57 13	35 10	50 14	00 06	63 36	74 69	09 63	34 88
13	40 80	04 99	08 54	83 12	19 98	05 52	82 63	72 92	32 36	50 26
14	43 58	48 96	47 24	87 85	66 70	00 22	15 01	93 99	59 16	23 77
15	16 65	37 96	04 60	32 57	13 01	35 74	28 36	36 73	05 88	72 29
16	48 50	26 90	55 65	32 25	87 48	31 44	68 02	37 31	25 29	63 67
17	96 76	55 46	92 36	31 05	62 30	48 29	63 83	52 23	81 66	40 94
18	38 92	36 15	50 80	35 78	17 84	23 44	41 26	03 33	99 22	81 25
19	77 95	28 16	94 25	22 50	55 87	51 07	30 10	70 60	21 86	19 61
20	17 92	52 80	05 25	52 60	87 71	02 64	13 50	64 05	79 64	51 70
21	94 03	68 59	78 02	31 80	44 99	41 01	41 05	31 87	43 12	15 96
22	47 46	06 04	79 56	23 04	84 17	14 37	28 51	07 27	55 80	03 68
23	47 85	05 00	88 51	99 28	24 39	40 64	41 71	70 13	46 31	82 88
24	57 01	63 46	53 92	29 86	40 18	10 37	57 05	15 02	98 09	07 56
25	08 30	09 27	04 06	75 26	66 10	57 18	87 91	07 54	22 22	20 13

Instructions: Select a random number by closing your eyes and pointing to the table with a pencil. The first number to the left of the pencil point is the selected random number. Count leftward until you have the number of digits you need.

ANNEX D
FIELD NUTRITION ASSESSMENT FORM

COUNTRY:

TEAM NO. (1—2)

DATE OF INTERVIEW MM DD YY (3—8)

IDENTIFICATION INFORMATION:

LEVEL I (9—11) LEVEL II (12—14) LEVEL III (15—17) LEVEL IV (18—20) LEVEL V (21—23)

I.D. No. (24—25)	Ethnic Code (26—27)	Sex 1=M 2=F (28)	Age Yrs. Mos. (29—31)	Weight (Kgs) (32—34)	Height (Cms) (35—38)	Edema 1=Y 2=N (40)	Additional Variables 1=Y 2=N (41)	1=Y 2=N (42)	1=Y 2=N (43)	1=Y 2=N (44)	Weight for Height Standard Deviation (Put 'X' in appropriate column) ≥-2 -1-	<-2 -2-	<-3 -3-	<-4 -4- (45)

HHS/PHS/CDC 7-80

ANNEX D

Instructions for Field Nutrition Assessment Form

The attached Field Nutrition Assessment Form is a general purpose data collection form for use in most field surveys of nutrition status. It can be adapted for computer tabulation, yet it is easily used in field situations when computers are not available. The form can be used to collect nutrition data in a variety of situations with little modification. The attached copy should be applied.

Specific Instructions:

TEAM

Each team should be assigned an identification number. If there are less than ten teams, the number should be preceeded by a 0.

DATE OF INTERVIEW

The date of the interview should be placed in these boxes.

IDENTIFICATION INFORMATION

Five levels of identification are provided for each survey site. Major geographic/political area, the Region, and the Camp/Village can be recorded in the first three levels. If additional identification is desired, it can be coded in levels IV and V, otherwise enter "9" in each box.

I.D.#

Enter the child's identification number, usually a number assigned sequentially from 01-30.

ETHNIC CODE

Enter a code for ethnic group of each child, otherwise enter 99.

SEX

Enter 1 = male 2 = female

AGE

If age estimations are made, enter the year and months. Otherwise enter /9/ . /9/9/.

WEIGHT

Weight must be entered to the nearest tenth kilogram.

HEIGHT (LENGTH)

Enter the height (length) to the nearest tenth centimeter. Remember that children below 85 cm must be measured in a lying down position.

EDEMA

Enter presence or absence of edema by marking "1" or "2."

ADDITIONAL VARIABLES

Provision is made for the coding of additional variables such as whether or not the child is enrolled in a supplemental feeding program, breast feeding information, immunization history, etc. Questions for each of these variables must be prepared in advance and printed on a separate sheet in the exact language in which they will be posed. Responses are marked as follows: 1 = yes, 2 = no.

WEIGHT FOR HEIGHT STANDARD DEVIATION

These final four columns are classifications of a child's weight for height value in relation to an internationally recognized growth reference. For further details see page 19, Data Tabulation, in the Manual.

ANNEX E

Weight for Height Reference Values
(Under 85 cm Assumed Recumbent and Standing Thereafter)

Weight in Kilograms

CM	Mean	-2 S.D.	-3 S.D.	-4 S.D.
50.0	3.4	2.6	2.2	1.8
50.5	3.4	2.6	2.2	1.8
51.0	3.5	2.7	2.3	1.9
51.5	3.6	2.7	2.3	1.9
52.0	3.7	2.8	2.4	1.9
52.5	3.8	2.9	2.4	2.0
53.0	3.9	2.9	2.5	2.0
53.5	4.0	3.0	2.5	2.1
54.0	4.1	3.1	2.6	2.1
54.5	4.2	3.2	2.7	2.2
55.0	4.3	3.3	2.8	2.2
55.5	4.4	3.4	2.8	2.3
56.0	4.6	3.5	2.9	2.4
56.5	4.7	3.6	3.0	2.5
57.0	4.8	3.7	3.1	2.5
57.5	4.9	3.8	3.2	2.6
58.0	5.1	3.9	3.3	2.7
58.5	5.2	4.0	3.4	2.8
59.0	5.3	4.1	3.5	2.9
59.5	5.5	4.2	3.6	3.0
60.0	5.6	4.3	3.7	3.1
60.5	5.7	4.5	3.8	3.2
61.0	5.9	4.6	3.9	3.3
61.5	6.0	4.7	4.1	3.4
62.0	6.2	4.8	4.2	3.5
62.5	6.3	5.0	4.3	3.6
63.0	6.5	5.1	4.4	3.7
63.5	6.6	5.2	4.5	3.9
64.0	6.7	5.4	4.7	4.0
64.5	6.9	5.5	4.8	4.1
65.0	7.0	5.6	4.9	4.2
65.5	7.2	5.8	5.0	4.3
66.0	7.3	5.9	5.2	4.4
66.5	7.5	6.0	5.3	4.6
67.0	7.6	6.1	5.4	4.7
67.5	7.8	6.3	5.5	4.8
68.0	7.9	6.4	5.7	4.9

1/ This table has been taken from the publication, "NCHS Growth Charts," HRA 76-1120, 1976.

2/ These reference data are commonly called the NCHS/CDC (WHO) reference growth tables.

CM	Mean	-2 S.D.	-3 S.D.	-4 S.D.
68.5	8.0	6.5	5.8	5.0
69.0	8.2	6.7	5.9	5.1
69.5	8.3	6.8	6.0	5.3
70.0	8.5	6.9	6.1	5.4
70.5	8.6	7.0	6.3	5.5
71.0	8.7	7.2	6.4	5.6
71.5	8.9	7.3	6.5	5.7
72.0	9.0	7.4	6.6	5.8
72.5	9.1	7.5	6.7	5.9
73.0	9.2	7.6	6.8	6.0
73.5	9.4	7.7	6.9	6.1
74.0	9.5	7.8	7.0	6.2
74.5	9.6	7.9	7.1	6.3
75.0	9.7	8.1	7.2	6.4
75.5	9.8	8.2	7.3	6.5
76.0	9.9	8.3	7.4	6.6
76.5	10.0	8.4	7.5	6.7
77.0	10.1	8.5	7.6	6.8
77.5	10.2	8.5	7.7	6.9
78.0	10.4	8.6	7.8	6.9
78.5	10.5	8.7	7.9	7.0
79.0	10.6	8.8	8.0	7.1
79.5	10.7	8.9	8.1	7.2
80.0	10.8	9.0	8.1	7.3
80.5	10.9	9.1	8.2	7.4
81.0	11.0	9.2	8.3	7.4
81.5	11.1	9.3	8.4	7.5
82.0	11.2	9.4	8.5	7.6
82.5	11.3	9.5	8.6	7.7
83.0	11.4	9.6	8.7	7.8
83.5	11.5	9.6	8.7	7.8
84.0	11.5	9.7	8.8	7.9
84.5	11.6	9.8	8.9	8.0
85.0	12.0	9.8	8.7	7.7
85.5	12.1	9.9	8.8	7.7
86.0	12.2	10.0	8.9	7.8
86.5	12.3	10.1	9.0	7.9
87.0	12.4	10.2	9.1	8.0
87.5	12.5	10.3	9.2	8.1
88.0	12.6	10.4	9.3	8.2
88.5	12.8	10.5	9.4	8.2
89.0	12.9	10.6	9.5	8.3
89.5	13.0	10.7	9.6	8.4
90.0	13.1	10.8	9.6	8.5
90.5	13.2	10.9	9.7	8.6
91.0	13.3	11.0	9.8	8.6
91.5	13.4	11.1	9.9	8.7
92.0	13.6	11.2	10.0	8.8
92.5	13.7	11.3	10.1	8.9

CM	Mean	-2 S.D.	-3 S.D.	-4 S.D.
93.0	13.8	11.4	10.2	9.0
93.5	13.9	11.5	10.3	9.0
94.0	14.0	11.6	10.4	9.1
94.5	14.2	11.7	10.4	9.2
95.0	14.3	11.8	10.5	9.3
95.5	14.4	11.9	10.6	9.4
96.0	14.5	12.0	10.7	9.4
96.5	14.7	12.1	10.8	9.5
97.0	14.8	12.2	10.9	9.6
97.5	14.9	12.3	11.0	9.7
98.0	15.0	12.4	11.1	9.8
98.5	15.2	12.5	11.2	9.8
99.0	15.3	12.6	11.3	9.9
99.5	15.4	12.7	11.4	10.0
100.0	15.6	12.8	11.5	10.1
100.5	15.7	12.9	11.6	10.2
101.0	15.8	13.0	11.7	10.3
101.5	16.0	13.2	11.8	10.4
102.0	16.1	13.3	11.9	10.4
102.5	16.2	13.4	12.0	10.5
103.0	16.4	13.5	12.1	10.6
103.5	16.5	13.6	12.2	10.7
104.0	16.7	13.7	12.3	10.8
104.5	16.8	13.8	12.4	10.9
105.0	16.9	14.0	12.5	11.0
105.5	17.1	14.1	12.6	11.1
106.0	17.2	14.2	12.7	11.2
106.5	17.4	14.3	12.8	11.3
107.0	17.5	14.5	12.9	11.4
107.5	17.7	14.6	13.0	11.5
108.0	17.8	14.7	13.2	11.6
108.5	18.0	14.8	13.3	11.7
109.0	18.1	15.0	13.4	11.8
109.5	18.3	15.1	13.5	11.9
110.0	18.4	15.2	13.6	12.0
110.5	18.6	15.4	13.8	12.2
111.0	18.8	15.5	13.9	12.3
111.5	18.9	15.7	14.0	12.4
112.0	19.1	15.8	14.2	12.5
112.5	19.3	15.9	14.3	12.6
113.0	19.4	16.1	14.4	12.8
113.5	19.6	16.2	14.6	12.9
114.0	19.8	16.4	14.7	13.0
114.5	19.9	16.5	14.8	13.1
115.0	20.1	16.7	15.0	13.3
115.5	20.3	16.8	15.1	13.4
116.0	20.5	17.0	15.3	13.5
116.5	20.7	17.2	15.4	13.7
117.0	20.8	17.3	15.6	13.8
117.5	21.0	17.5	15.7	13.9

CM	Mean	-2 S.D.	-3 S.D.	-4 S.D.
118.0	21.2	17.6	15.8	14.1
118.5	21.4	17.8	16.0	14.2
119.0	21.6	18.0	16.2	14.3
119.5	21.8	18.1	16.3	14.5
120.0	22.0	18.3	16.5	14.6
120.5	22.2	18.5	16.6	14.8
121.0	22.4	18.7	16.8	14.9
121.5	22.6	18.8	16.9	15.0
122.0	22.8	19.0	17.1	15.2
122.5	23.1	19.2	17.3	15.3
123.0	23.3	19.4	17.4	15.5
123.5	23.5	19.6	17.6	15.6
124.0	23.7	19.7	17.7	15.7
124.5	24.0	19.9	17.9	15.9
125.0	24.2	20.1	18.1	16.0
125.5	24.4	20.3	18.2	16.2
126.0	24.7	20.5	18.4	16.3
126.5	24.9	20.7	18.6	16.4
127.0	25.2	20.9	18.7	16.6
127.5	25.4	21.1	18.9	16.7
128.0	25.7	21.3	19.1	16.9
128.5	26.0	21.5	19.2	17.0
129.0	26.2	21.7	19.4	17.1
129.5	26.5	21.9	19.6	17.3
130.0	26.8	22.1	19.7	17.4
130.5	27.1	22.3	19.9	17.5
131.0	27.4	22.5	20.1	17.6
131.5	27.6	22.7	20.2	17.8
132.0	27.9	22.9	20.4	17.9
132.5	28.2	23.1	20.6	18.0
133.0	28.6	23.3	20.7	18.1
133.5	28.9	23.6	20.9	18.3
134.0	29.2	23.8	21.1	18.4
134.5	29.5	24.0	21.2	18.5
135.0	29.8	24.2	21.4	18.6
135.5	30.2	24.4	21.6	18.7
136.0	30.5	24.7	21.7	18.8
136.5	30.9	24.9	21.9	18.9
137.0	31.2	25.1	22.1	19.0

ANNEX F

This annex provides an example of a nutrition assessment conducted in a potential crisis situation. It was modeled after an actual assessment conducted in a country that has recently provided support to nearly 500,000 refugees.

In this country there are five refugee regions that have a total of sixteen refugee camps. The assessment was conducted in four of the five regions and in all 16 camps. At least 900 preschool children were examined in each region (30 clusters of 30 children). In each region, clusters were selected from camps using the population proportional method described in the text.

The Coding Sheet, which was prepared in advance by the survey director, provides coding data for each region (Level I), camp (Level II), and cluster (Level III). For example, the following identification represents the sixth cluster in Fatah Camp in the north region:

Level I /0/0/1/ Level II /0/0/3/ Level III /0/0/6/

Since almost all refugees are from the same ethnic group, only one code, 01 = Sani, has been designated. The code 02 always is reserved for the occasional child from a different ethnic group. The code 09 should be used only for children whose ethnic group is unknown.

A field assessment form like that shown in Annex D, has been completed for cluster #2 of the Yala camp. Age data were not collected on the survey children. An additional varible was asked of each child's parent to determine whether their child had been in the refugee camp more than 4 weeks. Note the cluster totals on the second page of the form.

The cluster totals were accumulated for each camp and the tabular results are presented in the sample memorandum. Note: Although data from individual camps are presented in this tabulation, statistical comparisons between the camps are not valid. This is because the cluster sampling methodology was designed to provide statistical reliability only if at least 900 children (30 clusters) were in each group. Nutritional differences between regions can be compared, but, extreme caution should be used in drawing conclusions from differences in individual camp data. In this hypothetical example, the Fata camp appears to have changed little in overall nutrition status. The percentage of newly arrived refugee children (50% as compared to an average of 25%) tends to validate this difference since newly arrived refugee children generally had a higher prevalence of undernutrition.

Other previous memoranda have contained information on sampling methodology and have provided an explanation or the various anthropometric indices used to assess undernutrition.

CODING SHEET

Level 1 (Region)

001 = North

002 = Northeast

003 = Central

004 = Costal

005 = South

Level 2 (Camps)

001 Alebo	009 Sulu
002 Fototo	010 Sulo
003 Fatah	011 Mogu
004 Yala	012 Naire
005 Kani	013 Janu
006 Woa	014 Wani
007 Mani	015 Tara
008 Yama	016 Mweno

Level 3	(Cluster Number)	Ethnic Code
001	008	01 = Sani
002	009	02 = Other
003	010	09 = Unknown
004	011	
005	012	
006	013	
007	014	

Variable Question

Has this child been in this refugee camp for a perioa less than 28 days? Enter "1" if yes.

ANNEX D

FIELD NUTRITION ASSESSMENT FORM

COUNTRY: EXAMPLE

TEAM NO. 02 (1–2)

DATE OF INTERVIEW (MM DD YY) 08 19 80 (3–8)

IDENTIFICATION INFORMATION:

LEVEL I 001 (9–11) LEVEL II 004 (12–14) LEVEL III 002 (15–17) LEVEL IV 999 (18–20) LEVEL V 999 (21–23)

I.D. No.	Ethnic Code	Sex 1=M 2=F	Age Yrs.	Age Mos.	Weight (Kgs)	Height (Cms)	Edema 1=Y 2=N	Additional Variables 1=Y 2=N	1=Y 2=N	1=Y 2=N	1=Y 2=N	Weight for Height Standard Deviation (Put 'X' in appropriate column) ≥-2	<-2	<-3	<-4
01	01	1			07.6	076.0	2	2					X		
02	01	1			06.5	071.3	2	2						X	
03	01	1			13.0	102.1	2	1					X		
04	01	2			10.0	089.0	2	1					X		
05	01	1			14.2	101.7	2	2				X			
06	01	1			12.5	090.0	2	2				X			
07	01	2			14.1	104.0	2	2				X			
08	01	2			13.2	101.1	2	2				X			
09	01	1			15.0	104.1	2	1				X			
10	01	1			15.5	104.0	2	1				X			
11	01	1			08.0	079.1	1	1						X	
12	01	2			11.0	085.2	2	2				X			
13	01	1			15.2	103.1	2	2				X			
14	01	2			09.4	081.0	2	2				X			
15	01	2			08.0	075.5	2	2					X		
16	01	1			16.9	109.4	2	2				X			
17	01	1			12.5	094.9	2	2				X			
18	01	2			12.8	100.0	2	2					X		
19	01	2			12.5	093.0	2	2				X			
20	01	2			10.0	080.0	2	2				X			
(24–25)	(26–27)	(28)	(29–31)		(32–34)	(35–38)	(40)	(41)	(42)	(43)	(44)	-1-	-2-	-3-	-4- (45)

ANNEX D

FIELD NUTRITION ASSESSMENT FORM

COUNTRY: EXAMPLE

TEAM NO. 02 (1–2)

DATE OF INTERVIEW MM 08 DD 19 YY 80 (3–8)

IDENTIFICATION INFORMATION:

LEVEL I 001 (9–11)

LEVEL II 004 (12–14)

LEVEL III 002 (15–17)

LEVEL IV 999 (18–20)

LEVEL V 999 (21–23)

I.D. No.	Ethnic Code	Sex 1=M 2=F	Age Yrs.	Age Mos.	Weight (Kgs)	Height (Cms)	Edema 1=Y 2=N	Additional Variables				Weight for Height Standard Deviation (Put 'X' in appropriate column)			
												≥-2	<-2	<-3	<-4
21	01	2			08.7	078.1	2	1				X			
22	01	1			11.4	084.5	2	1				X			
23	01	1			09.5	082.0	2	2				X			
24	01	2			12.6	099.5	2	2					X		
25	01	1			13.7	103.0	2	2				X			
26	01	1			12.1	094.0	2	2				X			
27	01	2			14.3	105.9	2	2				X			
28	01	1			15.2	109.0	2	2				X			
29	09	1			11.9	093.1	2	2				X			
30	01	1			12.0	096.5	2	2					X		
(24–25)	(26–27)	(28)	(29–31)		(32–34)	(35–38)	(40)	(41)	(42)	(43)	(44)	-1-	-2-	-3-	-4-
	18/12		-		-		17					21	7	2	0

(45)

TO: Minister of Health September 1, 19__

FROM: MOH Mission for Refugees

SUBJECT: Summary of Nutrition Assessment Surveys

During August, the Ministry of Health Mission for Refugees conducted a series of nutrition assessment surveys among refugee children in the North region. Below is a tabular summary of the data:

Region: North

Camp	Sample Size	Percent of Children in Various Weight for Height Categories (Standard Deviations)			
		≤ -4	≤ -3	< -2	≥ -2
Alebo	300	0	0.3	3.9	95.8
Fototo	118	0	1.5	3.8	94.7
Fatah	384	0	0.3	6.8	92.9
Yala	362	0	0.7	6.3	93.0
Total North	1164	0	0.5	5.6	93.9

These data indicate an improvement in the nutrition status of preschool children in the North Region when 8.3 percent of the children were < -2 standard deviation weight for height. This improvement is probably a result of increased food distributions and improved supplemental feeding activities in this area.

Camp	Percent of Children < -2 Standard Deviations: May	August	Change
Alebo	7.0	4.2	-2.8
Fototo	8.3	5.3	-3.0
Fatah	6.9	7.1	+0.2
Yala	10.4	7.0	-3.4

In the Fatah camp there apparently was no improvement in nutrition status. Although our sampling methodology does not permit a statistical validation of this difference, we feel that the difference is real and is a result of an influx of new refugees into the camp during July.

Although we are delighted with the improvement in nutrition status in this region we recommend continued disease and nutrition surveillance in this region. There have been recent unconfirmed reports of measles outbreaks in some camps. We are assigning an epidemiologist to this region for a followup investigation.

A nutrition status assessment should be conducted in the North in December.