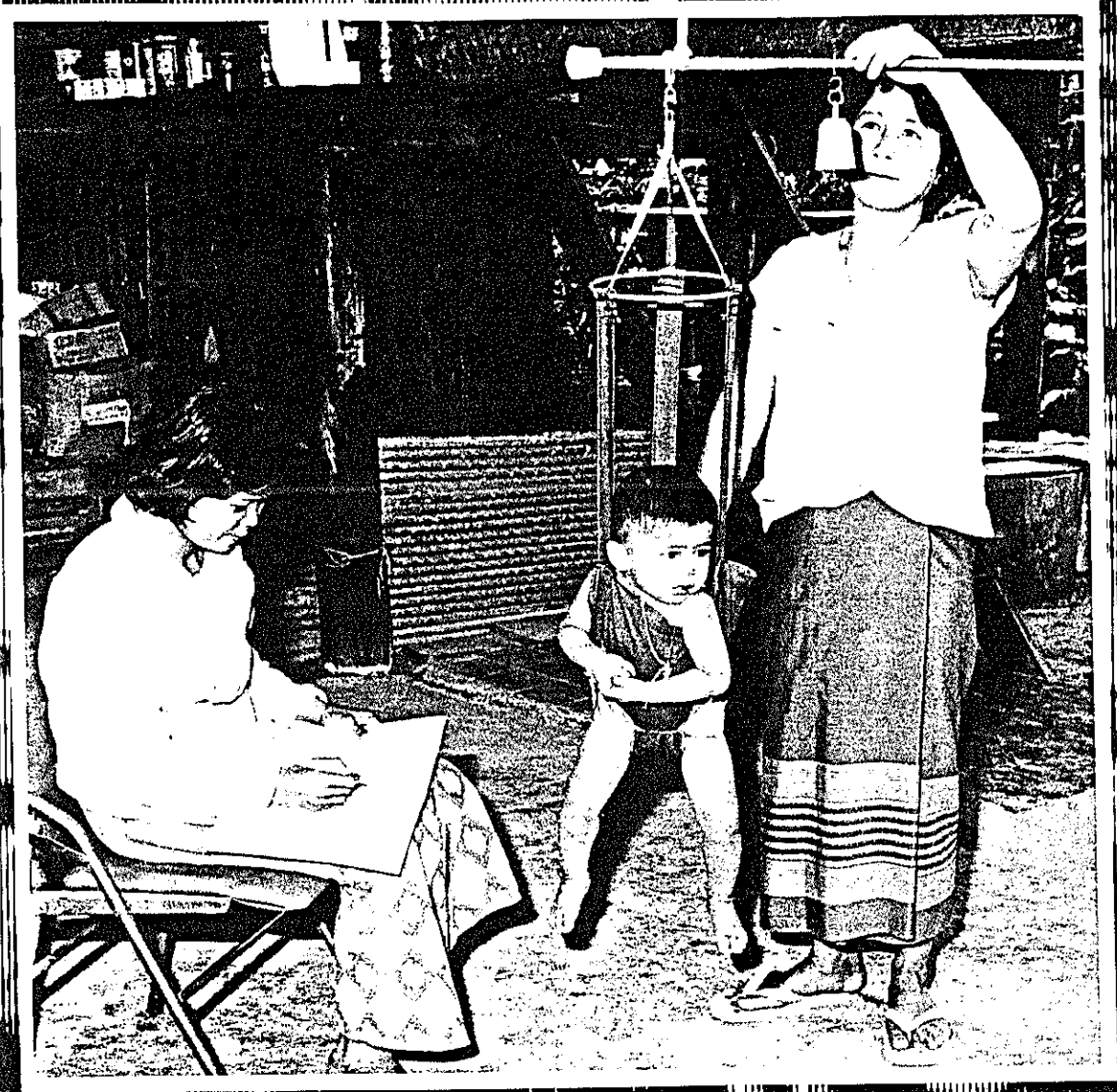


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**Growth Monitoring**



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# **Growth Monitoring of Preschool Children:**

## **Practical Considerations for Primary Health Care Projects**

**Prepared for UNICEF**

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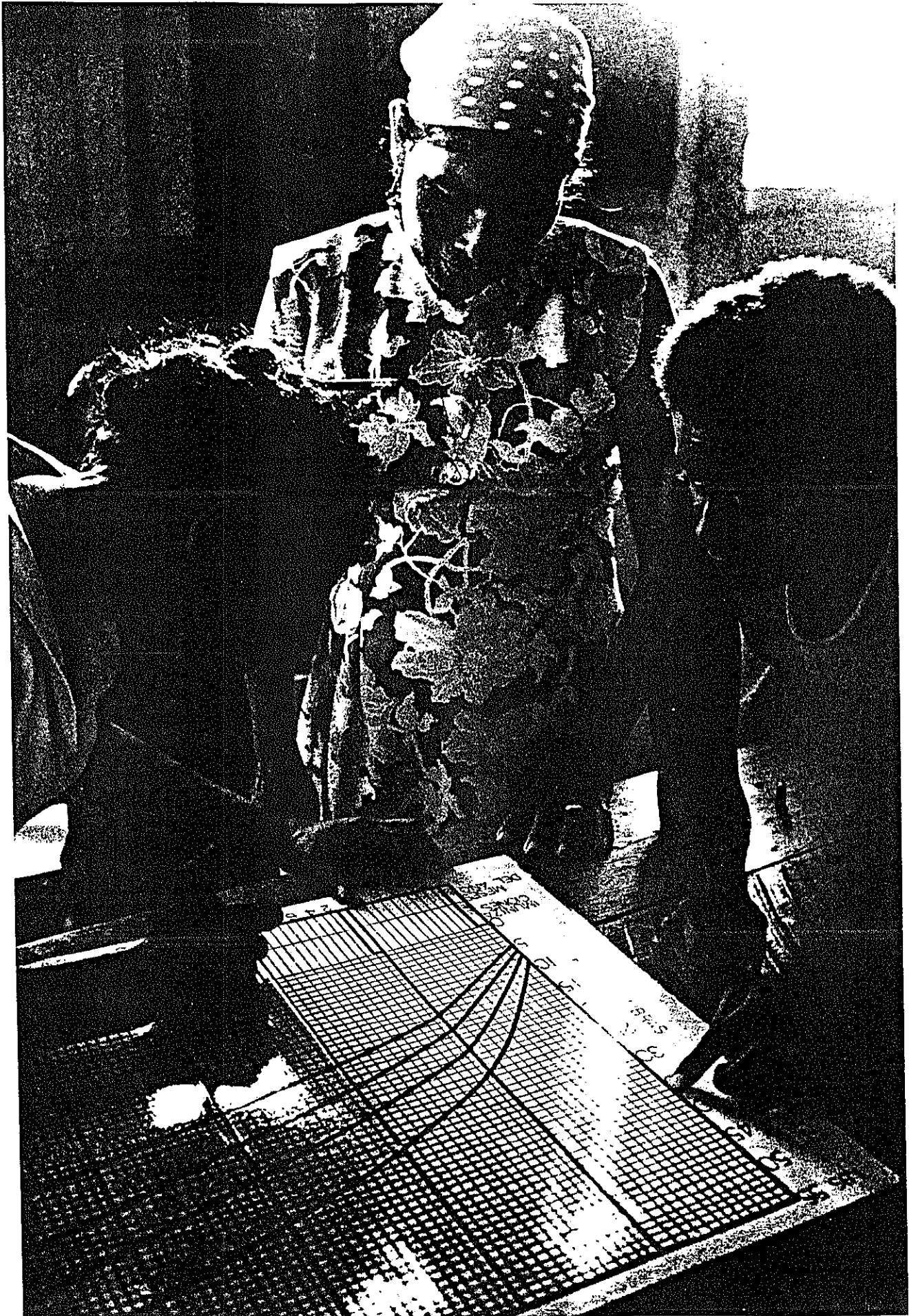
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*Village nutrition workers in Nicaragua undergo training in growth monitoring. M. Griffiths*

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## Preface

When the first edition of this monograph was published in October 1981, growth monitoring was not yet viewed by many health professionals as an essential element of primary health care programs. Since 1981, the state of the art has advanced considerably as growth monitoring activities of differing magnitudes have been implemented worldwide, allowing both the problems and the benefits of the activity to be better understood today.

The purpose of the paper as it was first written was to examine the state of the art of routine growth monitoring activities undertaken in communities and clinics as part of primary health care and nutrition programs throughout the developing world. The paper was intended to present essential findings from research and field experiences on monitoring growth that would enable the planners of primary health care programs to understand:

- the decisions and activities related to establishing a growth monitoring project;
- the major issues and problems involved in growth monitoring exercises; and
- some of the lessons learned in various projects and settings.

When UNICEF asked for the paper to be brought up to date, the purpose was not changed. The presentation of the information, therefore, remains unchanged, as does much of the text. Generally, the reader of both papers will find that the update provides additional experiences, places greater emphasis on certain techniques, and is more insistent about the urgency of uniting family education with the growth monitoring activity.

We continue to learn from experience: the World Federation of Public Health Associations and UNICEF welcome additional information on growth monitoring and comments on this paper. I personally would like to thank colleagues who have generously shared their ideas and time. Most of these contributions are cited in the bibliography. I would especially like to acknowledge the wealth of information and insights I have been given by fieldworkers and mothers. It is they who continue to inspire the belief that this type of activity can help make a difference in the well-being of children.

Marcia Griffiths  
August 1985

*Is this child healthy?*



*M. Griffiths*

# Introduction

## WHY MONITOR GROWTH?

Many times each day, the primary health care worker is faced with the deceptively simple question, "Is this child healthy?" To answer it, the health worker should consider many factors affecting the child's health, one of which is nutritional well-being. What information is needed about an under-five child to judge if he or she is well-nourished?

The techniques employed to assess nutritional well-being reflect the assessor's understanding of what it means to be well or malnourished.\* For example, Kartini, the child in the photograph on page 6 was judged differently by each person she encountered at a health post.

Her mother felt she was well nourished because she was "easy to care for" and "liked to eat" (51). The assistant at the post, having learned that certain physical signs indicate malnutrition, looked for skin lesions, a swollen belly, light-colored hair, signs of apathy, and illness (cough, cold, diarrhea). Since none of these signs were present, the assistant concluded that Kartini was healthy.

The auxiliary nurse knew she had to check Kartini's growth chart. The growth curve showed that Kartini was in the upper portion of the chart and could be considered "well nourished." But the auxiliary nurse also knew that of utmost importance to her diagnosis that day was whether Kartini had gained weight since her last visit. She weighed Kartini and after completing the growth chart saw that Kartini had lost about ½ kg since her last visit just over a month ago. In spite of all other indications, the diagnosis was that Kartini was not healthy and needed additional assessment of her health status and diet.

If this early warning sign of poor nutritional well-being (the failure to gain weight) had been overlooked, Kartini's problem could have gone unobserved until she showed severe physical symptoms of ill health and treatment would have been costly and more difficult.

*Such problems will not be overlooked if health workers monitor growth by a systematic, periodic measuring of children. For a relatively small expenditure per beneficiary, growth monitoring can greatly strengthen preventive health programs.*

The pioneering programs in the development of growth monitoring in Imes, Nigeria (87), Narangwal, India (68), and Hanover, Jamaica (4) demonstrated the benefits of growth monitoring as a part of health and nutri-

tion programs for following the progress of individual children to predict the extent of malnutrition and the risk of morbidity and mortality, and targetting appropriate curative and preventive interventions based on the diagnosis. Dr Stephen Joseph of UNICEF summarized what health programs have shown and what is encountered time and again in cases like Kartini's:

... careful growth monitoring is an *indispensable* tool in the making of good clinical judgment, especially for judgments that need to be taken by health workers who have *neither* long and broad clinical experience nor extensive grounding in the basic clinical sciences. (22, p. 22)

In addition to diagnostic assistance, the early trials with growth monitoring demonstrated other benefits. In the Hanover project, workers felt growth monitoring in itself was an intervention. Mothers learned so much about the relation between diet and health by watching their child's growth pattern that this alone led to dietary improvements that substantially reduced malnutrition and mortality. These observations have led some health professionals to conclude that:

... in communities where social or cultural factors play a greater role than absolute resource inadequacy in the etiology of malnutrition, nutrition monitoring appears to have the potential for a significant impact on mortality even in the absence of more expensive and more difficult to implement components such as nutrition supplementation or education (53, p. 9).

While such statements have stimulated program managers to begin growth monitoring activities, they may have raised false expectations for what growth monitoring without health system and educational follow-up can do. This has led to skepticism and disappointment in some programs in recent years. Growth monitoring has been found to be the most difficult of the principal Child Survival Revolution interventions\* to implement well (152), because of organizational, technological, and training problems. Although many programs use growth cards, there are few countries with national growth monitoring efforts, possibly because of the lack of evidence linking growth monitoring directly to improvements in child health.

Both the complexity and benefits of growth monitoring should be placed in perspective. The resources required for a good growth monitoring program have often been underestimated. Although the cost of growth monitoring remains extremely low in comparison to that of other activities (see Box), it is now evident that

\*The general term malnutrition is used throughout this paper although the major concern is with undernourished children.

\*The others are oral rehydration therapy, breastfeeding, and immunizations.



more must be done than simply supplying workers with growth charts. Health workers must be prepared with tools, training, and the required corrective measures.

The tools needed are those that gauge measurements such as weight, height, and arm circumference; charts that allow health workers and mothers to compare the child's measures against one another and with those of a reference population; and educational materials which help the worker discuss corrective measures so that families can improve their child's faltering growth. Health workers require training, monitoring, and retraining in the use of tools, the interpretation of the results, and the selection of an intervention program appropriate for the child and feasible within the family's and program's resources. A number of programs have refined training and education activities so that health workers can correctly weigh, record, interpret, act on findings, and operate effective growth monitoring activities.

The design of some programs gives evidence that there has been some confusion between growth monitoring and nutritional surveillance activities. Dr. Jon Rohde notes that where this has happened the programs did not fulfill their promise because they included:

... weigh charts emphasizing nutritional status rather than growth, lesser involvement of mothers particularly in weighing and interpretation, large groups, stress on older children after they had already become malnourished, lack of pragmatic focus to the health education when it was present at all and lack of referral or back-up opportunities for children in trouble (179).

On the other hand, Rohde has found:

... in Haiti as elsewhere, when growth monitoring is carried out by mothers in small groups in their own village, weighing and marking their own weight charts, focusing on growth, suggesting practical homemade actions, supported by occasional primary health care inputs such as vaccination, vitamin A, deworming, etc., that these programs work and are popular. (180)

In addition, the expectations for growth monitoring may need adjustment. Growth monitoring, unlike immunizations and some other activities, may have no direct health impact. It should not stand alone, nor should it be evaluated for its direct health impact. A growth monitoring program should be initiated for the added focus it can give to health, nutrition, and other development programs and for its potential to create awareness and to solve health and nutrition problems at the family and community levels. Its success should be measured by the actions it catalyzes such as efficient and effective nutrition education and other health and development activities.

It has been a challenge to show that growth monitoring activities can function to their potential. To do this, the planning, implementation, and evaluation of the activity needs to be reoriented. Along with the mistakes, there have also been successes, and even some of the less successful programs have shown the

### Costs of Growth Monitoring

The cost of adding growth monitoring to an ongoing program is small. Expenditures on growth charts and equipment should be minimal, since both should last for many years and the equipment can be used by all under-fives. Expenditures on growth charts range between U.S. 3¢ (29) and 33¢ (67) per child. What increases the cost of growth monitoring are the expenditures on training and supervision and on the indispensable education component. Real cost figures for nationwide community-run growth monitoring activities are unavailable. However, figures are available from pilot projects and a national program that includes more than growth monitoring.

The Tamil Nadu Nutrition Program's weighing and screening component, which emphasizes training, supervision, and information management, costs U.S. \$8.09 per beneficiary per year (197). The pilot Nutrition Communication and Behavior Change Component in Indonesia, which included growth monitoring and carefully formulated educational messages, cost U.S. \$3.94 per beneficiary per year, and would cost U.S. \$2.05 if expanded (197). Cost information on the Indonesian national nutrition program (UPGK) indicates that the basic package of services (growth monitoring, education, vitamin A capsules, iron tablets, and oral rehydration salts) costs U.S. \$4.00 to \$5.00 per beneficiary per year, with an additional U.S. \$1.00 to \$2.00 representing the cost of workers' time (189). Projections of the costs of operating a program similar to the Indonesian pilot project (growth monitoring and nutrition education) on a national scale indicate that 0.1 percent of the national budget would be required, a realizable expenditure for many countries (197).

promise of growth monitoring's potential to support the child survival revolution strategy in that it:

- helps identify children with high morbidity/mortality risk;
- helps identify parts of the community or the country for special health attention;
- helps maximize scarce resources for those most in need;
- assists in evaluating the impact of other health intervention activities on the beneficiaries;
- does not require a lot of time or expense;
- can be carried out reliably by health workers trained at low cost;
- can be organized and run by communities themselves;
- offers mothers useful information that, when explained in a culturally relevant manner, provides a basis for understanding and implementing specific dietary improvements;
- is a health care activity that can and should be performed without trauma to mother or child;
- stimulates collaborative involvement of the health system, the community, and the family; and
- assumes better preventive and therefore more effective care for all children.

## What to Measure

There is widespread agreement on two points related to growth monitoring. One is that growth status is the best available indicator of overall nutritional status. The second is that it is practical and effective to use growth data to evaluate the health of children under five and to plan appropriate follow-up activities. There is disagreement, however, about which is the best anthropometric\* measure to use. The measures most commonly used by community programs are weight, height, and/or arm circumference.

These measures have often been evaluated by how well they singularly, in combination with age (weight/age), or in combination with each other (weight/height), reflect the nutritional well-being of a child at a particular moment. Nutritional status is one way to assess well-being. To do this, the individual child's measurement is compared to values of a reference population. (See Chapter 2 for a discussion of reference populations.) Weight, for example, is often related to age, so that the weight of a two-year-old can be compared to that of other two-year-olds. While the ability of a measure to be both a specific and sensitive indicator of nutritional status is important, for purposes of growth monitoring the measure must also be able to reflect well-being by assessing dynamic growth status: the angle of the curve. The potential of growth monitoring lies in its uses as a diagnostic tool to detect problems *before* nutritional status is seriously jeopardized. To do this the measure chosen must be able to reflect small fluctuations in body size. If the measure is taken often enough a child's growth pattern can be established and any negative deviation from the pattern can be detected and interpreted as a sign for immediate action.

The most common combinations of measures are weight-for-age, height-for-age, and weight-for-height. Until recently the arm circumference measure was compared directly to the same single measure in the reference population, because arm circumference changes relatively little in children between the ages of one and five (32, 106, 118). Although simplicity is compromised, field trials have shown that more precision can be obtained if arm circumference, like weight and height, is related to age or at least to age groups (167, 182).

Each of the indicators described above provides a different piece of information pertaining to a child. Weight measurement assesses total body size, arm circumference the size (muscle, fat, and bone) of that area,

\*Anthropometric: refers to measuring the body or part of the body.



Health worker in Pakistan measures three year old child. WHO 7653/P. Bourcas

and height the degree of skeletal development or the amount of linear growth. Measurements of tissue mass (weight and arm circumference) can increase or decrease according to a child's current dietary intake and health status. Weight will fluctuate more rapidly than arm circumference because it is subject to such variables as retention of fluid and time of day. Height neither changes rapidly nor decreases, but will be arrested by long-term deprivation. Depending on the indicator a diagnosis made after only one measure might vary.

For example, a child who has not received an adequate diet over a considerable period of time, who has not grown adequately in either height or weight, but who is not extremely thin and has no edema,\* would most likely be classified in a one-time measurement by the different indicators in the following way:

\*edema: an accumulation of fluid in cells, tissues, or cavities of the body resulting in swelling—often noted first in ankles and lower legs.

Weight-for-age:	Moderately undernourished
Height-for-age:	Mildly undernourished
Weight-for-height:	Normal
Arm circumference:	Borderline

If the child had been monitored frequently, a similar variation would be evident:

Weight-for-age:	Decrease
Height-for-age:	Mild decrease
Weight-for-height:	Static, no problem
Arm circumference:	Mild decrease

Over time each of these indicators has been advocated for use in growth monitoring projects. In the 1950's and 1960's, weight-for-age was the most widely used indicator for identifying children with nutrition and health problems. Although weight-for-age is still the most commonly used indicator, alternatives became well accepted in the 1970's. Projects in communities with limited resources and using minimally-educated health workers introduced arm circumference as an acceptable indicator (107).

In 1972 a system using height-for-age and weight-for-height was introduced (124). By comparing results from both of these measurements (weight and height), health workers can distinguish between long-term, chronic malnutrition and current, acute malnutrition. In chronic malnutrition, which leads to stunting, height and weight are reduced, but weight is normal for height. In acute malnutrition, which leads to wasting, weight is low for height. This system and the weight-for-age system were endorsed in 1978 by the World Health Organization (124). Since that time, support has increased for the use of the weight-for-height comparison alone for identifying the nutritional status of children in programs that screen children periodically, because it distinguishes acute from chronic malnutrition, and it eliminates the difficulty of estimating children's ages (102-125). However, weight-for-age continues to be the favored measure for monitoring programs where measurements are taken frequently and monthly gain is stressed because weight is most sensitive to changes in diet and health (190).

Nevertheless, each program must find the indicator it deems most reliable. The answer depends on what the measurement is supposed to do and on how the information will be applied.

## GENERAL CONSIDERATIONS FOR CHOOSING A MEASURE

Program planners should consider the following questions in deciding what measure to use:

- What is the main purpose of initiating growth monitoring? All projects follow the progress of the individual child, but is the emphasis placed solely on present status or also on monthly improvement?

- What is to be done with the monitoring results? Will they be used to:
  - identify children with high mortality risk for emergency medical treatment?
  - identify children with high morbidity risk for emergency medical treatment?
  - identify children with minor growth failure for dietary improvement?
  - evaluate the effect of an intervention?
- What is the nutrition profile of the area as best determined by surveys? Is severe malnutrition common or is the population relatively healthy with only a few individuals experiencing malnutrition? Are there seasonal peaks for malnutrition? Are there particular ages at which malnutrition is most prevalent? The indicator should be sensitive to the community's needs as they are defined by the profile to ensure that the fewest number of malnourished children are misclassified.
- What is the level of competency of field workers? What training will be necessary to take the measure?
- How objective and reliable is the measurement? Will a repeated measure render the same result?
- How much time is required to take the measure?
- What instruments are needed and what financial resources and logistics are necessary for adequate use?
- What cultural factors should influence the decision (e.g., availability of age data, attitude of mothers toward measuring)?

The primary concern of most health care projects is to select the measure that most inclusively identifies children in need of nutrition and health interventions, and that indicates if and how well a child is responding to an intervention.

## The Measures as Predictors of Mortality Risk

Severely malnourished children, as measured by any indicator, have a much higher risk of mortality than well-nourished children. In Bangladesh (28), where severely malnourished children showed a fourfold increase in mortality over those with mild or moderate malnutrition, all the measures provided a good indication of mortality risk over a short period of monitoring growth. However, the indicators which most correctly identified children with mortality risk over a 24-month period were weight-for-age and arm circumference-for-age. The high correlation between weight-for-age and mortality outcome was substantiated by two projects in India (68, 104). Weight-for-age has been shown to be a reliable indicator of mortality risk through age five (28), although mortality rates are highest during the first three years of life.

While limited scientific data suggest that weight-for-age is a better predictor of mortality than other indicators, additional evidence has found arm circumfer-

ence without correlation to age (28, 118) as well as arm circumference-for-age to be measures of equal utility. In a study that compared low arm circumference values (less than 9 cms) to low birth weights as a predictor of infant mortality, both measures proved useful: all infants who died in the first month of life were detected, but arm circumference measurements placed more infants in the high risk groups (191). This implies that it would be useful to include age-specific (0-30 days) arm circumference measure for newborns where weight cannot be used.

### Evaluating Intervention Effectiveness

The first change noted in a child responding to the advice of a health worker is a weight increase. Thus, measuring weight over time is useful not only because it may signal problems early, but also because improvement will be seen quickly and the treatment can be altered according to the response.

Beyond evaluating changes in an individual child's status, growth monitoring data have and are being used to evaluate interventions for groups of children. (See Chapter 8 for a more thorough discussion.) Traditionally, weight-for-age has been used to evaluate a program's success in improving nutritional status. When some programs failed to show results with this indicator and its accompanying classification system, attention focused on using weight-for-height for evaluation purposes (8, 15). The argument against the weight-for-age system is that it groups children who are stunted from past malnutrition with children who are wasted from a current health or nutrition problem. Recovery rates of those wasted children are usually more rapid than those

of stunted children. Therefore, a system that distinguishes those currently suffering from acute malnutrition is the more desirable for highlighting program impact.

Evaluating children with current acute malnutrition as indicated by weight-for-height is a reasonable approach. Of course, exclusion of stunted children should not mean they are forgotten. These children can recover from height retardation (136). Additionally, if weight-for-height is used to monitor a program's progress or impact, health workers should distinguish children who gradually increase both weight and height and those who gain in height before adding muscle or fat. These children should not continue to be classified as part of the population that has not improved, even though they may not change category under the weight-for-height system (27). Again, it is important to combine nutritional status with dynamic growth status determinations.

As with mortality risk prediction, no indicator is perfect for assessing program impact. And, although data from a growth monitoring program may be useful to evaluators it is important that the diagnostic value of growth monitoring for an individual child not be compromised to the interest of research and evaluation or the system will be useful to no one.

### PARTICULARS OF EACH MEASURE

Studies done under a wide variety of conditions have compared the different growth indicators using various criteria. The advantages and disadvantages of the different indicators are found in Table 1, and the indicators are rated according to various criteria in Table 2.



*While the technique used by this Afghani nursing auxiliary is less than ideal, it is frequently used. WHO/17892*

**Table 1: Advantages and Disadvantages of Different Anthropometric Indicators for Growth Monitoring Projects**

Indicator	Advantages	Disadvantages	Comments
1. Weight-for-Age	<ul style="list-style-type: none"> <li>● Good basic indicator, combining acute and chronic malnutrition (125, 136).</li> <li>● Sensitive to small changes (although many variables influence small fluctuations in weight) (82).</li> <li>● Measure is objective and repeatable (82).</li> <li>● Sole tool (scale) is portable and relatively inexpensive.</li> <li>● Weighing is relatively easy for inexperienced health workers to manage.</li> <li>● Measure is not time consuming.</li> </ul>	<ul style="list-style-type: none"> <li>● Not sensitive to a stunted child who is growing well (below but parallel to a normal growth channel) (8, 27) or to the very tall child who may be malnourished (1).</li> <li>● Relies on age data, which are often subject to error. Age data for children below two years old have been found accurate, or, if in error, easily corrected, but it is difficult to accurately estimate unknown ages for children over two years (76).</li> <li>● Mothers in some countries have objected to hanging their children from the scale during weighing (67).</li> </ul>	<ul style="list-style-type: none"> <li>● Better if used with children 0-2 years because height retardation is less pronounced (125); however, it is a valid indicator through the preschool years.</li> </ul>
2. Length/Height-for-Age	<ul style="list-style-type: none"> <li>● Good indicator of past nutrition problems (125).</li> <li>● Measure is objective (82).</li> <li>● Sole tool (A length and height board) can be made locally for a minimum investment, and the board is easily transported.</li> <li>● Rarely are mothers reluctant to have child measured because of appearance of the board.</li> </ul>	<ul style="list-style-type: none"> <li>● In growth monitoring projects it should be supplemented by another indicator like weight-for-age or weight-for-height because changes in height occur relatively slowly.</li> <li>● Requires two different techniques if programs include all preschoolers: recumbent (lying down) length (children 0-2 years) and standing height (children 3-5 years).</li> <li>● More difficult for unskilled workers to learn to take accurate length/heights than to weigh a child with a simple scale.</li> <li>● Requires two persons to take the measure.</li> <li>● Relies on age data, which are often subject to error.</li> </ul>	
3. Weight-for-Length/Height	<ul style="list-style-type: none"> <li>● Good indicator to distinguish those who are well proportioned (weight/height) from those who are thin (or heavy) for their height (8, 122).</li> <li>● Indicator does not require age data, which are often inaccurate and difficult to obtain.</li> <li>● Measures are objective.</li> </ul>	<ul style="list-style-type: none"> <li>● Depending on the cut-off points chosen (see Chapter III), weight-for-height can underestimate malnutrition by classifying those who are short and thin as normal (102, 106).</li> <li>● Requires taking two measures; therefore, problems of purchasing or making the instruments and transporting them are compounded.</li> <li>● Weighing and measuring height will require more training time and may be too complicated and time consuming for the inexperienced clinic worker to do with frequency.</li> <li>● Some mothers may be reluctant to have their children weighed.</li> <li>● Requires two persons to take length or height measure.</li> </ul>	

Indicator	Advantages	Disadvantages	Comments
4. Arm Circumference	<ul style="list-style-type: none"> <li>● Indicator of severe current malnutrition (1), whether or not stunting is present (8).</li> <li>● While it may not detect changes as rapidly as weight monitoring, it will indicate changes in nutritional status over a short time.</li> <li>● Measurement is taken with an inexpensive and portable arm tape, which can be made by project personnel.</li> <li>● Quick to use.</li> <li>● Arm tape can be color coded for use by non-literate health workers.</li> <li>● Indicator does not require age data, which can be inaccurate and difficult to obtain.</li> <li>● No known objection by community to this measure.</li> </ul>	<ul style="list-style-type: none"> <li>● Will only identify children with severe malnutrition. It is more difficult to determine who is borderline.</li> <li>● Variability is high on measurement. Field workers need practice taking measurement to do it accurately. Finding the mid-upper arm and placing the tape around the arm without compressing the tissue is difficult.</li> </ul>	<ul style="list-style-type: none"> <li>● Some researchers indicate that measure should be used only with children 1-3 years old (7, 96), although others say it is valid for children 1-5 or 6 years old (106), and that it can be used beginning at 6 months (132). (Others have indicated that the measurement is best if it is adjusted for age increments.)</li> </ul>

**Table 2: Rating of the Different Indicators by Ability to Fulfill Criteria**

crit <sup>erion</sup>	weight-for-age	height-for-age	weight-for-height	arm circumference
1. Population Group				
● To serve as an overall indicator of malnutrition	4	2	3	3
● To identify current malnutrition (wasting)	3	1	4	3
● To identify a maximum of malnourished children	4	2	2	3
2. Instruments				
● cost	2	3	1	4
● portability	3	2	2	4
3. Difficulty in taking measure	3	2	1	3
4. Time to take measure	2	2	1	3
5. Reliability (low error)	3	2	2	3
6. Sensitivity to change over a short time period	4	1	3	3
7. Resistance to measure by families	3	3	3	4
8. Age preference	0-6 years, but best ≤ 3 years	0-6 years, but best > 2 years.	0-6 years, but best > 2 years	approx. 1-4 years
9. Other			age independent	age independent; system adaptable for non-literate workers.

Each indicator has been rated on a scale of 0-4:

0 = not appropriate 1 = poor performance 2 = moderate performance 3 = good performance 4 = excellent performance

## Defining Adequate Growth

### CHOOSING A REFERENCE POPULATION

Monitoring the growth of a child requires comparing changes in the same measure taken at regular intervals. A single measurement only indicates the child's size at the moment; it offers little information about whether the child's size is increasing, entering a period of stability, or declining. Because most children will continue to grow—even if only slightly—unless they are extremely ill, it is easy to mistake some growth for adequate growth unless the child's measurement is compared to a reference population.

Which population to use for comparison purposes is a controversial question. The debate continues about whether children from different areas of the world have the same genetic potential for growth (54, 125, 161, 186). Some experts argue that genetic background does make a difference, particularly for age-specific rates of growth (44, 48, 103, 125), while others argue that for children 0–5 growth rates are the same and only begin to be influenced by genetic potential at puberty (24). Investigators exploring the effect of environmental factors, such as extremely high altitudes, on growth (18) conclude that perhaps in countries and even in regions where environmental factors are extreme, special reference values should be established based on more realistic expectations of growth in these populations.

Several studies indicate that presumably well-nourished, upper-class children in developing countries grow at the same rate as upper-class children in developed countries. This implies that growth patterns may be influenced more strongly by such environmental factors as dietary adequacy and frequency of illness than by genes (17, 54, 89, 119). If this is true, reference values based on the growth of healthy children in industrialized countries are suitable for use in less developed countries or in ethnically distinct communities (17, 54, 61, 66, 94).

Another determinant of child growth, infant feeding patterns, is currently being assessed to determine whether or not separate standards are needed for exclusively breastfed infants. Initial studies point to the fact that infants who are exclusively breastfed from birth have a faster rate of growth during the first two to three months than children who are supplemented. Their growth velocity then slows falling below these children who are supplemented, but the breastfed infants remain healthy. Small differences in growth continue beyond when the breastfed infants receive supplementary foods.

The emerging conclusion is that for a population where children are almost exclusively breastfed for the first six months of life it might be more appropriate to use a different growth standard by which to measure their progress (194, 195).

Gathering data to establish local reference population values is no minor undertaking; measurements must be taken on a cross-section of a well-nourished population—on a minimum of 200 individuals in age groupings of 3–6 months for each sex—following strict scientific survey methods and standards and with careful data analysis (125). Colombia (35), India (57), and Brazil (155, 161) have established their own reference populations. Because creating local standards may not be feasible for each country or ethnic group, internationally applicable reference populations have been recommended for use with adjustments to be made in the cut-off points\* for defining malnutrition within each area or project (61, 125–158). With the recent acceptance of international standards in both Colombia and Brazil (141), the decision was made to print the national growth card using international standards rather than those developed locally.

Over the last two decades two sets of reference population data for preschool children have been used extensively and internationally—the Boston and Tanner standards. Although well recognized, these reference population values are now being replaced by the National Center for Health Statistics' (NCHS) data, which is drawn from a sampling of a more heterogeneous population than either of the earlier surveys.

Following is a brief description of the three reference populations.

#### 1. The Boston or Harvard Reference Population:

These data resulted from a study conducted by Stuart during 1930–1939 on a small sample of relatively well-nourished Caucasian children in the United States (112). These data are expressed in percentiles for weight-for-age and height-for-age, and from them median scores have been calculated for weight-for-height. The Boston reference population data have been used extensively in designing weight-for-age growth charts in Latin America and Asia.

Often these data are combined with the Iowa or Meredith reference population data, compiled from a survey done in 1923 on a small population of Caucasian

\*Cut-off point: as defined by WHO is "the value which marks the boundary of acceptability" (39).

school-age children (13). The tables that combine these two sets of data are referred to as the Stuart-Meredith Tables (111).

### 2. Tanner's Reference Population:

As part of the International Children's Centre's longitudinal research program, growth data have been collected from a number of countries: France, the Netherlands, Sweden, Switzerland, and England. The English data, collected by Tanner from a homogeneous population, were used to formulate growth standards for England (115) for the basic growth indicators. These standards have been used extensively in Africa on the Ilesha or Road-to-Health Card (see Chapter 3).

### 3. National Center for Health Statistics (NCHS) Reference Population:

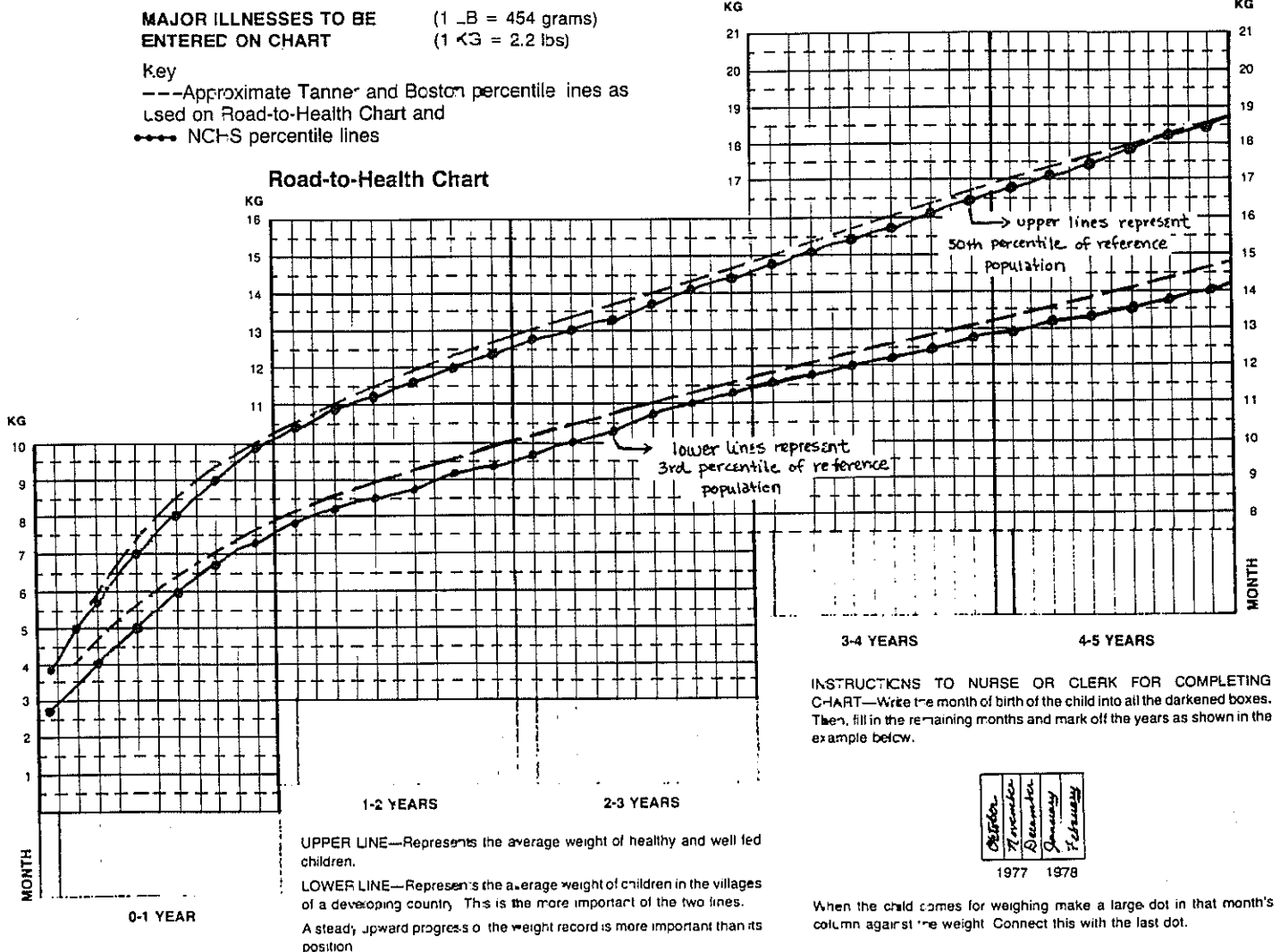
In 1974 the U.S. National Academy of Sciences recommended updating the reference population used for comparing the health status of groups within the U.S.

The result of several years of work is a set of tables and charts that combine two reference populations, both large and randomly selected from different economic and ethnic groups in the United States. The tables for children from birth to three years are compiled from measurements collected by the Fels Research Institute. The tables for children two to eighteen years are based on data collected by the Health Examination Survey of the National Center for Health Statistics. Tables and charts are available for: weight, height, skinfold thickness, head and arm circumference (90).\*

The differences among the Boston, the Tanner, and the NCHS reference populations are minor: the NCHS values are slightly lower (165, 186). (See Figure 1 for a comparison of the fiftieth and third percentiles of Boston, Tanner, and NCHS data.) However, the World

\*A copy of these tables and a sample of the growth charts can be obtained free of charge from:  
U.S. National Center for Health Statistics  
3700 East-West Highway, Center Building 1-57,  
Hyattsville, MD 20782 U.S.A.

Figure 1: Comparison of Tanner and Boston 50th and 3rd Percentile Values with Those of the National Center for Health Statistics (NCHS).





Health Organization, the Centers for Disease Control, and other groups strongly urge adoption of the NCHS reference population data because interpretation of a comparison made to NCHS data is more useful and clearer: the individual or group is being compared to all contemporary U.S. children of the same age and sex without selection for economic or ethnic background.

## INTERPRETING THE LINE FOR ADEQUATE GROWTH

While reference population values serve to relate the progress of an individual child to a known growth potential, this comparison becomes most useful to the health worker or mother when cut-off points between adequate and inadequate progress, and between acceptable nutrition and malnutrition are specified. Determination of cut-off points is an important issue for local consideration since it can determine how severe the problem appears and can determine the priority assigned to child nutrition programs in a particular region.

An examination of the ways to express cut-off points should precede a discussion of the systems currently in use. Cut-off points are expressed in three ways: percentages of the median, percentiles, and standard deviation units.

**Percentage of the Median.** To adapt data derived from well-nourished populations in industrialized countries for use in developing countries, classification of nutritional status has been shown in terms of percentages of the median of the reference population. Percentages of the median are calculated by first identifying the median (middle) value for the reference population; this median value, then, is called 100 percent. Second, absolute values at different percentage units from the median are calculated. For example, if the median weight of all two-year-olds in the reference population is 12 kilograms, 90 percent of the median would equal 10.8 kilograms and 50 percent would equal 7.2 kilograms.

Several classification systems have been proposed using percentage of the median (see Tables 3-7). Gomez *et al.* in 1956 (46) proposed one system for calculating weight-for-age first using a Mexican population and then transferring to the Boston reference population. This system is well known and has been used extensively in Latin America. Slightly modified classification systems, using the same principles, were later proposed (see Table 1). Cut-off points based on percentage of the median have been developed also for weight-for-height and height-for-age by Waterlow (125), McLaren and Read (79), CDC (37), WHO (39), and others.

**Percentiles.** Some health professionals, dissatisfied with the percentage of the median method of expressing cut-off points, have advocated using percentiles from the reference population data (86, 114). The number of the percentile represents a position out of 100. The

fiftieth percentile represents the midpoint of the population; exactly half the children will be above and half below this value. For example, if in a group of 100 children one child falls at the tenth percentile line, nine children would be below and ninety above this child.

Figure 2 illustrates how percentages of the median and percentiles compare using the same reference population. In this figure, 120, 90, 75 and 60 percent of the Boston median are compared to the fiftieth and third percentiles. Note that 75 percent of the median value and the third percentile are almost identical.

**Standard Deviation Units.** Standard deviation (SD) units, also called Z scores, are most often used to express survey results. However, WHO (129) and Waterlow *et al.* (125) now advocate using standard deviation units to express growth monitoring results. To date only the WHC chart designed for use by health professionals has cut-off lines that represent SD units calculated from the NCHS reference population data (129).

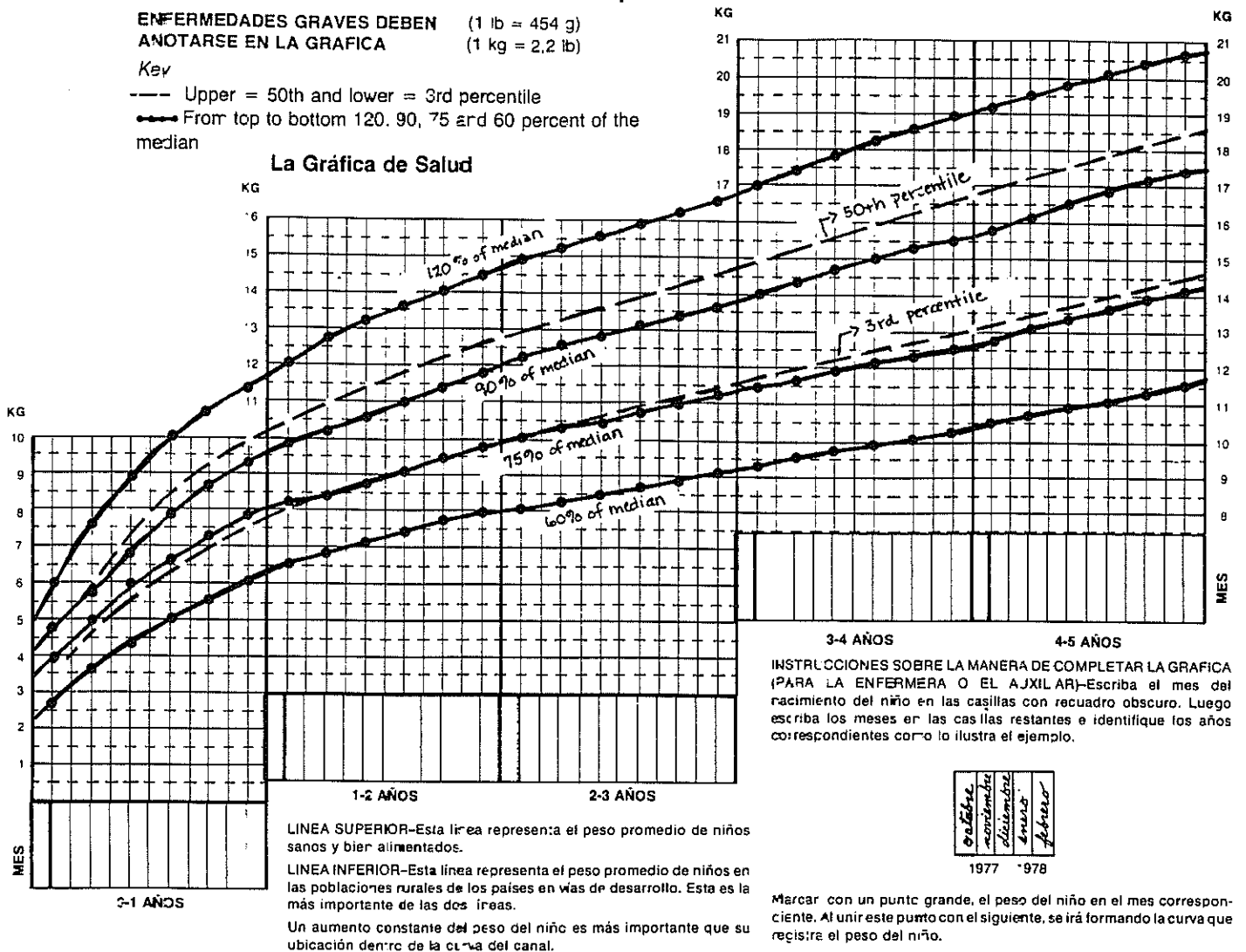
Following are SD unit equivalents for different indicators as they are commonly expressed in growth monitoring:

- 1 SD unit = 11-12 percent units from the median weight-for-age (132).  
e.g., if a child is 75 percent of the median weight-for-age, (s)he would be 25 percentage units below the median or just below -2 SD units.
- 1 SD unit = 10 percent units from the median weight-for-height (125).  
e.g., if a child is 85 percent of the median weight-for-height, (s)he would be 15 percentage units below the median or -1.5 SD units.
- 1 SD unit = 4-5 percent units from the median height-for-age (132).  
e.g., if a child is 105 percent of the median height-for-age, (s)he would be 5 percent units above the median or +1 SD unit

The normal growth channel for any population is considered to be that range between plus and minus two standard deviation units of the median, a range that includes almost 98 percent of the *reference* population. It has been suggested that this be considered the "lower level of normality" and that national or project goals could include reducing the percent of children below this limit to 3 percent of the population (158). For guidance, the rough equivalents for -2 SD units, the concern when describing undernutrition, are given as percentages of the median:

weight-for-age:	77 percent of median (approximates 3rd percentile)
weight-for-height:	80 percent of median
height-for-age:	90 percent of median

**Figure 2: Comparison of 50th and 3rd Percentile Curves with Curves at 120, 90, 75 and 60 Percent of the Median Using the Bostor Reference Population.**



**VARIOUS CLASSIFICATION SYSTEMS**

Using these basic statistical procedures, sometimes combined with clinical signs, a variety of systems have been designed to define a child's nutritional status. One exception is in Tamil Nadu, India, where a regional program is experimenting with the concept of "dynamic" nutritional status by comparing absolute weight gain by the child each month to reference population values for weight gain (49), rather than judging nutritional status by a measurement taken only once. No matter which system is chosen their aim is to identify those children most in need of help—either because they are

malnourished or because they are in danger of becoming malnourished. Each system attempts to identify 100 percent of those who are truly malnourished (to have no undetected positive cases) and to minimize the identification of children who do not need nutritional help (to minimize detected negative cases).

As stated earlier, the choice of a classification system, or where the cut-off lines will be drawn, greatly influences how the incidence of malnutrition will be reported and thus, the priority assigned to nutrition programs.

The following tables show a variety of classification systems by indicator.

**Table 3: Arm Circumference**

System	Reference Population	Method	Classifier
WHO (39) and Shakir (106)	Wolanski 16.5 cm.	% of median	>85% or >14 cm.: normal 85-76% or 14-12.5 cm.: malnutrition <76% or <12.5 cm.: severe malnutrition
SINAPS (167)	Wolanski adjusted for age	% of median	>80%: not at risk <80%: at risk

**Table 4: Weight-for-Age**

System	Reference Population	Method	Classification
Gomez (46)	Boston	% of median	> 95%: normal 90-75%: mild malnutrition (grade 1) 75-61%: moderate malnutrition (grade 2) ≤ 60%: severe malnutrition (grade 3)
Jelliffe (61)	Boston	% of median	110-90%: normal 90-81%: mild malnutrition (grade 1) 80-61%: moderate malnutrition (grades 2 and 3) ≤ 60%: severe malnutrition (grade 4)
Bengoa (16)	Boston	% of median	Gomez classification with all cases of edema added to the category of severe malnutrition
Kasa Project, India (104)	Boston	% of median	> 65%: not at risk ≤ 65%: high nutritional risk
WHO (129)	NCHS	Percentile	50th-3rd percentile: normal ≤ 3rd percentile: malnourished
Tamil Nadu (49)	Indian Council of Medical Research	Absolute weight gain	6-11 mo.: 500 gm/months: normal 12-35 mo.: 500 gm/3 months: normal anything less is inadequate
Candalaria Project, Colombia (35)	Boston	% of expected gain	< 85% of expected weight gain shows nutritional risk
Indonesia (20)	Boston	% of median + weight gain	Gomez classification on chart and children < 60% are considered at risk. For other children risk assessed by weight gain: gaining weight each month—normal; no weight gain—at risk

**Table 5: Height-for-Age**

System	Reference Population	Method	Classification
Kanawati and McLaren (65)	Boston	% of median	≥ 95%: normal 95-90%: mild malnutrition 90-85%: moderate malnutrition 85%: severe malnutrition
WHO (39)	Boston	% of median	105-93%: normal 93-80%: short < 80%: dwarf
CDC (37)	NCHS	% of median	≥ 90%: adequate < 90% stunted or chronically undernourished

**Table 6: Weight-for-Height and Height-for-Age**

System	Reference Population	Method	Classification
Waterlow (125)	Boston	% of median	(see above for actual percentages) adequate weight/height and height/age: normal low weight/height, normal height/age: acute malnutrition normal weight/height, low height/age: chronic malnutrition low weight/height and height/age: chronic and acute malnutrition

**Table 7: Weight-for-Height**

<i>System</i>	<i>Standard</i>	<i>Method</i>	<i>Classification</i>
McLaren/Read (79)	Boston	% of median	110-90% normal 90-85%: mild malnutrition 85-75%: moderate malnutrition <75%: and/or eczema; severe malnutrition
Waterlow (125)	Boston	% of median	110-90%: normal 90-80% mild malnutrition 80-70% moderate malnutrition <70%: severe malnutrition
Viteri/Beghin (121)	Boston	% of median	< 92%: warning sign (needs clinical exam)
Patulul Project, Guatemala (34)	Boston	% of median	>90%: normal 90-81%: moderate malnutrition ≤80%: severe malnutrition
CDC (37)	NCHS	% of median	85-80%: moderate malnutrition <80% wasted/acute malnutrition
NCHS (90)	NCHS	Percentile	75th-25th normal 10th-5th: moderate malnutrition <5th: severe malnutrition

### CHOOSING A CLASSIFICATION SYSTEM

The above tables make it clear that a wide variety of systems exist, some with several cut-off points, others with only one. The choice depends on the program goals, the resources available (159), and the need for cut-off points to reflect achievable goals that will encourage both mothers and project personnel.

#### Project Goals and Resources

The general goal of most growth monitoring projects is to identify children who are malnourished or whose growth pattern is faltering and to offer particular interventions to improve their condition before it reaches emergency status. Generally, programs have three types of resources to offer these children: their families, and communities: food, medical attention, and education.

Since scarce resources such as food should be provided to those with the greatest need, indicators and cut-off lines should be chosen carefully to indicate only acutely malnourished children. Hence, those who may have been malnourished in the past but currently are growing adequately would not be included. When weight-for-age is monitored, it is important to look at nutritional classification as well as monthly weight gain. If weight-for-height is used, children with very low weight for their height would be included. Each program should evaluate the impact of resources such as food on children with varying nutritional status to determine the cut-off lines and criteria (nutritional and non-nutritional) for admission into the intervention program.

When growth monitoring results are used to identify children who need medical attention, the variety of

categories should reflect the types of attention available within the referral system. As a preventive measure, a high curve would be drawn to indicate children in need of a visit to the nearest health center (one professional (121) suggests that all children less than 92 percent of the reference median for weight-for-height or any child who has not gained weight for 2 second consecutive month should receive a clinical exam). A high cut-off line would help ensure that children with a low morbidity risk be examined for common problems and be given immunizations. The cut-off line for sending a child on to a regional health facility or hospital would be lower, identifying acutely malnourished children by their low weight-for-height, inability to gain weight over time, and/or classification as severely malnourished under any of a variety of systems.

All programs with growth monitoring should include health and nutrition promotion and education. Generally, no one should be excluded from these activities. However, if single-subject group discussions or home visits are planned, some screening criteria may need to be established to avoid over-burdening the health worker. In this case cut-off points can be so high as to include even mildly malnourished children or children not gaining weight during the month, but not children growing normally.

#### Motivation of Mothers and Project Staff

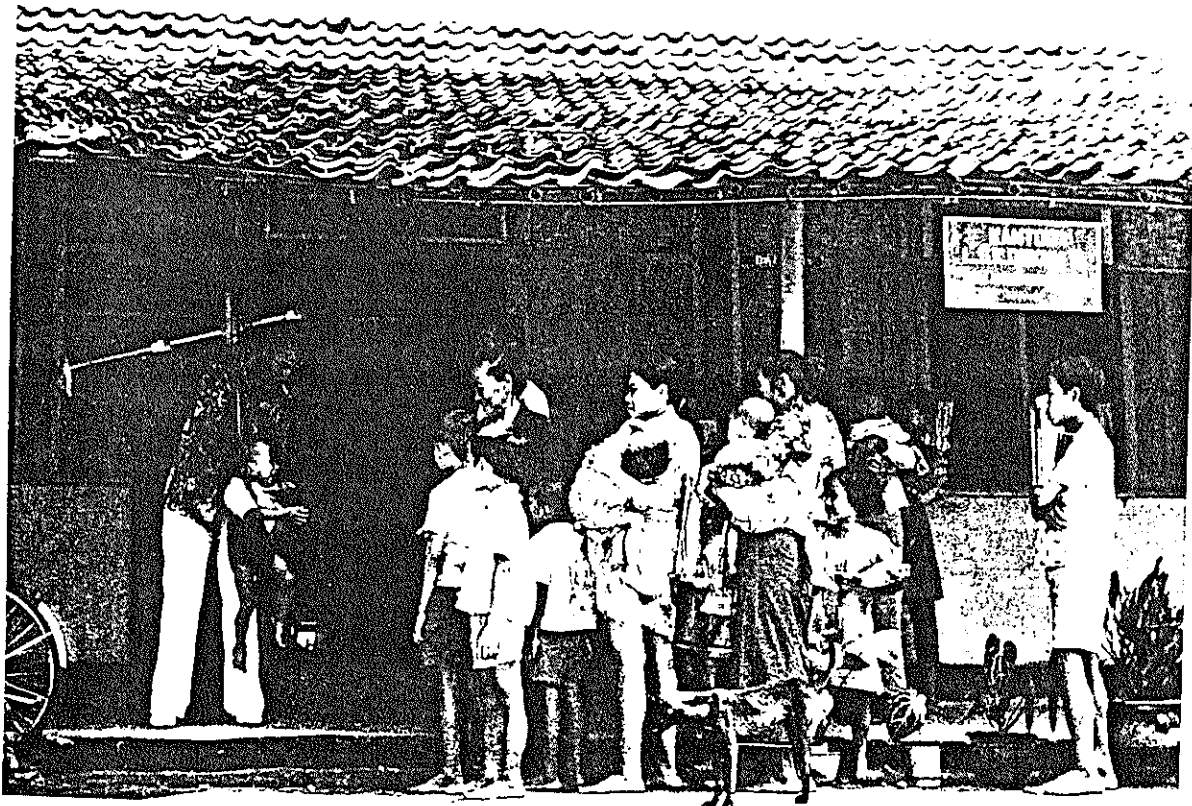
One measure of the impact of a growth monitoring project is its effect on mothers and their willingness to change daily practices to improve their children's growth patterns and thus their nutrition and health status. The

choice of cut-off points can affect mothers' motivation because the cut-off points specify goals and emphasize a record of accomplishment. Although the advantage of using only one line to separate the malnourished from the well-nourished is its simplicity, it may leave the mother with no goal once her child is above the line, or her child may be so far below the line that she will presume failure. During a growth monitoring project in Bangladesh, project personnel learned that using three different cut-off points on the child's growth chart helped to motivate mothers because they saw that the goal (the next growth channel) would be reached if the child gained only a small amount instead of many kilograms (57).

In this same regard, realistic criteria or cut-off points for judging the success of a program in improving nutritional status will motivate project staff. The inclination of program planners is to say that after a particular period of time there will be no more severely malnourished children and to plot the cut-off line much higher than can be achieved. Before following this inclination, program planners should examine the number of children below various cut-off values, selecting a cut-off level that will include no more children than the program can expect to contact or include in intervention activities. Then consideration should be given to the ability of children within certain age groups to show marked recovery, particularly those who were malnourished in the past. For many programs an example of a realistic measure of impact would be a reduction

in the number of children requiring referral to a hospital (those who are wasted). This goal often can be achieved by programs unable to effect improvements in mild and moderately malnourished children.

It is important to remember that while classification systems are useful for statistical comparison of children and geographic areas, at the community level the category in which a child is placed must be linked with a diagnosis and with follow-up activities. Therefore, most program planners are now advocating that at the community level, the most important goal is weight gain, regardless of nutritional status. The simple criterion used by the worker is whether or not the child has gained weight, and actions are taken based on this outcome. For the parents as well, this goal of weight gain is a realistic goal that indicates differences that can be noted each month. If program planners need to restrict access to scarce resources, the weight-gain criteria could be used in addition to nutritional status; i.e., those moderately and severely malnourished children who have not gained weight could be considered eligible to receive food. Because weight gain is the most dynamic of criteria and will help a program act responsively to the first sign of the problem of malnutrition, it should be considered a priority in defining the overall classification system. But whatever system is selected it must be tailored to the program and the existing nutrition situation if it is to be meaningful for the health worker.



People wait in line to have children weighed. UNICEF 7806.

## Choosing a Recording System

Over the years a variety of systems have been devised for recording and classifying anthropometric information. The choice of a record-keeping system is of prime importance because the purpose of monitoring children's growth can be achieved only when measurements can be compared at regular intervals against one another and against reference population values. To enable the health worker to judge the adequacy of a child's growth for diagnostic purposes, the recording system must be more sophisticated than a simple ledger on which the child's weight and/or height are recorded.\* Its usefulness will depend upon a mechanism that requires no mathematical manipulation of data by the health worker and that illustrates vividly if the child is gaining at an acceptable velocity.

### DETERMINING RECORD DESIGN

The purpose of the monitoring activity within the project will influence the range of information on the card as well as the format for presenting monitoring results. Recording system variables depends on project objectives for growth monitoring. For example, are they to:

- assess child health,
- motivate and educate families,
- assess improvements in individual children?

### Assessment Of Overall Child Health

One purpose of growth monitoring is to help the health worker assess the health status of the individual child in order to decide on appropriate action and to interest the family in the health of the child. To this end, growth information should be combined with other variables to ensure continuity of care and the proper identification of the problem and the solution.

Currently over 80 countries are using growth charts (152). Over 250 "child management records" that use the "Road-to-Health" graph (Figure 3A and 3B) were examined at the Institute of Child Health in England (128). The study shows the information most often recorded on the cards:

child's birth date	100%
immunization history	98%
sex of child	93% (only 2% had different cards for males and females)
ages of siblings	60%
nutritional risk category	42%

Other information may be useful depending on program priorities: child feeding history (128), parents' involvement in family planning (128), antimalarial medication (14), history of illness (outpatient and hospital discharges) (14), and mother's nutritional status (14).

### Motivation and Education of Families

Another purpose for growth monitoring is to motivate and educate families. Frequently, however, the form on which the monitoring results are recorded is designed for the record-keepers and not for teaching purposes or for understanding and interpretation by mothers and other family members. Often, cards provide no space to record the action recommended to help the child and thus foster continued reliance on counseling.

To meet the objective of using growth monitoring as an educational tool the card must be designed appropriately. Designing a simple recording tool that is used and understood by everyone from the doctor to the village family helps eliminate the hierarchical relationship between the doctor and the family, increases communication between them, and demystifies the weighing process and the resulting diagnosis.

Experience has shown the following to be important considerations in designing a card for easy use and interpretation.

**Size of the card and the writing spaces.** The chart must be large enough to be distinguished from other papers and to prevent loss. Its size is determined by the amount of information to be included and the format for recording the anthropometric information. Cards with graphs range in size from 16 × 14 centimeters to 50 × 30 centimeters (128).

When planning the space where health workers will record information, designers should remember that health workers may write with large letters. (Weight charts with a calendar system on the bottom axis have spaces between 5.5 and 7.5 millimeters wide in the graphs of a child's first three years (128).) A simple format and large blocks on the card will make it easier for the health worker to plot the results (67) and for the health worker and mother to interpret the card. The ease and accuracy of plotting are important to consider

\*An exception is the Tamil Nadu nutrition project, where health workers do not use charts but only look at absolute change between measurements (49). This same type of growth velocity system has been proposed for Africa by Dr. Bailey (139).

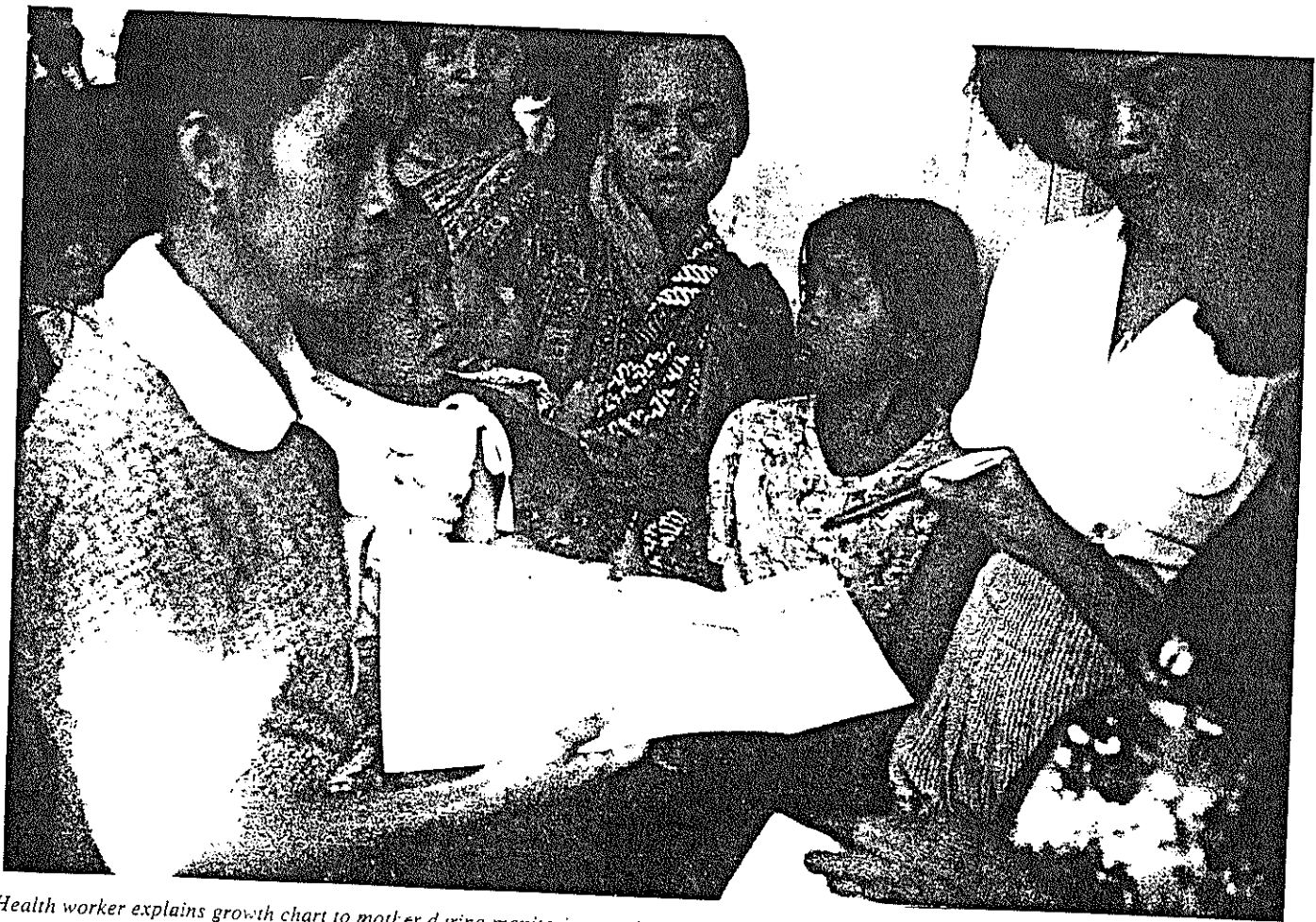
in the context of the average growth monitoring session, where many people have papers to fill out and there are at most only two health workers—one to read the measurement and one to record it.

Space should be provided to note the message given to the mother, the changes in feeding practices she agreed to try, and the follow-up medical attention that was given (132). This space will remind the health worker to make recommendations indicated by monitoring. Additionally, writing the message on the card can help the health worker provide more appropriate follow-up during subsequent visits.

**Cultural context.** The cultural framework and philosophical concepts accepted by the mothers should be incorporated into the card design to make the educational task easier. For example, Dr. Cutting observed in southern India that the Road-to-Health concept could really be adapted to the "road to peace," a philosoph-

ical concept the mothers already understood (31). Additionally, the card should use the appropriate native language, and, if included, motifs and foods should also be local. A study in Pakistan comparing three weight cards found that the card most popular with mothers was the least complicated, was written in the native language, had pleasing colors, and showed a picture of a healthy baby from the local province. Use of the card appeared to dramatically increase the mothers' participation in the program (63).

During field testing in both highland and coastal Ecuador (153) and in the development of Project Poshak in India (47), health workers discovered the strong identification mothers made between colors and health status. Red, often chosen by westerners to indicate danger, in this case was selected as the color of health, while green and yellow were selected to represent weakness and illness. When Project Poshak ended,



*Health worker explains growth chart to mother during monitoring session. M. Griffiths*



workers found that choosing a color association acceptable to mothers enabled 84 percent of the mothers to understand the meaning of the color bands on the chart.

The left-to-right orientation of the cards is another variable that should be examined more carefully in Middle Eastern and Asian cultures. Cards that read from left to right are being used in countries where people read from right to left. The rationale for not reversing the orientation is that educated people are flexible enough to adapt (123). But no one really knows how well the village workers and mothers have succeeded (2). It should be noted that at least one weighing program in Egypt adapted its weight card to read from right to left in accordance with Arabic custom (81). Unfortunately, no evaluation of the perceptions of this change has been made.

Symbols, names, colors, and layout should be decided with the help of all intended users. Testing should be done with both the health workers, who complete the record and explain results to mothers, and the mothers, who need to understand the results and follow the interventions.

**Ease of Interpretation.** The size of the spaces, the number of lines, and the clutter of numbers all influence the ease with which health workers and mothers correctly interpret the chart. Lines should be kept to a minimum, and only those cut-off lines (curves) which are absolutely necessary to determine the appropriate action for the child should be used. Too many cut-off lines or zones focuses attention on nutritional status rather than weight gain (190). Shading growth channels may be better than clearly differentiated zones.

### **Assessing Program Impact and the Improvement of Individual Children**

Another purpose of growth monitoring is to allow program implementers to assess the impact of an intervention strategy on an individual child. Often it is erroneous to assume that because the child is being monitored, full advantage is being taken of the program. As noted above, program personnel should have space to record the specific interventions agreed upon with the mothers so their success can be evaluated.

The growth record is also used by program planners to make community and regional nutrition profiles and to determine program impact in a geographic area. To aid in the aggregation of growth data, the simplicity of the chart as well as a notation of the interventions recommended or provided to the family are crucial. For more details on the aggregation of growth monitoring data, see Chapter 8.

It is useful to be able to collect cards after three to five years of use for evaluation purposes. Often the measuring is done monthly and the cards stored under less than ideal circumstances. Therefore, the record should be printed on durable paper that can withstand

considerable folding and unfolding. The review of growth charts by the Institute of Child Health (128) found that over half were printed on satisfactory (heavy) paper. If the paper was absorbent and easily ripped, "there was difficulty maintaining the health workers' and mothers' pride in the chart" (128, p. 140). If records are maintained by the family, a plastic envelope to protect the paper both extends the life of the card and encourages mothers to give it more importance and better care.

Since recording systems should be tailored to program needs, the selection of a final design should not be made without considerable testing with the users of the card. It is recommended that a well-accepted system (e.g., the WHO chart) be initiated on a trial basis for a few years and then modified (89). The prime consideration is that the format be clear and simple with large spaces that allow for easy and accurate plotting and interpretation. A minimum manipulation of the information obtained from the measurement decreases error. The additional information on the card should be only that immediately useful to the health worker or the mother, or absolutely indispensable in compiling community statistics. Examples are the child's birth date, sex, immunization status, history of illness, nutrition "risk" category, and interventions agreed upon for trial or provided to the child or mother. As mentioned above, local symbols and attractive pictures help increase the prestige of the card as an important record.

### **SYSTEMS FOR RECORDING ANTHROPOMETRIC MEASURES**

One reason there is such a variety of charts in existence around the world is that programs use different anthropometric measures. The systems described below have been used in well-supervised situations or in large programs. They have undergone revision based on implementation experience and can serve as models for local adaptation.

Although different systems may be necessary because of varying program objectives, one system should be used in a single clinic or village and preferably throughout a country, particularly if the population is mobile. If more than one system is in use, it is recommended that program implementers re-evaluate needs and unify systems to avoid duplication of forms and an extremely confusing situation for the health worker. What is crucial in deciding which system to use is its ability to provide the necessary information to those working within the program.

### **Recording Changes in Weight-for-Age**

Perhaps the best known record for growth monitoring is the *Road-to-Health* card developed in the Ilesha Clinic in Nigeria by Dr. David Morley (93) (Figure 3).



The chart allows the health worker to judge the adequacy of growth by completing a graph that has age determinations along the horizontal axis and weight in either pounds or kilograms (never both) along the vertical axis. First the health worker completes the individual "calendar" for the child by filling in the first space on the horizontal axis with the child's birth date (month and year) and continuing to fill the boxes month by month until the child's sixth birthday. At each weighing session, the health worker locates the box and column that correspond to the current month and year. If the calendar is completed the first time the child is seen, this procedure is not time consuming. The health worker then locates the child's weight along the vertical axis. Drawing a horizontal line into the middle of the chart, the health worker notes the child's current posi-

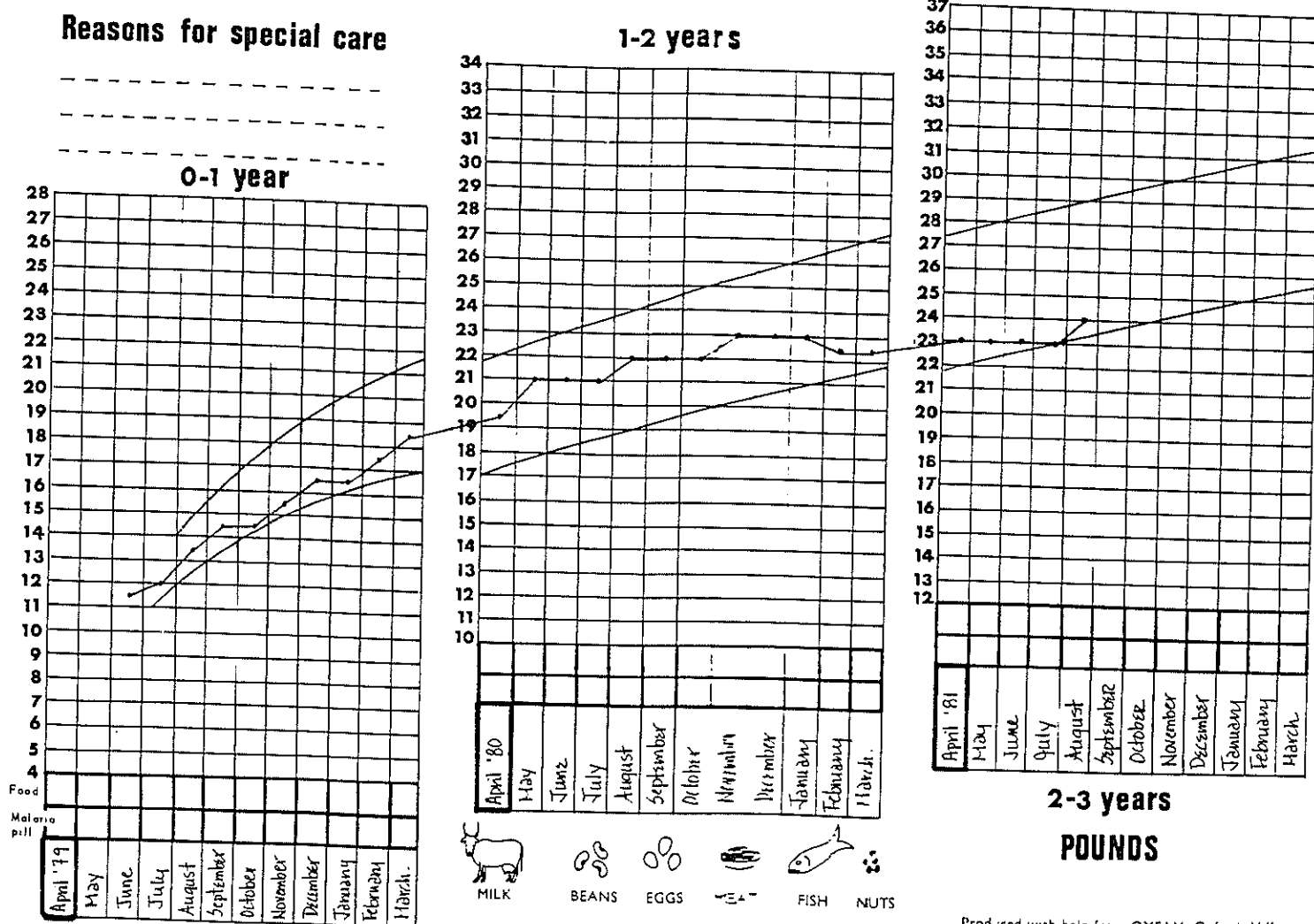
tion with a dot where the weight line crosses the age line.

In this card two curves cross the graph to indicate the boundaries for adequate growth (see discussion in Chapter 2 on cut-off points). A record of growth during the child's first three years is printed on one side of the card (Figure 3A); the other side (Figure 3B) is used to keep a record of growth during the child's fourth and fifth years, of immunizations, and of family information. Samples of this card will be sent free on request.

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AL1 4AX, United Kingdom

**Figure 3A: Road-to-Health Card, side one**

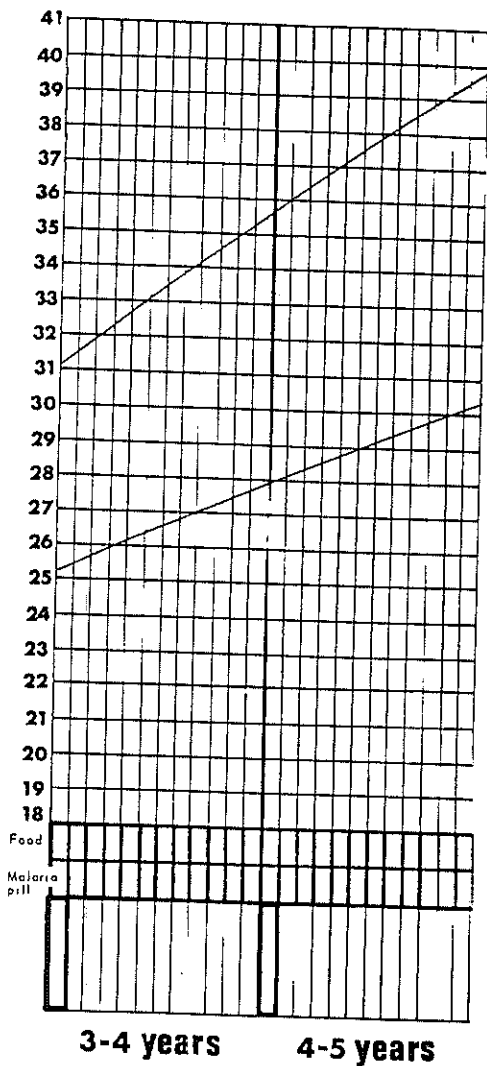
Completed using an example of a child born in April 1979 who has attended a monthly monitoring session through August 1981. The weights marked with + and C are for comparison with the charts in Figs. 8 and 9A. Source: Teaching Aids at Low Cost



Produced with help from OXFAM, Oxford, U.K.

Figure 3B: Road-to-Health Card, side two

Source: Teaching Aids at Low Cost



## Under fives clinic

CLINIC		CHILD'S No.
CHILD'S NAME		
		Boy/Girl
MOTHER'S NAME	REGISTRATION No.	
FATHER'S NAME	REGISTRATION No.	
DATE FIRST SEEN	BIRTHDAY	
WHERE THE FAMILY LIVE		
BROTHERS AND SISTERS		
Year of birth	Boy/Girl	REMARKS

ANTI-TUBERCULOSIS IMMUNISATION (BCG)
Date of BCG immunisation _____
_____
(BCG can be given immediately after birth)

SMALLPOX IMMUNISATION
Date of immunisation _____
(as soon after 3 months as possible)
Date of scar inspection _____
_____
Date of reimmunisation _____
(between four and five years of age)

POLIOMYELITIS IMMUNISATION
Date of first immunisation _____
_____
Date of second immunisation _____
_____
Date of third immunisation _____
_____

WHOPING COUGH, TETANUS & DIPHTHERIA IMMUNISATION
Date of first injection _____
(at the age of one month or later)
Date of second injection _____
(one month after the first injection)
Date of third injection _____
(one month after the second injection)

MEASLES IMMUNISATION
Date of immunisation _____
(at the age of 9 months)

Variations of the Road-to-Health chart exist all over the world. Some of the charts add a sixth year, some add cut-off lines (see Chapter 2), while others begin the lines in the first month of life and others not until month three or four. In an attempt to standardize the chart, the World Health Organization published a model chart for community use in 1978 (129). This chart (Figure 4) is slowly being adopted and adapted by countries with the result that more countries now use only one recording system that is generally simpler and more clear. The WHO chart includes the fifth year of life and begins in month one, where the birth weight should be noted. WHO has recently updated their publication on the growth chart. This new monograph *The Second Revised Edition of a Growth Chart for International Use in Maternal and Child Health Care* (1985), places growth monitoring in the context of health promotion; it describes the chart, but goes farther to demonstrate the adaptation of the technology to local priorities and to

explain the basic concepts behind the chart to trainers of health personnel. This publication which is the first of a proposed series of three publications on growth monitoring being prepared by WHO's Division of Family Health can be obtained from:

World Health Organization  
Division of Family Health  
1211 Geneva 27-Switzerland

One adaptation initially made in Indonesia and now used in Colombia concerns the placement of the boxes where the months are written. On both of these charts, the first (birth month) box has been shifted by half a box to the left. This alteration resulted from years of field work using the traditional method. Program managers found that the health workers always placed the dot for the child's age and weight on the lines, not within the space between the lines as they had been instructed. By shifting the boxes there is now a line



obviously associated with one month and the confusion about whether the dot goes on the line preceding or following the box or within the space has been eliminated (See Figure 5).

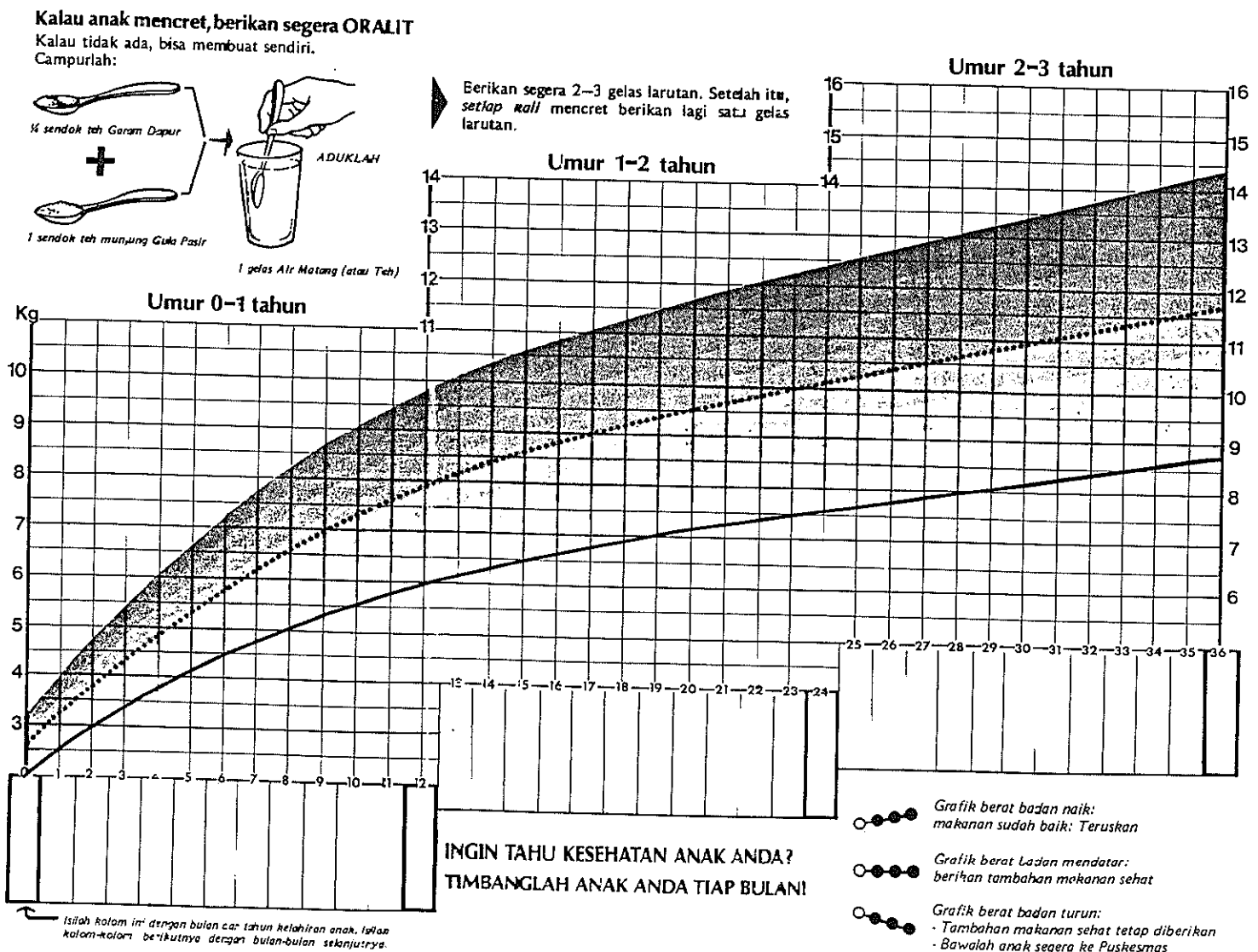
In addition to refinements in the card, the interpretation of the results has also been changing. When the Road-to-Health card was first used, health workers evaluated the adequacy of growth by the position of the last dot on the child's growth curve, i.e. the relationship between the dot and the cut-off lines. Now health workers are taught that some small children who may fall along the bottom line on the graph are small for their age rather than severely malnourished. As long as the children continue to gain weight (their line on the graph ascends), they are not in need of immediate attention. Therefore, health workers currently are being

taught to look at the change taking place between weighings in addition to the relation of the dots to the cut-off lines. A growth line that flattens or descends is a warning sign, as is the presence of edema. A reminder should be included on the growth card to consider the slope of the line when interpreting the new entry.

Programs' success with this type of card has varied. Some problems have been noted when the calendar system is not completed correctly or when it is filled out at each weighing session rather than in one sitting. If it is filled out at each session, a month is often omitted, making subsequent results inaccurate (74). Additionally, a few field workers have commented that the graph and the slowly ascending curve are difficult for the mother to understand.

Figure 5: Indonesia Growth Chart Illustrates Shift in Placement of Boxes Indicating Child's Age and Shows a Reminder of the Slope's Meaning in Bottom Right Hand Corner

Source: UPGK



Attempts have been made to improve these two aspects of the Road-to-Health chart. One is the *Growth Surveillance System* used in Catholic Relief Services' Africa projects (see the final section of this chapter). The other the *Growth Table* developed in the Philippines, was designed to be easier for health workers and mothers to use and understand (Figure 6). On this table, the months of the calendar, beginning with the child's birth date run along the top of the card, and a space for recording the weight each month is provided directly underneath. Under each month is a column marked in kilograms to indicate the range of weight for a child of that age. The health worker places an X in the box representing the range in which the child's weight falls. Four colored areas divide the chart horizontally (not in a curve) to indicate to the mother and the health worker the relative adequacy of the growth achieved.

The mother needs to know that the X's representing her child's weight should follow a straight line across the chart or should increase. If the X's are in the upper portion of the table and a horizontal line can be maintained, the child is gaining weight at the proper rate. If the X's are along the bottom of the chart, an effort should be made to help the child gain weight. If the X's

begin to descend, the health worker and the mother should heed the warning that the child needs special attention. Health workers believe that this system interests mothers and is easy for them to understand, since even with a small change in weight, the progress or decrease is clearly seen in the Table's large boxes (38).

One of the few studies to evaluate the ease and accuracy with which weight charts can be completed and interpreted was conducted in the Philippines. It compared the performance of nutritionists and nutrition aides using three different charts (72). The first was the Growth Table just described. The other two have growth curves: one is illustrated in Figure 3, and the other is a Philippine adaptation, which has a smaller grid that records the entire six years on one side of the card. Although the nutritionists had better scores than the aides, the results of both groups correlated closely.

There was no difference in the ease of plotting or the ease of interpretation among the charts. However, there was a difference in the accuracy of plotting and interpretation and in the overall preference for the charts. The Philippine weight curve received the best scores for plotting accuracy, while the Growth Table was the

Figure 6: Philippine Growth Table Source: USAID mission, Philippines

Name \_\_\_\_\_  
Date of Birth \_\_\_\_\_

**PHILIPPINE NUTRITION PROGRAM**  
**NUTRITION HEALTH CHART FOR BABIES**

PROVINCE: \_\_\_\_\_  
MUNICIPALITY: \_\_\_\_\_  
BARANGAY: \_\_\_\_\_

MONTH	BIRTHMONTH																				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18			
WEIGHT (kg)																					
NUTRITION LEVEL	(PLOT MONTHLY WEIGHT IN CORRECT BLOCK TO DETERMINE NUTRITION LEVEL)																				
GREEN ZONE	1 HEALTHY	3.1	3.8	4.5	5.1	5.7	6.2	6.7	7.1	7.6	8.0	8.3	8.6	8.9	9.1	9.3	9.5	9.7	9.9	10.1	
	WHITE ZONE	2 MILDLY MALNOURISHED	2.9	3.6	4.2	4.6	5.4	5.9	6.3	6.7	7.1	7.6	7.8	8.2	8.4	8.6	8.8	9.0	9.2	9.4	9.5
3		2.7	3.4	4.0	4.5	5.0	5.5	5.9	6.3	6.7	7.1	7.4	7.7	7.9	8.1	8.2	8.5	8.6	8.8	9.0	
YELLOW ZONE	4	2.6	3.2	3.8	4.3	4.7	5.2	5.6	5.9	6.3	6.7	6.9	7.2	7.4	7.6	7.7	8.0	8.1	8.2	8.4	
	5 MODERATELY MALNOURISHED	2.4	2.9	3.5	4.0	4.4	4.8	5.2	5.5	5.9	6.2	6.4	6.7	6.9	7.1	7.2	7.4	7.6	7.7	7.8	
RED ZONE	6	2.2	2.7	3.2	3.7	4.1	4.5	4.8	5.1	5.5	5.8	6.0	6.2	6.4	6.6	6.7	6.8	7.0	7.2	7.3	
	7	2.0	2.5	3.0	3.4	3.8	4.1	4.4	4.7	5.0	5.3	5.5	5.8	5.9	6.1	6.2	6.4	6.5	6.6	6.7	
	8 SEVERELY MALNOURISHED	1.9	2.3	2.8	3.1	3.6	3.8	4.1	4.3	4.6	4.8	5.1	5.3	5.4	5.6	5.7	5.8	5.9	6.1	6.2	
	9	1.7	2.1	2.2	2.8	3.2	3.4	3.7	4.0	4.2	4.6	4.8	4.8	4.8	5.0	5.1	5.2	5.3	5.4	5.5	5.6
	10																				

2-3 YEARS BETWEEN BABIES MEANS HEALTHIER FAMILIES



The second system (Figure 8) has been innovatively designed for use by both literate and non-literate health workers.\* Again, the chart has thin columns for each month. Each column is equal in length to the arm tape. The horizontal color bands on the chart correspond to the bands on the arm tape. The worker measures the child's arm and marks the place on the tape. The tape is laid on top of the child's chart, matching the colors, and the mark on the tape is transferred to the chart. Since this procedure only requires matching colors and transferring the mark, users need not know how to read or write (200). Also, the exact month is not important because the arm circumference is independent of age for children between one and five years old. The health worker simply places the marks consecutively regardless of the time between monitoring sessions.

\*This same type of recording system has been designed for thigh circumference measurement. Thigh circumference has not been included in this paper because it has only been tested in one project (134). However, it may be of interest to program planners, particularly where workers are non-literate.

### Recording Changes in Weight-for-Height

In community growth monitoring projects, height is usually compared to weight and not to age. There are two types of cards currently in use. One resembles the weight-for-age graph, and the other is similar to the arm tape card used in Nepal. An example of the first type is from the Colombian Institute of Family Welfare (Figure 9). This chart places height in centimeters along the horizontal axis and weight in kilograms on the vertical axis. Reference curves are then drawn across the grid. For ease of plotting and interpretation by health workers and mothers, the advantages and disadvantages of this system are similar to those of the weight-for-age curve.

The other type of card (Figure 10) is used with the *Thinness Measure* wall chart explained in Chapter 4. This card, like the arm-circumference card, is easy for the health worker to complete. The health worker marks the card in the colored box corresponding to the color on the wall chart where the child is measured (178).

Figure 8: Arm Circumference Card (Upper Volta) Source: Harvard Institute of International Development, Cambridge Massachusetts

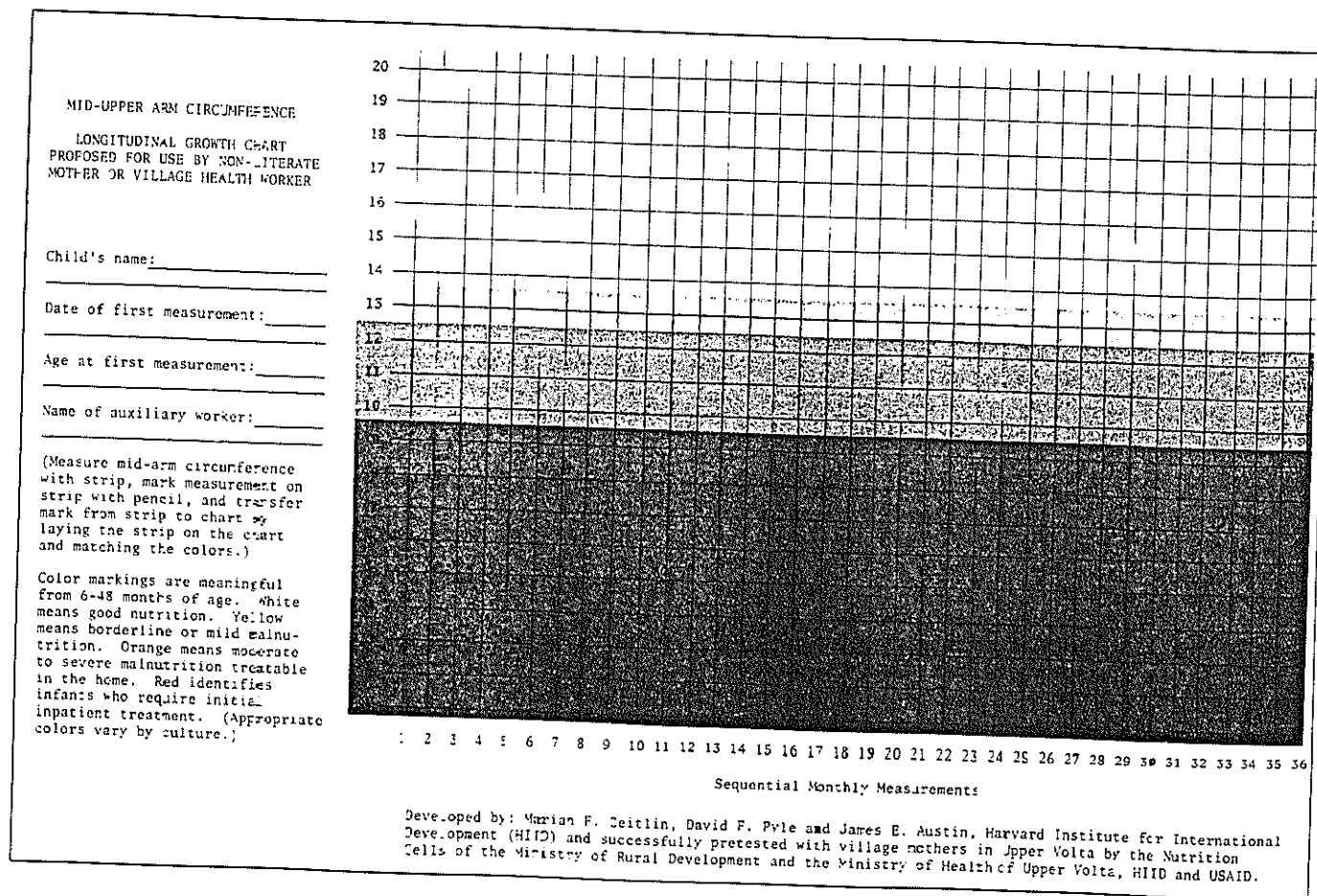
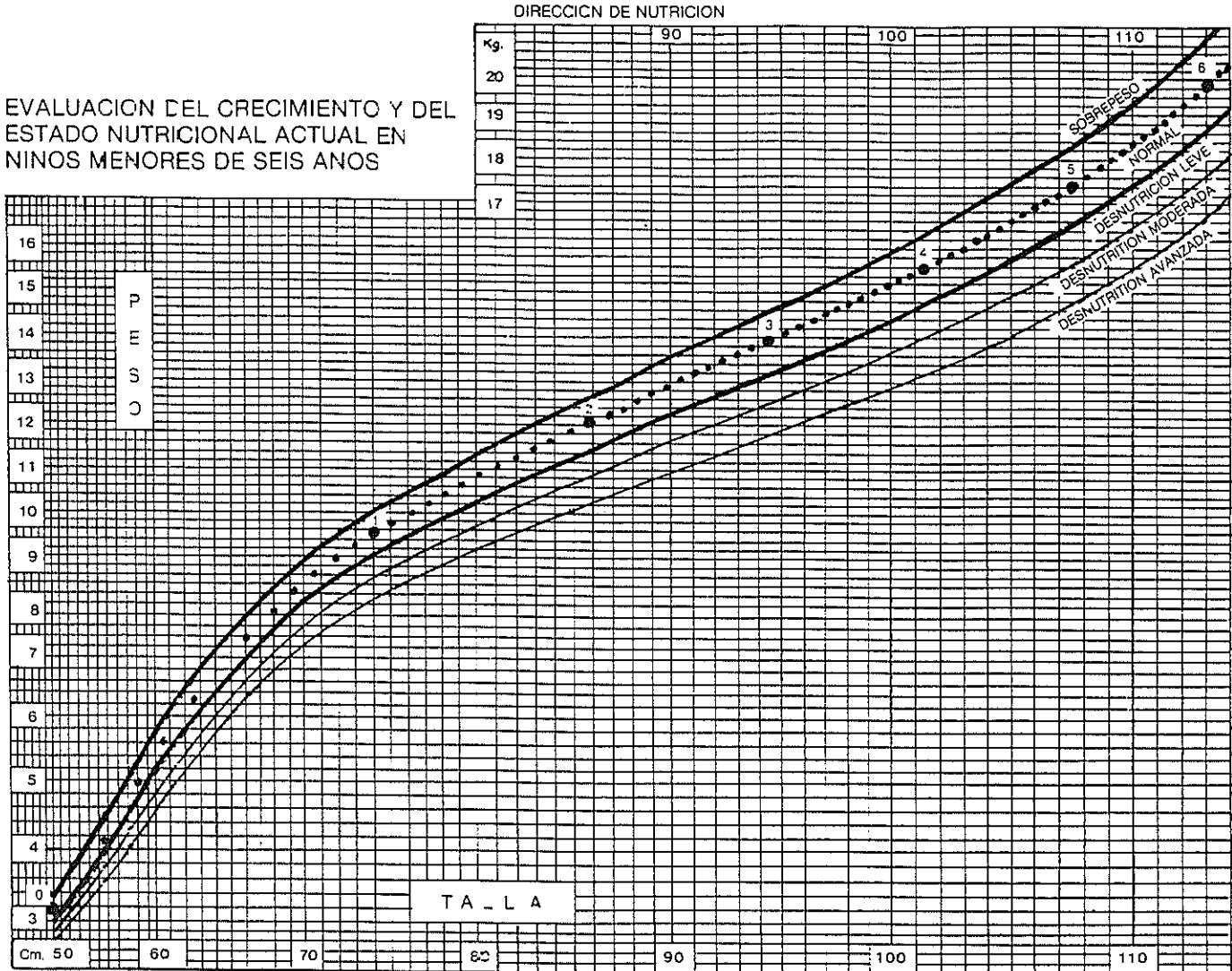


Figure 9: Weight-for-Height Card (Colombia) Source: Instituto de Bienestar Familiar Bogotá, Colombia



dibujo : M<sup>o</sup>. Victoria de Gorrido

Figure 10: Thinness Measure Card Source: Teaching Aids at Low Cost

AGE (months)		NUTRITION CARD												Number																										
Weight for Height percent	60														Dark	Child's name .....																								
	70														Red	Sex    male <input type="checkbox"/> female <input type="checkbox"/>																								
	80														Yellow	Mother .....																								
	90														Yellow	Father .....																								
	100														Green	Address .....																								
	110														Green	Health clinic .....																								
	MONTE														January	February	March	April	May	June	July	August	September	October	November	December	January	February	March	April	May	June	July	August	September	October	November	December	Date of Registration	<input type="text"/>
	YEAR																																							



## A System To Use With Different Charts And Anthropometric Measures

One difficulty that both health workers and parents have found in completing and interpreting the standard weight and height charts is comparing the curve made by an individual child's entries with the background reference curves. Dr. Capone of Catholic Relief Services (CRS) has suggested a numerical version of the curve to overcome this problem (143).

This proposed system can be used in conjunction with any growth chart the program may be using. It is a further development of the Growth Surveillance System used by CRS in Africa. To date it has been implemented in Haiti, Indonesia, and the CRS programs in Africa (142).

A numerical version of the card means that the growth entries, instead of being indicated by a dot, are noted with a number from 1 to 10, so that the growth process is assessed by health workers and parents in terms of the absolute level and, more importantly, by changes in the level (see Figure 11). The numerical value of the entry depends on the relative distance of the entry from the Standard. In Figure 11, the upper line is 100 percent of the Harvard Standard. The zone above that line is assigned the number 10. The lowest line on the chart

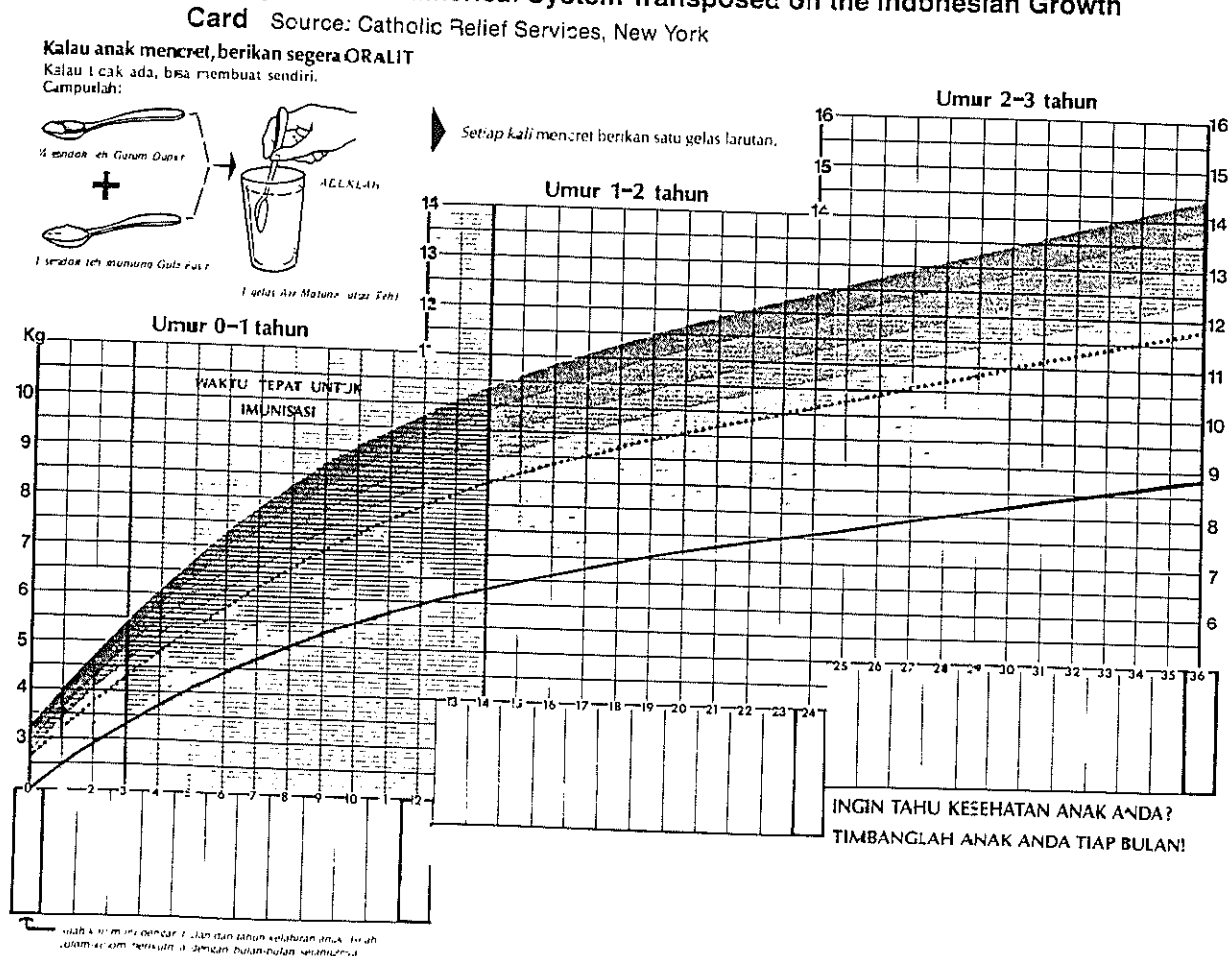
is 60 percent of the Standard, and the zone below this line is assigned the number 1. Levels 5 and 6 are on either side of 80 percent of the Standard. Levels 2-4 and 7-9 are ranked on either side.

This system assumes that:

- 1) The width of the growth levels are small enough to rapidly detect changes in growth velocity for the timely introduction of preventive measures. (While this is true for younger children, the growth levels of children over three are sufficiently wide that a child's failure to gain weight for two or three months could go undetected in the recording of the growth level).
- 2) A sequence of numbers is more easily understood than a curve in that it conveys more clearly the notion of a quantitative change in growth which is necessary to stimulate health workers and parents to take action.
- 3) Monthly entries and a limited sequence of numbers are easily memorized by parents. Therefore, parents can appreciate and recall their child's progress.

The advantage of this system may be greatest for programs with extremely limited resources. This system enables the implementation of a meaningful growth monitoring program even if growth charts are not available. In a ledger in the health center or preferably on

**Figure 11: Example of the Numerical System Transposed on the Indonesian Growth Card**



paper for the mother, the growth level can be recorded each month. Thus, with one "Master" Chart and the numbering system, parents and health workers can assess growth status (See Box).

Dr. Capone has identified three ways of converting the graphic entry to a number:

1. The numbers that correspond to the ranked levels are printed on the child's growth chart. This, however, requires reprinting the charts.
2. Entries are converted into numbers with the help of a transparent overlay on which the levels and the corresponding numbers have been traced. To find out the number that corresponds to the entry, the health worker superimposes the overlay on the chart. It has been observed that after a little practice, the health worker learns to convert the entries into numbers without the help of the overlay.
3. Entries are converted into numbers with the help of a Master Chart using a conversion table (Figure 12). Once the growth measurement is known, reference is made to the Master Chart to convert the entry into the corresponding number. The number is then entered in the child's record. The presence of the Master Chart (conversion table) is necessary when individual growth charts are not available and the growth measurements are tabulated on plain paper.

With the present interest in growth monitoring and the growing consensus among health professionals that the WHO curve is a suitable basis around which to develop a local card, government agencies have begun adapting existing cards and adopting new ones. There is greater uniformity now, at least within countries, than just a few years ago. However, many variations still exist to meet the differing country program circumstances. Some examples of recording systems currently in use are found in Table 8.

**Ledger of Growth Data Using the Numerical System**

JOHN MBUWA Born May 82 Enrolled Oct. 82				
Date	Age months	Weight (kg)	Gain loss	Level
Oct. 82	5	5.300	—	(5)
Nov. 82	6	5.500	+ .200	(5)
Dec. 82	7	6.000	+ .500	(5)
Jan. 83	8	6.700	+ .700	(6)
Feb. 83	9	7.200	+ .500	(6)
March 83	10	7.700	+ .500	(6)
April 83	11	8.100	+ .400	(6)
May 83	12	8.600	+ .500	(7)
June 83	13	9.000	+ .400	(7)
July 83	14	8.800	- .200	(7)
August 83	15	8.700	- .100	(6)

**Figure 12: Second Year of Catholic Relief Services Conversion Table which Covers Five Years** Source: Catholic Relief Services, New York

	13	14	15	16	17	18	19	20	21	22	23	24
10	10.2	10.4	10.6	10.8	11.0	11.3	11.5	11.7	11.9	12.0	12.2	12.4
9	9.6	9.8	10.0	10.2	10.4	10.7	10.9	11.1	11.3	11.5	11.6	11.8
8	9.1	9.3	9.5	9.7	9.9	10.1	10.3	10.5	10.7	10.9	11.1	11.2
7	8.6	8.8	9.0	9.2	9.4	9.5	9.7	9.9	10.1	10.3	10.4	10.5
6	8.1	8.3	8.5	8.7	8.9	9.0	9.2	9.4	9.6	9.7	9.8	9.9
5	7.6	7.8	7.9	8.1	8.3	8.4	8.6	8.8	8.9	9.0	9.2	9.3
4	7.1	7.3	7.4	7.6	7.8	7.9	8.1	8.2	8.3	8.4	8.6	8.7
3	6.6	6.8	6.9	7.1	7.2	7.3	7.5	7.6	7.7	7.8	8.0	8.1
2	6.2	6.3	6.4	6.6	6.7	6.8	7.0	7.1	7.2	7.3	7.4	7.5
1												
NUTRITION LEVELS	13	14	15	16	17	18	19	20	21	22	23	24

Second Year

**Table 8: Samples of Recording Systems Currently in Use**

**AFRICA\*** Generally, African child health programs monitor growth by comparing weight-for-age (wt/age) values to either U.S. or English reference population values. Two major recording systems are used: 1) the Road-to-Health card with two cut-off lines and 2) the Growth Surveillance System.

country	program	measure	record	reference population	classification system	space for medical information	educational messages
Botswana	MOH**	wt/age	Growth curve	Boston	Two divisions: • Above 80% of reference population median • Below 80% of reference population median Channels are marked in 5% bands	Yes	Yes
	CRS***	wt/age	Growth curve-Master Chart and linear individual card	Boston	Every 5-10% interval using reference population values Two major divisions: • Above 80% • Below 80%	Yes	Yes
Lesotho	CRS	wt/age	Growth curve Master Chart	Boston	Two divisions: • Above 80% of reference population median • Below 80% of reference population median 5% intervals using reference population median	Yes	No
<b>ASIA</b>							
A variety of recording systems is being used in Asian child health programs. While weight-for-age measures predominate, arm circumference is used in programs with limited resources. Growth curves generally use Boston reference population values with three or four cut-off lines for nutritional status categories							
Indonesia	MOH	wt/age	Growth curve	Boston	Two divisions: the one most clearly delineated is the severely undernourished • 100% to 60% of reference population median distinguished by shaded channels to emphasize weight gain over nutritional status • Severely malnourished— <60% of reference population median	Yes	Yes
Nepal	MOH	AC	Linear recording	N.A.	Three divisions	No	No
	Save the Children	wt/ht	Thickness measure	NCHS	Five divisions See card on p. 31	No	No
Thailand	ACH	wt/age	Growth curve	N.A.	Four divisions	Yes	No
<b>LATIN AMERICA</b>							
Child health care programs in Latin America generally monitor weight-for-age. The standard growth card was designed at the Institute of Nutrition for Central America and Panama (INCAP) although most countries have made adaptations in the basic design. The card uses the Harvard reference population and four cut-off lines.							
Brazil	MOH	wt/age	Growth curve	NCHS	Two divisions: • Normal—between the 90th and 10th percentile • Undernourished—below the 10th percentile	No	No
Colombia	Colombian Institute of Family Welfare (ICBF)	ht/wt	Growth curve	Colombian	Five divisions details—N.A.	No	No
	MOH	wt/age	Growth curve	NCHS	Three divisions: • Normal High—90th-50th percentile • Normal Low—50th-3rd percentile • Severely malnourished—<3rd percentile	Yes	Yes

\*In many African countries there is disparity regarding cards even within the same program. \*\*MOH—Ministry of Health. \*\*\*CRS—Catholic Relief Services.

**Table 8: Samples of Recording Systems Currently in Use (cont.)**

country	program	measure	recrd	reference population	classification system	space for medical information	educational messages
Costa Rica	Social Security MOH	wt age ht age wt ht	Growth curves—separate by sex	NCHS	Five divisions from 95%-5% of reference population values on each curve	Yes	No
Ecuador	MOH	wt age	Growth curve	NCHS	Four divisions: <ul style="list-style-type: none"> <li>• Normal—90th-10th percentile</li> <li>• Mild malnutrition—10th-3rd percentile</li> <li>• Moderate malnutrition—3rd percentile to -3 std pts</li> <li>• Severely malnourished— &lt;3rd percentile</li> </ul>	Yes	Yes
Guatemala	MOH	wt age	Growth curve	Boston	Four divisions: <ul style="list-style-type: none"> <li>• Normal— &gt;90% of reference population median</li> <li>• Mildly undernourished—90%-75% of reference population median</li> <li>• Moderately undernourished— 75%-61% of reference population median</li> <li>• Severely undernourished— ≥60% of reference population median</li> </ul>	No	No
	Patulu	wt ht	N.A.	Boston	Three divisions: <ul style="list-style-type: none"> <li>• Normal— &gt;90% of reference population median</li> <li>• Moderate malnutrition— 90%-81% of reference population median</li> <li>• Severe malnutrition— ≤80% of reference population</li> </ul>	—	—
	SINAFS	AC	N.A.	N.A.		No	No
<b>NEAR EAST</b>	Generally Near East child health programs monitor weight-for-age. The recording systems vary, but often use the "Road-to-Health" pattern. Within one country, two systems usually exist, one designed by the Ministry of Health and the other by the Ministry of Soc Affairs.						
Egypt	CFS	wt age	Growth curve	Boston	Two divisions: <ul style="list-style-type: none"> <li>• Normal (Road-to-Health)— 100%-80% of reference population median</li> <li>• Undernourished &lt; 80% of reference population median</li> </ul>	Yes	No
	Strengthening Rural Health Care	wt age	Growth curve	Boston	Two divisions: <ul style="list-style-type: none"> <li>• Normal— 95th-5th percentile of reference population</li> <li>• Undernourished— &lt; 5th percentile of reference population</li> </ul>	Yes	No
	Belena—Upper Egypt	wt age	Growth curve	Boston	Two divisions: <ul style="list-style-type: none"> <li>• Normal— above 80% of reference population median</li> <li>• Undernourished— less than 80% of reference population median</li> </ul>		
Morocco	Min. of Social Affairs—CRS	wt age	Growth curve	Boston	Two divisions (see description of Egypt CRS card)	Yes	No
	MOH	wt age	Growth curve	N.A.	Two divisions details N.A.	Yes	No

# Tools for Measuring

Tools that can be *standardized*,\* that maintain *accuracy*, and that can be *easily and correctly used* are essential for growth monitoring projects. Other criteria for choosing instruments include: *low cost, sturdiness, durability, ease of repair, readability*, and an *appearance* that is not threatening to mother and child (1). For some projects *portability* will also be important.

Consideration should also be given to the *cultural appropriateness* of the instrument and measurement method. For example, in areas where a beam scale (see Figure 20) is commonly used at the market, the adaptation of this scale for child weighing may be more appropriate than using the unfamiliar spring scale. In regions where mothers may object to hanging their children from a hook "like a piece of meat," (81) it is necessary to use a basket or box for suspending the child if the suspension method of weighing is feasible at all.

Measuring devices suited to the varying needs of monitoring programs are discussed below. A brief description of each instrument along with sources of directions for making tools and the addresses of manufacturers are listed in Appendix A. At the end of this chapter, Table 10 rates different instruments by the criteria mentioned above. Besides consulting these sources, the user should carefully examine the set of step-by-step illustrated instructions on the use and handling of each instrument which should accompany it.

## METHODS TO MEASURE ARM CIRCUMFERENCE

The arm band can be purchased or made inexpensively by program personnel. The material chosen for the band should be durable and resistant to shrinking or stretching. Suggested materials include strong cord, plastic-coated cloth measuring tape used photographic film (107), and paper covered with see-through plastic tape. Each strip must be checked periodically against a standard, in this case a ruler.

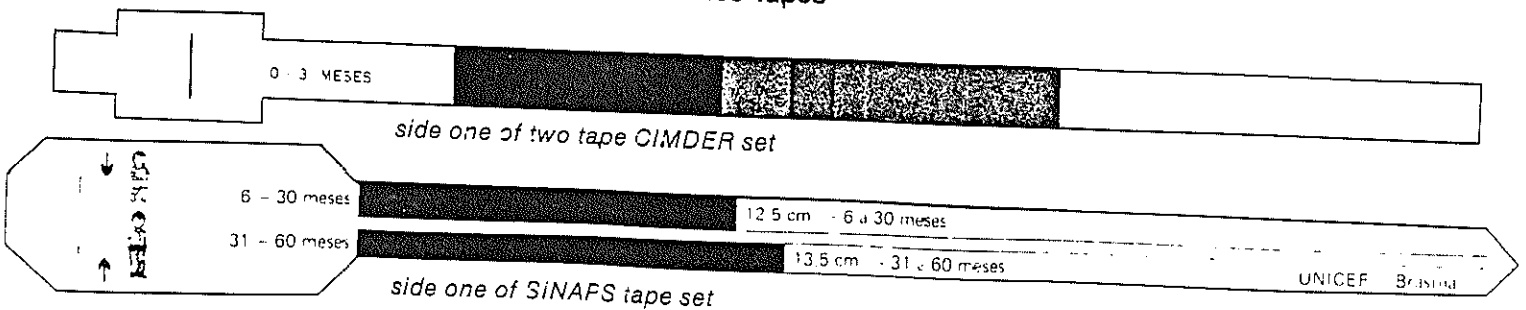
The beginning of the tape should be marked clearly on arm bands. To avoid confusion, "zero" should be recorded at the lead edge of the tape and should not be preceded by a blank portion (132). Or, at the zero end of the tape, a slot can be cut and the other end inserted through it. The measurement can be read at the point where the tape comes through the opening (138); this is a simple method to avoid incorrect reading.

The band can be marked in centimeters, if the exact measurement is needed, or it can be marked in zones (normal, sub-optimal, and danger) usually indicated by culturally appropriate colors. (The exact ranges used to mark the zones are discussed in Chapter 2, Table 7.) Using an "insertion" tape with colored zones assures easy reading, reduces error, and makes arm circumference an appropriate measure for programs employing non-literate health workers. Now new arm tapes are available which add age specificity to the standard tri-colored "Shakir" strip. The CIMDER and SINAPS projects (167-182) in Latin America report an improved predictive ability for these tapes (see Figure 13). Although these tapes have similarities, the SINAPS tape includes all age specifications on one tape, while the CIMDER system uses two tapes. The SINAPS tape also has special categories for newborns and women.

A second method to measure arm circumference, the Laugesen test for malnutrition, is being tried with village health workers in India, Bangladesh, and West Africa. To perform this test, the health worker gauges the relative thinness of a child's upper arm by noting the distance between the worker's index finger and the ball of the thumb. No tools are necessary for the test, but training tools are essential. These can be pieces of wood or tubes for the health workers to practice detecting different diameters before they work with children (88).

\*Standardization: the comparison of the results given by an instrument to a known measure (a known weight or a length on a measuring tape). An instrument that can be adjusted to agree with the known measure can be "standardized."

Figure 13: CIMDER and SINAPS Arm Circumference Tapes



## CHOICE AND USE OF A SCALE FOR WEIGHING

In addition to applying the general criteria for selecting measuring instruments, the choice of a scale should be based on:

- the accuracy of the scale to the nearest 250 grams (9), but preferably to the nearest 100 grams or quarter pound, because children make small weight gains during the second year (3);
- a total weight capacity of at least 25 kilograms, or 50 pounds, for programs weighing children under six years old (3);
- the ease of reading the numbers: there should be no confusion between a pound or kilogram gradient if both are on the same scale, and a direct interpretation of the result should be possible without mathematical calculations (3);
- an adjusting mechanism that will allow the scale to be tared.\*

Models now exist for scales that can be manufactured locally from low or no cost materials, and a variety of scales are available for purchase. The advantages and disadvantages of scales that are often moved or subjected to rough handling are reviewed below. (Bathroom scales have not been included because they are known to become inaccurate over time, especially when moved frequently.)

### Locally Manufactured Scales

Four different designs have been proposed (9): a single beam scale (Figure 14), a folding scale (Figure 15), a quadrant scale (Figure 16), and a tubular spring scale (Figure 17).

Close attention must be paid to accuracy by standardizing the scale during all phases of construction with both light and heavy weights. Known weights in increments suitable for the scale must be obtained before construction begins. After completion, the scales must be standardized each day they are used or at each location if moved. (If the results of the weighing program are to be used in a study, the scale should be purchased rather than homemade.)

Although these scales may be more difficult to use than commercially constructed instruments, there are several advantages of locally made scales (126):

- expense is less;

\*Tare: to return the needle of the scale to zero. If the needle rests slightly on one side or the other of zero, the scale is difficult to read correctly. In the case when something like a basket is hung on the scale, this weight needs to be subtracted before the child is weighed. If the scale can be tared, these situations can be accommodated without the health worker having to add or subtract from the indicated weight.

Figure 14: Beam Scale

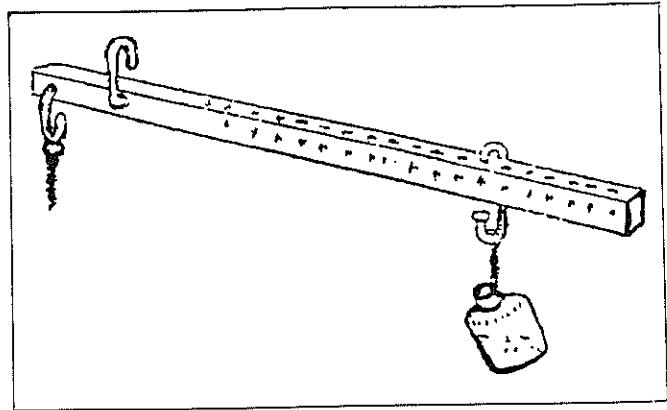


Figure 15: Folding Scale

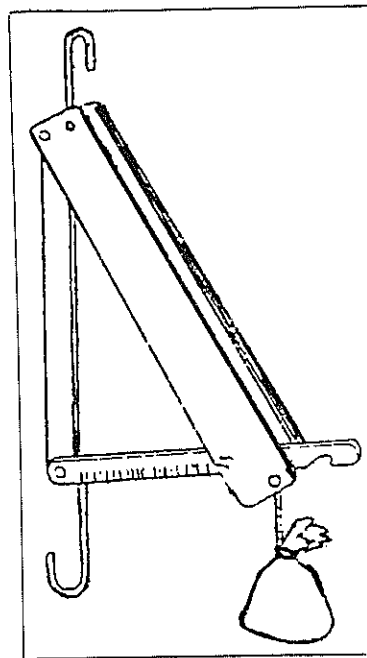
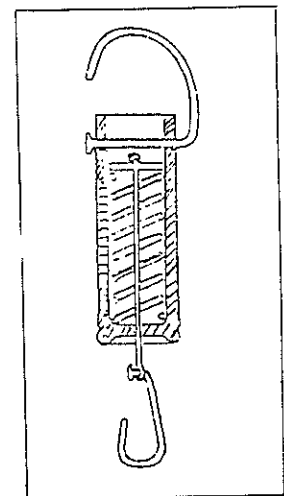
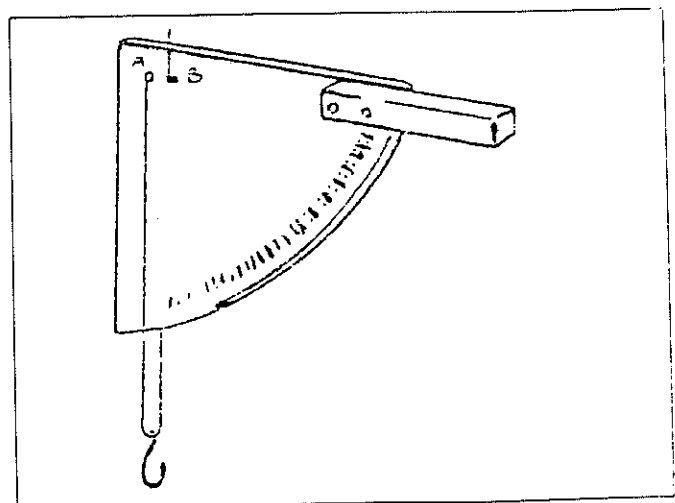


Figure 17: Spring Scale



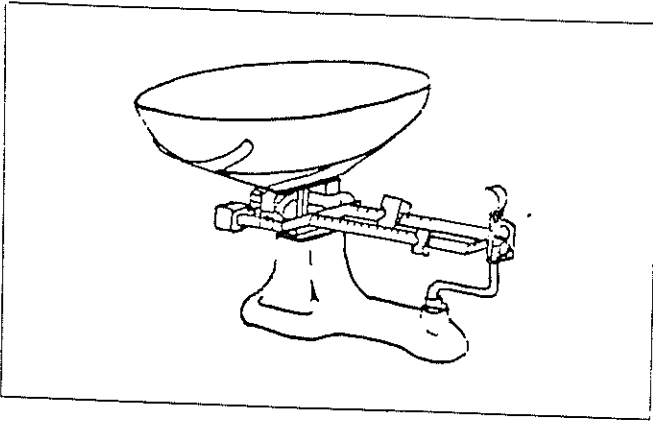
Source: Appropriate Health Resources and Technologies Action Group (AMRTAG), London, U.K.

Figure 16: Quadrant Scale



**Figure 19: Single Beam Scale for Clinic Use**

Source: CMS Weighing Equipment, Ltd., London, U.K.



- health workers gain new understanding and skills;
- community members can become involved;
- local manufacturing demystifies the process of weighing babies;
- participation in the construction process elicits inventiveness, imagination, and problem solving from the "manufacturers" encouraging self-reliance;
- local weight units can be used.

### Commercially Manufactured Scales

**Single Beam Scales.** Single beam scales are easily maintained and remain accurate over time. Two types of single beam scales are used in growth monitoring projects.

One type, commonly used in clinics (Figure 19), is a table or small floor model on which the child can sit or stand. While this type of scale eliminates the problem of suspending the scale and usually is not threatening to the child, it cannot be transported without a vehicle. Also, these scales are generally the most expensive. Since so many models are available, specific scales have not been reviewed, although addresses of distributors are given in Appendix A.

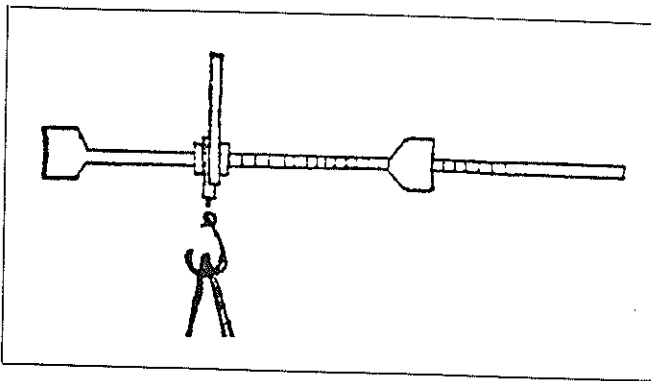
The second type of single beam scale is called a bar scale because the beam is free hanging. An individual can easily transport these scales if they are made from light materials. Such scales are widely used in Asia. Some countries (e.g., Indonesia) have adopted the scale used in the local markets (Figure 20), while other programs (e.g., in the Philippines) have made minor alterations on the traditional scale (Figure 21). See Appendix A for a description of the following scales and ordering information:

- Philippine Bar Scale
- Kumudini Bar Scale (Bangladesh)
- Chinese Wood Bar Scale (Thailand)
- Tansi Bar Scale (Tamil Nadu, India, and Korea)

**Dial-faced Spring Scales.** Two types of spring scales are commonly used: one is tubular (Figure 18) and the other is dial-shaped (Figure 22). Outside Southeast Asia the dial-shaped scale is probably the most popular. It is light (2.75 pounds or 1.25 kilograms), durable, compact, and easily transported. In the past, field workers complained that the springs inside the scales rusted and that within a few years the parts or the entire scale needed to be replaced (50, 67). The scales currently available have gone through a number of changes and are much more durable. Internal springs now have teflon coating, and a plastic face protects the needle on the front of the scale. The scale case is either stainless steel or enamel. These scales are accurate and easy to use; on the other hand, they are the most expensive among the easily transportable models.

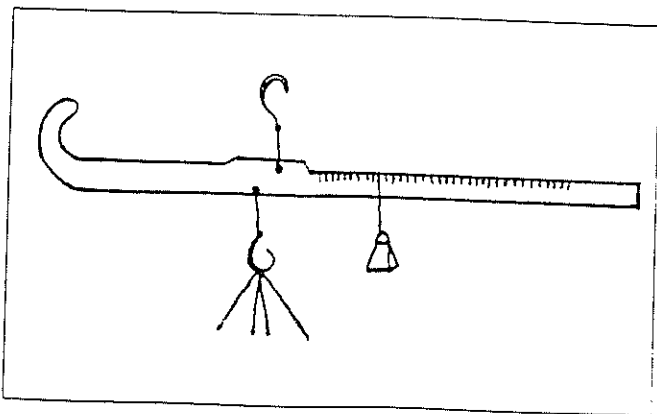
**Figure 20: Indonesian Scale—Dacin**

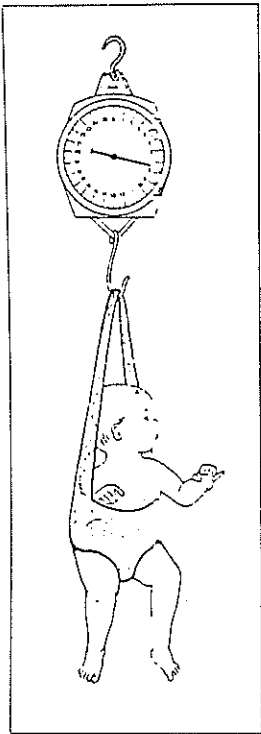
Source: Nutrition Division, Ministry of Health Jakarta, Indonesia



**Figure 21: Philippines Bar Scale**

Source: Nutrition Center of the Philippines, Manila, Philippines





**Figure 22: Dial-Shaped Spring Scale**

Source: Teaching Aids at Low Cost

**Tubular Spring Scales.** These scales are extremely light, easy to transport, and convenient for weighing newborns (Figure 18). However, they have not proved durable over years of use, and they are not as easily read as the dial or beam scales because both the marker and the space between units are small. To facilitate reading when the scale is used to weigh newborns, a colored stripe can be painted or taped on the scale at the 2.5 kg (5 lb.) mark. Then the health worker or midwife can quickly make the critical judgment as to whether the infant has a low birthweight. Appendix A describes and gives ordering information on the most durable scales:

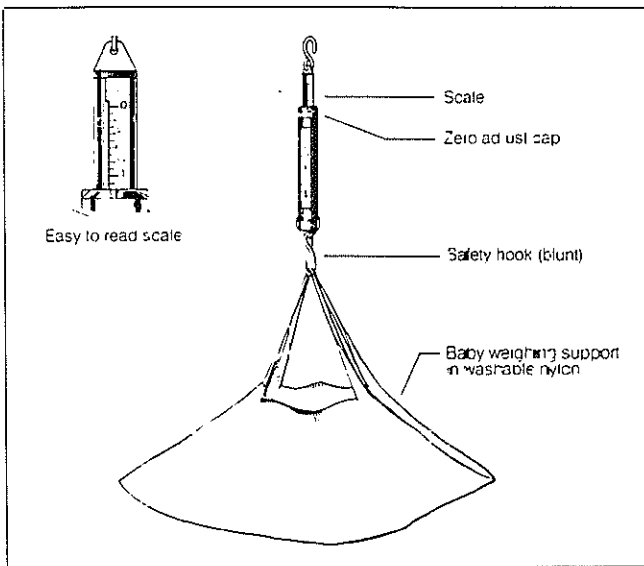
- Chatillon IN-50
- CMS Plastic Tubular Weigher
- Super Samsor
- ITAC Model 100

**Springs.** A new type of weighing device, a spring, is currently being developed at The Institute for Child Health, University of London. This spring stretches from 1–17 cms accurately at 1 kg. per centimeter. With this spring the mother sees it stretching further each month as her child gains weight. To record the child's progress, the spring operates in conjunction with a chart where 1cm = 1kg and a dot can be placed on the chart indicating how much weight the child is gaining. A similar spring is being developed for newborns which will allow the infant to be weighed more frequently than once a month and for changes in weight to be easily detected.

**Digital Scales.** Currently, a small, light digital scale is being developed for field use. One advantage of this scale is that it displays the exact weight, so the health worker or midwife does not need to read the weight from a continuum of numbers. One disadvantage could be that the scale operates on batteries (although it could be adapted to solar batteries). A description of the scale and an address for more information are found in Appendix A.

Another tool in the development stage, "Birthweigh," is a low birthweight indicator. This tool is essentially a hook attached to a steel loop through which a window is cut which gives the worker an indication of whether the newborn is above or below 2500g when the child is suspended in a sling or scarf.\* A qualitative reading of the child's weight is given by displaying bands of color through the window. If the color is blue the infant weighs more than 2500 g. If any yellow appears the infant weighs less than 2500 g and should be considered at risk. It is hoped that eventually this indicator could be made locally.

**Figure 18: Tubular Spring Scale** Source: Salter



A description of the following scales and ordering information is found in Appendix A.

- ITAC Model 300
- Salter Model 235
- CMS Model MP25 and Model DM20
- Marsden Model 165

\*PATH. "Letter to D. Cebu June 28, 1985." Seattle, WA.



### Methods of Suspending Both the Scale and Child

All of the scales described above, except for the table or floor models of the single beam scale, must be suspended so that the face of the scale or the beam is at the measurer's eye level. Health workers must plan how the scale will be suspended before arriving at the weighing site. Usually a place can be found at the weighing site to secure the scale: a tree branch, a house beam, or a beam on a drying rack. If suspending the scale presents a problem, a tripod can be constructed at each locale. Weighing should never be undertaken unless the scale is absolutely secure.

Locally made hangers can be used for suspending the child. It is best to have a sling that will envelop extremely young children and hold them horizontally, so there is less chance that they will be uncomfortable and cry. For older children, pants with a suspension strap have been recommended as well as seats or boxes constructed to hold the child as comfortably as possible. The difficulty of fitting the child into the pants often undercuts the portability and storage advantages of this method. Figure 23 shows examples of different suspension methods (89). Figures 24 and 25 show a good method for putting the weighing pants on a child (183).

A recent innovation in suspending the child from the scale is the "Wilkinson Damper" (88). A piece of inner tube is placed between the scale and the child to help reduce the swing of the needle caused by an active child (Figure 26).

### Standardization of Instruments

It is crucial that all instruments be standardized each time they are moved or before each day of heavy use. This is especially true for scales that receive rough treatment and that are occasionally overloaded. Scales can be standardized one against the other to ensure that with the same weight they all read identically, or that one scale continues to record the same weight when the same object is weighed. No well-tested method exists for standardizing when standard weights are not

Figure 24: Health Worker Places Hands Through Weighing Pants Source: I. Shorr

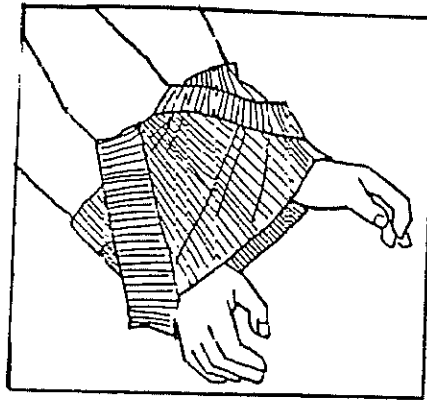
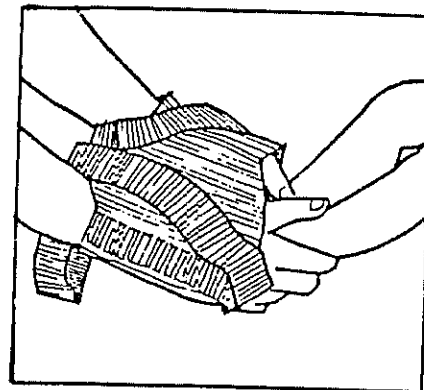


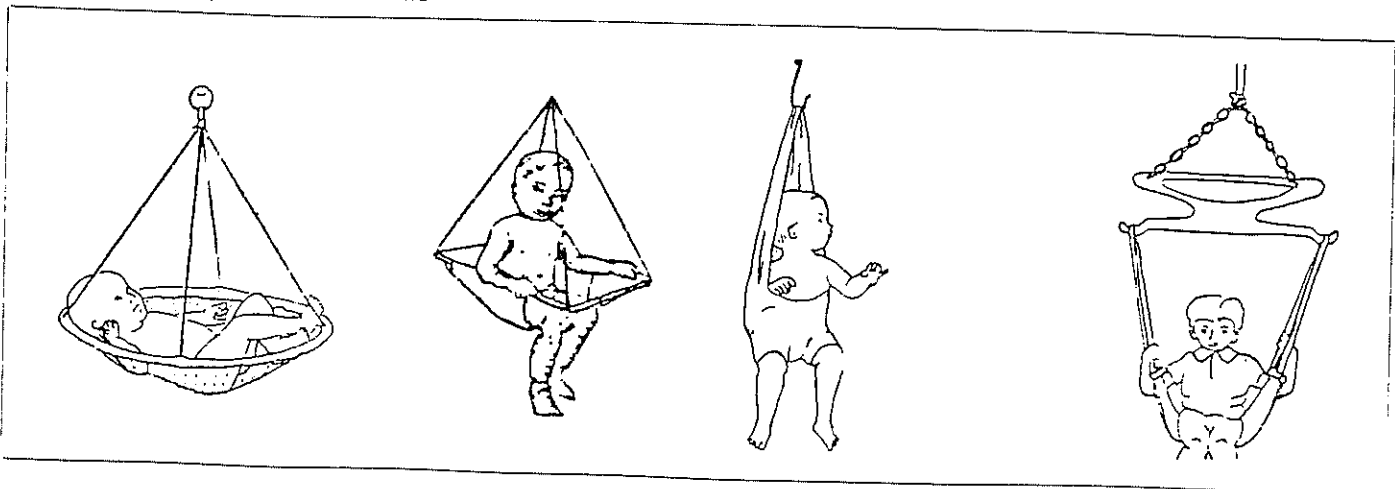
Figure 25: Child's Feet Are Grasped and Legs Pulled Through Pants Source: I. Shorr



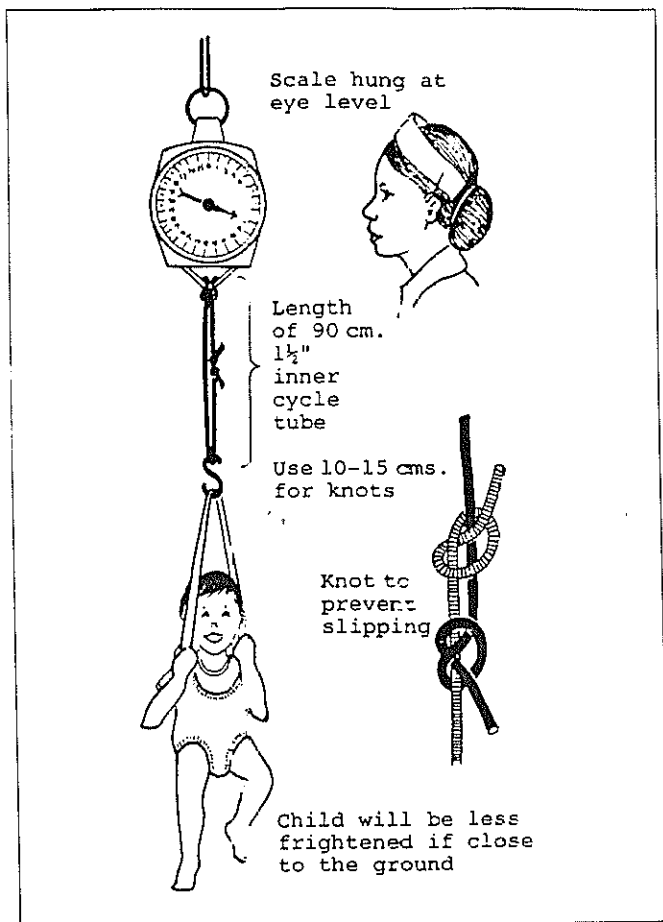
available. One recommendation is to use sturdy plastic bags that can be marked and filled with water (62). The bags are easy to carry and fill in villages during supervisory visits. Any readily available object can become the standard for testing a scale that remains in one place.

Additionally, if the health workers come to a center for periodic training, they should bring their scales for maintenance and standardization.

Figure 23: Suspension Methods



**Figure 26: Hanging the Scale Using "Wilkensens Damper"** Source: Dr. D. Morley



**BOARDS FOR MEASURING LENGTH AND HEIGHT**

Measuring height requires an instrument for each of two measurements: for children under two, recumbent length (the length lying down), and for older children, standing height. A well-designed measuring board can be used for both. There is a temptation, when measuring length and height, to place the child against a measuring tape and to glance at the top of the head and read the measurement. To obtain an accurate reading is more difficult and requires a board 175 centimeters long with a sliding piece perpendicular to the backboard on one end and a fixed piece perpendicular to the backboard on the other end Figures 27 and 28.

Boards can be purchased or made locally and plans are available for constructing a well-tested board. Many designs have been tried. It is important that the moveable piece have a wedge on one side to ensure that it is held perpendicularly to the backboard, whether it is part of the instrument, wall, or a table. The moveable piece should also have guides, or two tape measures should be attached to the backboard (boards, walls, or table) to ensure that the moveable piece will be held level, and will read the same on either side (see Figure 29).

Sources of commercially available tools and of plans for constructing measuring boards are found in Appendix A.

**Figure 27: Measuring Board for Height or Length** Source: Prof. O. Koksai for WHC (36)

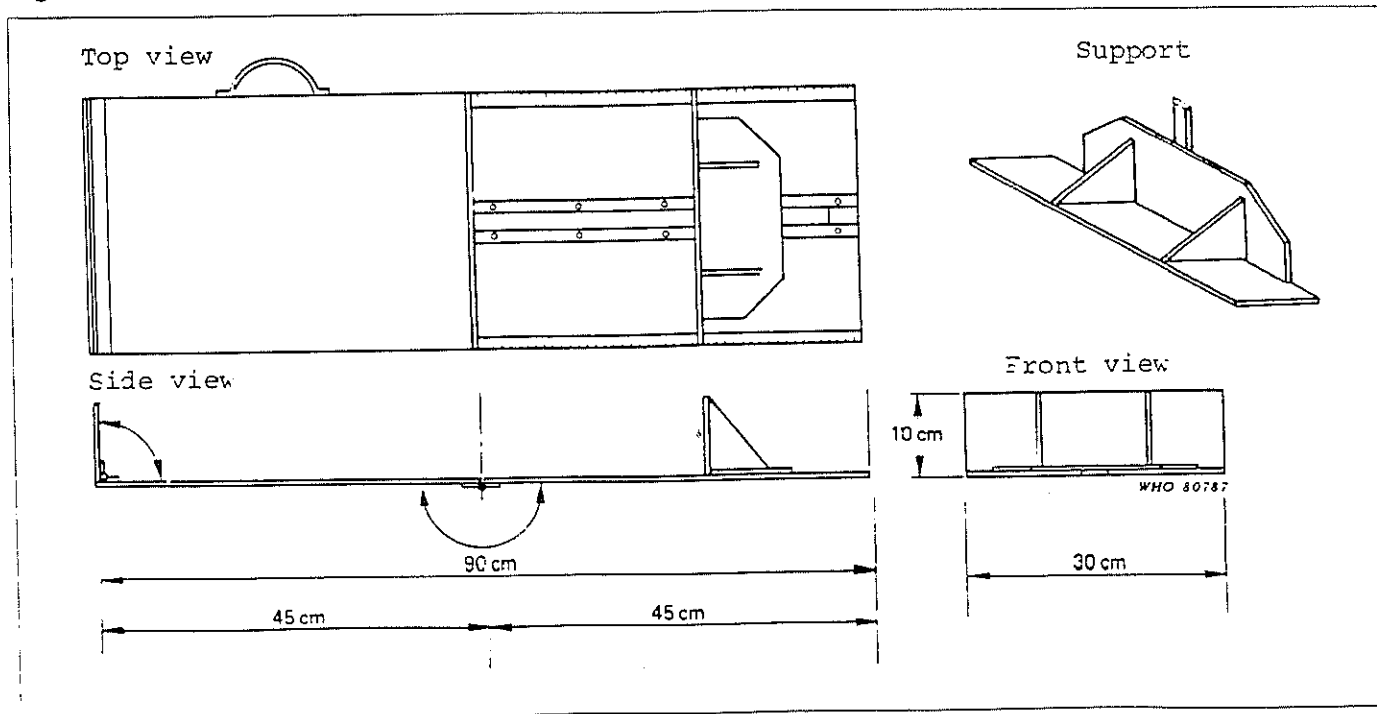
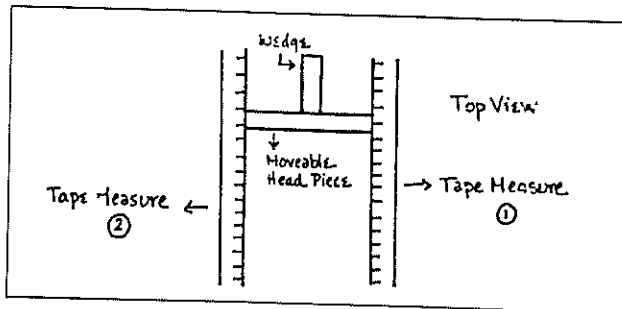


Figure 28: Child Height Measurement

Source: I. Shorr

Figure 29: Top View of Measuring Board



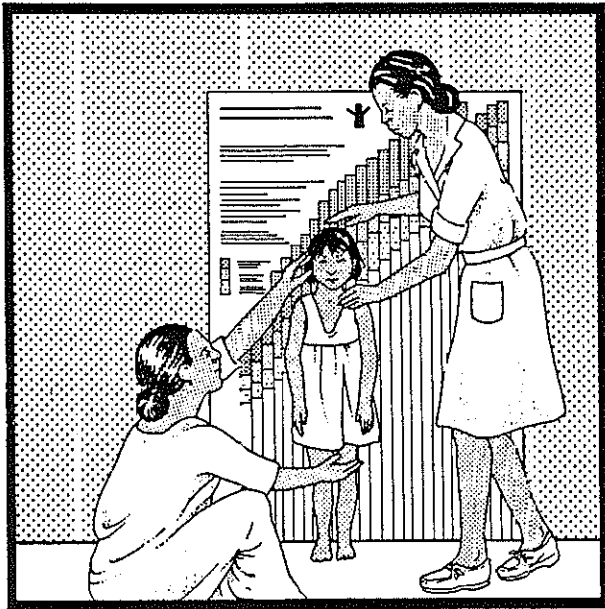
### "THINNESS MEASURE" WALL CHART MEASURES WEIGHT-FOR-HEIGHT

A relatively new tool is the weight-for-height wall chart, or *Thinness Measure*, developed in Nepal by Save the Children Fund and the London School of Hygiene and Tropical Medicine. The chart is large (140 centimeters by 100 centimeters) and printed on plastic-coated paper, so that it can be folded and easily transported. It should be taped or nailed to the wall with the bottom of the chart at ground level. Use of the chart does not preclude weighing, but the task of measuring height is slightly easier. After being weighed, the child stands against the column corresponding to his or her weight. The health worker then notes the color band at the top of the child's head. The color indicates the nutritional status or risk category for the child (Figure 30).

This method, using a weight-for-height comparison, is most effective in areas where a large portion of the child population is stunted. Although individual growth cards are available for use with this chart, the best use for this tool has been in screening for acute malnutrition rather than monitoring growth.

The advantage of this wall chart is that it allows a direct reading of the result and does not require plotting or transposing results from other charts. A thinness measure length board is being developed, since the wallchart is only for children over two years of age. Additionally, life-size cut-outs of children are available for use in training. References on the "thinness measure" are given in Appendix A.

**Figure 30: Health Worker and Mother Measuring Child on Thinness Chart** Source: London School of Hygiene and Tropical Medicine, London, U.K.



### CHILD DEVELOPMENT CHARACTERISTICS AND LOCAL EVENTS CALENDARS HELP DETERMINE AGE

In areas where birth certificates or other official records are not available, several techniques can help health workers and mothers estimate the birth date or the age of a child.

- The mother should be asked which children in the village were born at approximately the same time as her child. If these children have known birth dates, then the unknown birth date can be estimated.
- The child's approximate age can be gauged by counting the number of teeth present and noting other developmental characteristics. In Malawi health workers are taught to estimate the child's age in months by adding six to the number of teeth the child has (14). If the child has three teeth, (s)he is probably about nine months old. Below is another method taken from *Finding the Causes of Child Malnutrition* (19).
- A local events calendar has proven useful in helping mothers remember more precisely when their children were born by associating births with a local festival, harvest, planting, or disaster. The under-fives clinics in Malawi use local calendars (14). In India events calendars are printed centrally by the Voluntary Health Association of India and distributed to health workers who complete the calendar with local or regional events (83). The completion of a local events calendar might be a useful activity to introduce during health worker training.

**Table 9: Method of Estimating a Child's Age**

The child is like this:	So he is this old:
No teeth Can't sit alone	0-5 months
Has 1-6 teeth Can sit alone Can't walk alone	6-11 months
Has 6-18 teeth Can walk Knows a few words	12-23 months
Has 18-20 teeth Walks well Starting to talk well	24-35 months
Walks and runs well Talks well Has not yet lost first baby tooth	36-59 months

Be careful: You should never look at the size of a child when you are guessing his age. If the child is malnourished, his small size will make you think he is younger than he really is.

Brown (19) recommends that before using a local calendar, the health worker approximate the child's age and birth date using developmental characteristics. The range in the possible birth dates then can be narrowed by using the local events calendar.

- A conversion table should be established for regions that do not use the twelve month calendar. In Indonesia, for example, it was necessary for Javanese mothers to translate their children's birth dates from the Javanese calendar before they could complete the growth charts, which are printed for use in the entire country. A conversion table was printed centrally and distributed to all village workers in Java (113).



Health worker and scale in Indonesia. M. Griffiths

**Table 10: Comparison of Different Types of Measuring Tools**

	<i>Accuracy/standardization</i>	<i>Ease of use</i>	<i>Timing</i>	<i>Sturdiness/durability</i>	<i>Ease of repair</i>	<i>Readability</i>	<i>Non-threatening appearance</i>	<i>Portability</i>	<i>Cost (US\$)</i>
Arm circumference tape	Subject to observer error. Pulling tape too tight	Use of strip easy but often difficult to take mid-arm measure	N.A.	2	3	3	3	3	Very reasonable
Locally manufactured scales	Scale may not be as accurate as commercially manufactured scales; maintenance may be a problem	Depends on construction, but after training not difficult	Usually no mechanism	2	3	2	2	3	Reasonable
Single beam "clinic" scales	Accurate and can be standardized	After training not difficult	Yes	3 (if stationary)	2	2	3	1	50-100
Single beam—free hanging scales	Accurate and can be standardized	After training not difficult	May not have timing mechanism	3	3 (if local) 2 (if imported)	3	2	3 Depends on weight	20-30
Dial spring scales	Accurate and can be standardized	After training not difficult	Yes	3	2	3 (although a problem with swinging needle)	2	3	40-60
Tubular spring scales	May lose accuracy quickly	After training not difficult	Yes	2	2	2	2	3	11-37
Length/height boards	Should be accurate and easy to standardize	After training not difficult, but needs two people for accurate measure	N.A.	3	3	3	3	2 Depends on weight	Can be locally manufactured or purchased 10-125
Weight/height chart	As accurate as scale and method of taking height	After training not difficult, but needs two people for accurate measure	N.A.	2	Need to order new chart or re-draw old chart	3	3 Scale may be problem	3	Chart and scale, 50-60

Key: 3-excellent 2-mediocre 1-poor N.A.-not applicable

## Program Organization

Ideally, growth monitoring programs form part of continuing health care services operating in all communities. A broad health care strategy that integrates growth monitoring and allows the different administrative and care levels to cooperate can make optimal use of growth monitoring in providing comprehensive services.

Over the years, the location and structure of monitoring programs have tended to dictate their purpose, defining two different (but not mutually exclusive) strategies. (148). The first is an educational strategy which emphasizes family and community responsibility for child health. This strategy is found in programs implemented by local workers in the community. The second is a screening strategy which is directed toward improving the quality and efficiency of the health system in providing care to young children. This second strategy predominates in clinic-based growth monitoring programs. For too long these strategies have been implemented singly; it is now time for them to be practiced together.

Unifying these two strategies to create a growth monitoring program capable of delivering quality service necessitates active involvement of every level of the program infrastructure and each level's acceptance of specific responsibilities. At this time there is evidence that this is not always occurring. Major educational and organizational efforts continue to be required.

Usually there are at least four organizational levels to consider—a central, coordinating group; a mid-level managing group; the community; and the family itself. In such an organization, the central level provides program guidelines, logistical support (records, measuring tools, transportation), training guides, and some supervision. The mid-level staff offers inservice training, supervision, and backup logistical support. The community supports its local growth monitoring project and village workers and ensures that the children in need of help receive it, either in the community or through referral to a facility offering more services. Program organizers should remember that the scale of a project will influence the interaction between communities and the central office. Project dynamics often change when small projects expand to regional or national scope. And finally, the involvement of the family as a whole is necessary to create an environment conducive to the child's sustained growth.

### ROLE OF THE CENTRAL LEVEL

Program goals are reflected in guidelines produced at the central level, which specify measures, reference

population, cut-off points, recording system, and tools. Other policies to be established centrally, but based on local conditions, include those concerning periodicity of the monitoring, children to be included, structure and staffing of monitoring sessions, and use of the results to decide appropriate interventions.

### Establishing Periodicity and Selecting Children to be Included

If the educational and screening strategies are to be combined, the recommended frequency for monitoring is once a month. However, the decision about frequency will be influenced by:

- the sensitivity of the chosen indicator to small fluctuations;
- the nutrition profile of the local population by age;
- local resources for supervising the program, for providing growth charts, and for carrying out the interventions indicated by monitoring; and
- the time constraints on community workers and the families bringing children to monitoring sessions.

Because weight changes much more rapidly than height or arm circumference, programs monitoring weight may benefit from weighing children monthly while height and arm circumference may not need to be measured more often than once every three months.

If the measurement is taken monthly, it should be remembered that growth monitoring takes time. Depending on a variety of factors (including whether the worker is a volunteer or a paid member of the health system), this time may vary from a partial day once a month to several days a month. If multiple measures or house-to-house visits are required, the amount of time will increase substantially.

In a community program in Indonesia, village workers with growth monitoring and home visitation commitments spent an average of one and a half days per month compared to one half day per month by volunteers responsible for only working at a weighing session (170).

To achieve the desired frequency of weighing (especially of high-risk children), while not overburdening a community or clinic program, it may be necessary to examine alternatives:

- *Structure the sessions so that the children can be weighed or measured at a central location.* Home visits for individual consultations can be made another day. When the worker only needs to set up the scale or height board once, substantial time is saved. However,

there may be severe tradeoffs in program participation. Efforts to increase the availability of the services may indicate the need to have sessions extremely close to family homes, hold them at different hours, or change the day of the week. Increasing participation requires close communication with the community.

- *Establish priorities according to the age of the child.* If resources are scarce, the priority age group to include in growth monitoring are children under three years of age. The Nutrition Intervention Pilot Project in Indonesia weighed all children under three every month and took their heights once every three months (113). In the Patulul Project in Guatemala, children under three are weighed and measured every three months, after which they are weighed every six months until the age of five, and annually after age five (34).

Because growth faltering may occur in the first critical months of an infant's life it is important to enroll the infant within the first month of life (190). The card should begin with the infant's birthweight or an indication if it was above or below 2.5kgs. Since health workers are not always attending the birth, enrollment should be coordinated with hospitals and traditional birth attendants.

- *Establish priorities according to the nutritional status of the child.* Nutritional status determines the frequency with which children are monitored in other projects. In the Philippines only severely malnourished children are weighed every month; others are weighed every three months (103). Similarly, in the Kasa Project in India the children who are nutritionally "at risk"—those who have low nutritional status, fail to gain weight over three months, lose weight over two months, or are sick—are weighed every month. Other children are weighed every three months (105).

In a CRS project in the Dominican Republic, participation criteria include both age and nutritional status. All children under five are weighed once every six months in order to compile a community profile; the high-risk children are selected and weighed monthly. These children include all those under two and children three to five who are classified as malnourished or who have not gained sufficient weight (154).

Whatever guidelines are established, they should be consistent with the twin goals of increasing community participation in monitoring sessions and of correcting growth faltering before it jeopardizes health status. To ensure that program guidelines in fact promote program goals, it is essential that central-level planners be sensitive to negative repercussions as evidenced by community attitudes and actions. For example, what happens when programs ask mothers with well-nourished children to come less frequently? On the one hand, attending the sessions takes time needed for other activities, so mothers may be happy not to have to

bring their children. However, if mothers of healthy children are "rewarded" by not having to come, this may give the monitoring session an unwanted reputation as something only "problem" mothers have to attend.

Likewise, some programs give growth cards only to mothers with malnourished children to reduce program costs (91). Possibly, not receiving the growth card, which other mothers value, will not be easily understood by a mother who wants recognition for her healthy child. Or the card may lose its value if it becomes attached to having a sick baby.

### Structuring the Monitoring Session

Another area in which the central level can offer guidance is in the basic structuring of the session and ensuring proper preparation and logistic support. However, planners with limited field experience assume that growth monitoring—weighing and measuring children—is easy. While it need not be complicated, it does require planning and supervision. Without this support, the result is chaos at the session, inaccurate measurements, errors in recording, and no participation by the mothers. First, a sufficient number of cards and the proper measuring instruments in working condition must be available to prevent last-minute improvisations.

Second, village workers need training not only in weighing and measuring techniques, but also in managing the session (see discussion of training in Chapter 7). Properly planned sessions flow in a way that minimizes the time the mothers wait, decreases confusion during the actual measuring and recording, and helps ensure that each mother is included in the process and involved in discussing her child's results.

Morley has outlined a series of steps or stations that should be established at each growth monitoring event at under-fives clinics (89). These stages have been adopted for sessions outside clinics, such as those conducted in villages in Indonesia (20). If the activity is done house-to-house, one worker is responsible for all of the steps; if the activity is done at community sessions, health workers can divide the work, and it will move faster. Depending on the ability of health workers, between 10 and 15 children can be weighed per half hour at a community session, not including the educational counseling or discussion. To maximize the effectiveness of the education component, it is recommended that the group at one session be no larger than 20 to 25 families (179). This number of children can be handled in a few hours without much confusion.

The basic steps follow:

- *Registration:* The child is looked over for physical signs of illness. The card brought by the mother is checked, and the immunization status and completion of other health activities are noted. Other appropriate

records are completed. The card should remain with the mother.

- *Weighing or Measuring:* The mother and child pass from a general waiting area to the place where the scale and/or height board are set up. This area should be away from the confusion of the registration area. The village worker and the mother weigh and measure the child.\* These results are read and another health worker completes the card with the mother. The card remains with the mother.

- *Discussion of Results:* The mother and child then proceed to the area where the results are interpreted by a village worker and solutions or interventions needed to correct any problems are discussed. (More details on this step are provided in Chapter 6).

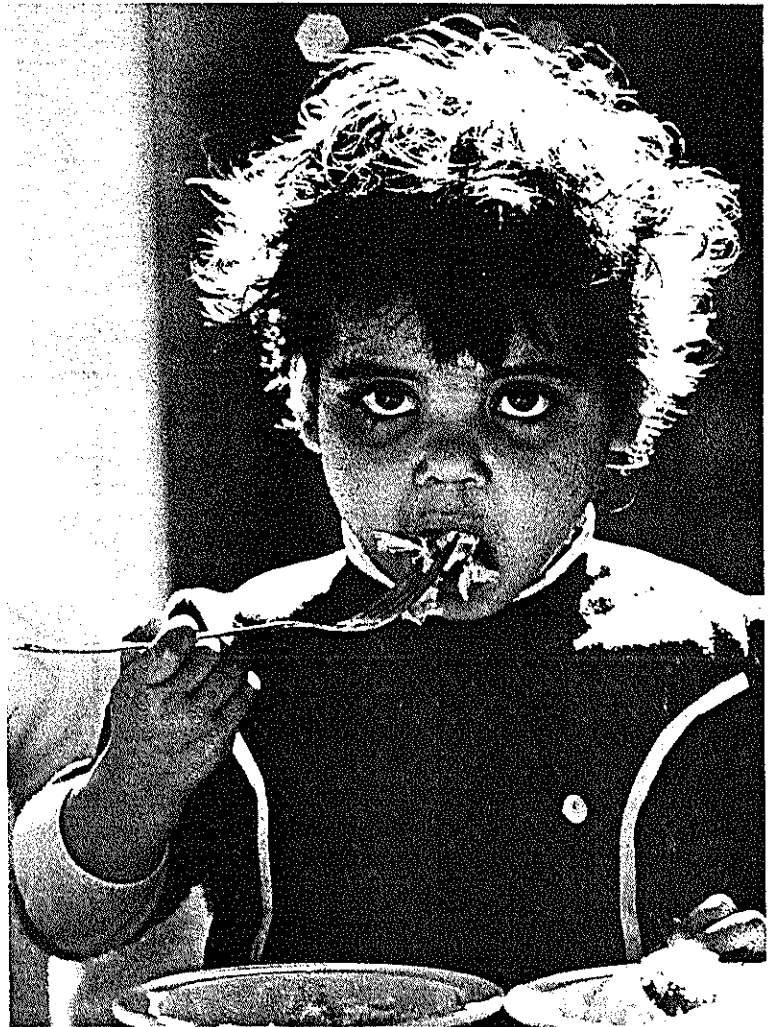
### **Integrating Growth Monitoring with Other Project Activities**

The central level can play an important role in providing the supporting, preventive medical services needed to act on monitoring results. Growth monitoring should not be an isolated activity. Simply obtaining growth monitoring results solves nothing unless they are closely linked with some interventions. Decisions on which interventions should be tried and when they should begin and end should be based on the growth monitoring results and an assessment of the effectiveness of the interventions on the improvement noted in a child's nutritional status. The health worker should look at both the child's diet as well as his/her physical state to decide on appropriate interventions and referrals. A variety of chronic and acute infections contribute significantly to children's failure to gain weight. Thus, it is extremely important for growth monitoring programs to look beyond nutritional causes and solutions for explanations for poor growth.

**Medical Interventions.** At the monitoring session, mothers can be asked a few basic questions about the change in their child's growth pattern to determine if diarrhea, tuberculosis, an infection, or other illness is the cause of the growth failure. By repeating the questions and explaining their significance to the mother, the health worker can alert her to particular danger signs.

Some of the interventions are begun at the monitoring session. Usually, these are preventive medical activities carried out in primary health care programs. In most areas, particularly in Africa, the growth monitoring session provides a time to give the child needed immunizations. In the Philippines, vitamin A capsules and a ferrous sulfate preparation are given to the undernourished child. Additionally, deworming medicine is provided to some children, although not to the severely malnourished until they are rehabilitated (92).

\* A protocol for weighing and measuring is presented in Appendix B.



*Algerian youngster receives high-protein lunch. ICEF/6493*

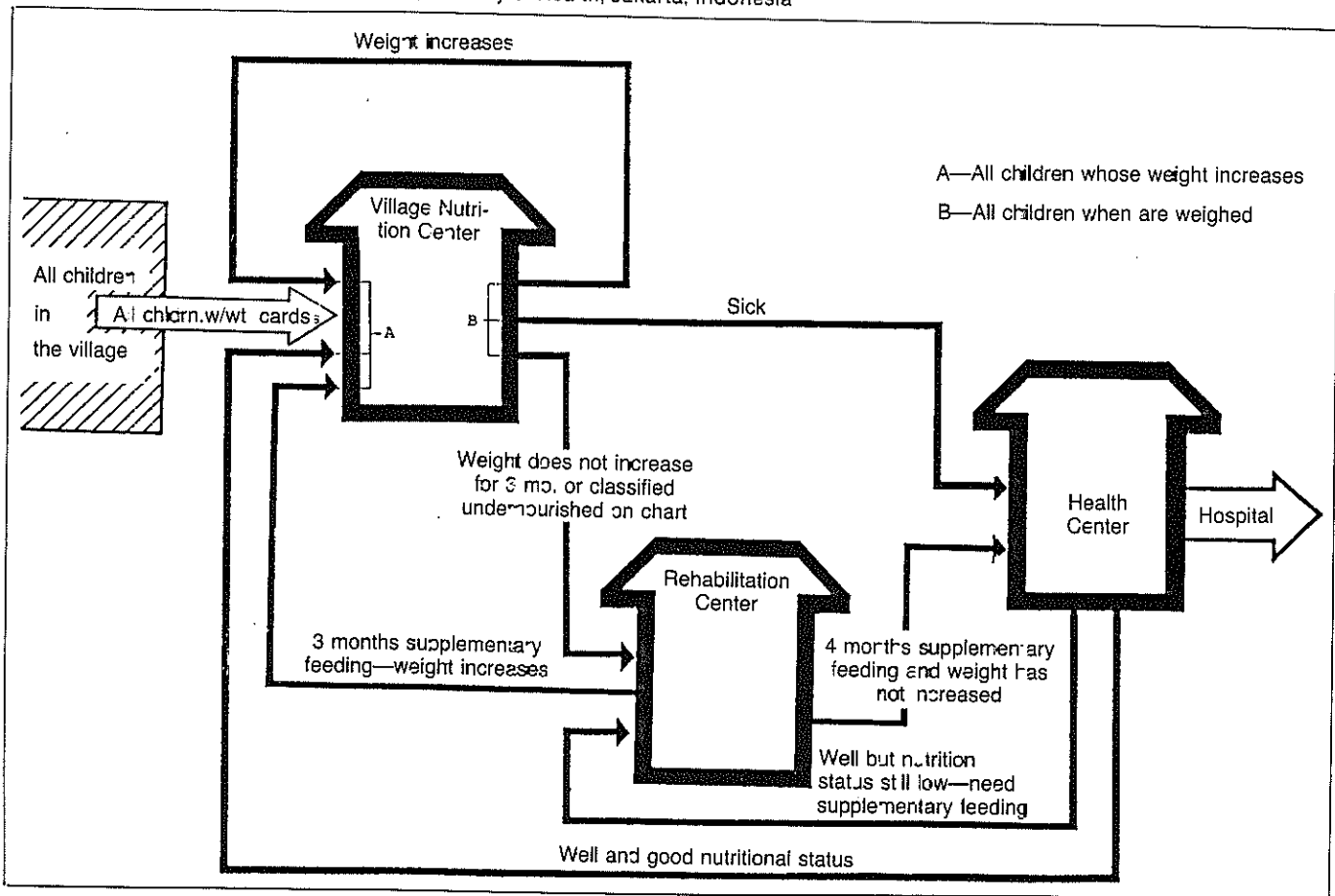
Unfortunately, some programs do not have the support of an active primary health care program. In cases of minimal resources at the community level, medical backup may be limited to referral to another facility or program. In Indonesia, for example, a referral system has been established as part of the community weighing program. Children stay in the village weighing program if their weight increases. Those whose weight has not increased for three months are sent to a village rehabilitation program where they receive food supplements. Those who are sick are referred to the health center. The complete system bases each move on the weighing results (See Figure 31).

**Feeding Programs.** Whether food programs are operated at the clinic or community level the advantage of adding a growth monitoring activity cannot be overemphasized if the food program is interested in achieving more than just food distribution. Growth monitoring, due to its direct link with educational activities,



**Figure 31: Nutrition Referral System—Indonesian Family Nutrition Improvement Program (UPGK)**

Source: Nutrition Division, Ministry of Health, Jakarta, Indonesia



provides a way to target advice for home rehabilitation and also signals the children most in need of food allowing their progress to be monitored.

An evaluation of a Moroccan feeding program stressed this combination of activities:

To improve targeting of the most vulnerable groups, it is essential that scarce food resources be allocated on the basis of nutritional status as well as income level. . . . A unified and centralized record keeping and management system should be instituted in feeding programs so that progress can be properly monitored and impact fully documented. The additional resources and effort required are well worth it (45, pp. ii and iii, 45).

If food is to be targeted, i.e. given only to certain families bringing children to be weighed, extreme caution should be used in deciding how to organize food distribution in relation to growth monitoring. Program planners in some African programs have noted that when food is targeted, those receiving food feel stigmatized, and occasionally husbands will not allow their wives and children to attend the program (14). In Indonesia a similar phenomenon is observed, although the food is seen as a reward and therefore causes mothers with healthy children to feel cheated (55). Therefore, the nutrition program in Indonesia separates monitoring from food distribution. Mothers with malnourished

children must return to the village center to receive food and instructions about its use at another time (a tactic that is practical only if the center is close, and the extra session is not long).

In a community nutrition program in Tamil Nadu, India a similar strategy is used. Children who are not growing must return each day for a feeding program which provides a snack food to be eaten at the center (49). Using growth monitoring to select beneficiaries for the feeding program has meant substantial savings on food in Tamil Nadu without, it appears, jeopardizing children's lives (197). In spite of the cost savings, one critic (149) views the growth monitoring activity as impractical and unnecessary for the national program because of implementation problems (assumed to be inherent). The critic feels that food should not be denied to any child in a poor Indian village as this may jeopardize their well-being if not survival.

**Educational Activities.** Educational activities should be coupled with growth monitoring, whether or not there are resources for medical interventions and feeding programs. Educational advice needs to be precise and oriented toward improving one or two practices which will help a child gain weight. Central-level staff can work with mic-level and local workers to define

the messages, make appropriate local adaptations, develop the materials, and formulate a training curriculum in the use of the materials. More information on educational activities and training is provided in Chapters 6 and 7.

Decisions that are made at a central level need to reflect local realities: the perceptions of program participants and the community in general should be continually sought and evaluated. And while the plans for the actual monitoring activity are important, emphasis should be placed on use of the results to build a program which will make a difference in child growth.

### ROLE OF THE MID-LEVEL WORKER

The mid-level worker plays a critical and often sighted role, in ensuring the success of a monitoring program. Whether organizationally based at a district office, health center, or other facility, the mid-level worker is the principal provider of supervision and program management. This person must balance central-level goals and guidelines with the realities of program implementation. As the communication link between the central and local levels, the mid-level worker should be a knowledgeable and active participant in the processes of each. While these supervisors need to collect information for central-level program monitoring, their most important tasks are local-level follow-up, guidance, and detection of potential problems or misunderstandings. This involves working not only with program personnel, but also directly with program participants.

A well-designed form for supervisory visits can facilitate communications and enhance the quality of the supervision provided at the local level. A great number of forms exist. The example below is from an Angolan project (145), which was instituting a village-run monitoring program. This form is of interest because it attempts to quantify progress made in implementation. One element missing from this form is the reaction of parents to the idea of monitoring.

### ROLE OF THE COMMUNITY

Enlisting the support of local leaders is a first step to ensure the success of a monitoring project in most countries (20, 92).

Because a monitoring program is one in which *all* families with young children should participate, community support needs to be broadly based. Therefore, "local workers" should include not only political leaders but also religious and informal leaders. Several programs recently have begun to work closely with religious leaders. For example, national programs in Colombia and Brazil are working with the Catholic church, from its national offices to parish priests to inform them about the program and gain their support for activities at the local level. Likewise, in Indonesia

the national program has designed special materials for Islamic leaders on nutrition, emphasizing monthly weighing and adequate growth. Local Imams are encouraged to talk with fathers about the health of their children and fathers' participation in the community program.

A consistently important role for both male and female community opinion leaders is that of motivational agent to encourage participation in the project. In most cases their involvement must go beyond explaining the benefits of growth monitoring for potential health and nutrition improvement, to actually participating in the sessions and speaking with families on informal occasions. They also might assist in organizing community social events, such as lotteries, which serve to promote participation by all at the monitoring sessions. In this case, tickets for a lottery could be obtained only at the growth monitoring session. Additional tickets could be given to any mother whose child gained weight (52).

Other ideas for activities that can be organized on a community level to encourage participation in growth

**Figure 32: Evaluation Form for Weight Chart Introduction Assessment**

	Score for each item
1. Number of charts filled in	
— 100% of target	(8)
— 75% of target	(6)
— 50% of target	(4)
— 25% of target	(2)
2. Master chart of the child clinic population	
— 2 master charts made correctly	(4)
— 1 master chart made correctly	(2)
3. Identification of common chart errors (clinic staff must discover eight mistakes on the evaluation sample chart)	(8)
4. Use of weighing scales	
— knowledge and practical demonstration of balance scale taring	(2)
— correct reading of weight on Salter scale	(2)
5. Observations on filling in of charts (20 random charts evaluated)	
— child's calendar filled in according to rules	(2)
— year registered against birth month end January	(2)
— size, position, and linking of weight dots made correctly	(2)
— administrative information	(2)
6. Frequency of visits (in last three months)	
— child attended three times consecutively	(4)
— child attended once in any two months	(2)
7. Regular home visiting performed	(4)
8. Clinic education given to mothers on the importance of the weight chart	(2)
9. Contact and collaboration offered	
— by the Angolan Women's Organization	(2)
— by other local leaders	(2)
10. Identification of children at risk with appropriate action taken	(4)
<b>Maximum score</b>	<b>(50)</b>

Source: Delahaye, P. "The Introduction of Weight Charts in Angola: Some Aspects of Project Implementation." *Assignment Children* (61/62) 1983: p. 280.

monitoring include giving each mother a card that is marked at each session she attends. After the card has been completed, she can present it to a local merchant for a prize (55). Coupons can also be used as an incentive for mothers: initially they may be given for attendance, then for those children that show weight gain, and ultimately for maintenance in the upper portion of the growth card.

The community can organize a small fair or bazaar at the time of the session, or hold the session on market day (110). Organizing a fair may be especially practical if there are small handicraft projects in the community that produce items useful to community members.

Besides participating in the monitoring sessions, community members should also take responsibility for examining the results (see Chapter 8) and planning their own response to the problems that are highlighted. For example, in Indonesia and Nepal communities have begun their own supplementary feeding programs for malnourished children. These programs use local foods and are funded by money collected from the women who attend the monitoring sessions or local meetings (70, 80). In Nicaragua, women organized to obtain free or subsidized food from outside the community and then gave or sold it at cost to families with malnourished children (50).

#### **ROLE OF THE FAMILY**

Although the community can do a great deal to organize, promote, and act on the results of growth monitoring, the real involvement and commitment must come from each household with young children. This involvement and commitment is strengthened when family members can interpret monitoring results, decide on their own interventions, and witness changes in their children (67, 83). Although involvement of all families to this extent is not a simple or quick process, it is a necessary and basic goal for growth monitoring programs if they are to benefit the children who participate.

Two pilot projects (67, 98) have attempted, with some success, to place full responsibility for growth monitoring with the mothers: mothers weigh their children and help maintain growth cards. Although this may not be practical for all areas, even if mothers do not weigh and measure their children alone, they should be trained and share in the responsibility at each step.

All programs can use the growth card to begin encouraging participation. It has been reported that the mothers' enthusiasm and participation in a program increases when they are given the growth cards (50). Possession of the card is a clear indication to the mother that she shares in the responsibility for her child's health. Other advantages include decreasing the amount of time mothers wait for workers to find and refile records (101).

Health workers' major criticism of this policy, that mothers lose cards, has not been substantiated, since

the cards are just as likely to be lost at a typical health center (109, 196). The loss rates reported by several programs in which the mothers keep the cards are not alarming:

- At the close of Project Poshak (India) interviews were conducted with 375 mothers. Not one of the mothers had lost her child's weight card over a four year period (47).
- A study of four well-established, under-fives clinics in Africa shows an overall loss rate for home records of eight percent (101).
- A report on the Ministry of Health/Catholic Relief Services Community Studies Project in Hanover, Jamaica notes that "not a single weight chart was ever lost" (43, p. 303).
- In a randomly selected sample of homes in Indonesian villages with weighing programs, there was a loss rate of one percent. However, eight percent of the cards were left at home by mothers who took their children to be weighed regularly (51).

One potential problem noted by WHO is that although mothers have their cards, they may fail to bring them to the session. The WHO study (129) conducted in several countries found such failure to occur between five and fifteen percent of the time. The study attributed failure on the part of mothers to the centers' keeping of duplicate records, which made the mothers feel that their efforts were superfluous. Nonetheless, some experienced professionals feel that eliminating health-center records would be a mistake (14, 74, 127). Clinic records have proven especially valuable for project evaluation (173) and for identifying children who may have problems and do not return to be weighed (196). But are they worth the expense and time to maintain for an occasional evaluation? This is another delicate situation for program planners because clinic records should not be perceived as lessening the family's responsibility for maintaining the card.

Families should be responsible for more than their cards; they should be encouraged to look for their own solutions to their children's health and nutrition problems. As Dr. Capone remarks on food supplementation programs, there should be a contract-like arrangement with the parents (23). The parents should be encouraged to alter some feeding practices, to take the child to the health center, or to give the child a particular medicine between weighing sessions. It is through family responsibility for particular behavioral changes that growth monitoring projects will become an integrated part of the health care services that the families feel are truly important for them.

It is only when all levels (central, mid-level, community, and household) cooperate that the general goal of growth monitoring projects will be achieved—improved nutrition and health status for all children.

## Using Monitoring Results for Family Education

Often growth monitoring activities are not integrated into national primary health care programs because governments fear that a program that identifies undernourished children will require them to begin and maintain a massive feeding program. Although large feeding programs may be necessary during emergencies or in areas where subsistence is marginal, the majority of areas where growth monitoring activities could be implemented do not need massive feeding programs. For impact growth monitoring programs must acknowledge and treat/prevent the numerous parasitic, viral, and bacterial infections that lead to weight loss. While actions to prevent and cure infections are often complex and long-term, assessing the respective roles of poor nutrition and of specific infections as well as providing for their treatment and educating families about their prevention may well constitute a crucial step in improving children's growth. Together with responsive medical service, routine child feeding practices often require improvement.

Growth monitoring programs have shown that families can respond to identified growth deficits by reallocating their own resources to cover their needs if they are:

- offered the proper motivation,
- given clear and feasible alternatives, and
- given a role in deciding what practices they will try to change.

As the *State of the World's Children 1984* points out: "... half of all cases of malnutrition are to be found in households where there is no absolute shortage of food." (151)

Education becomes the hope. Ideally, monitoring growth will make the malnutrition "visible" and then education will help families improve their practices to prevent malnutrition and rehabilitate their malnourished children. A few pilot projects (Thailand (193), Indonesia (170)) have demonstrated that this theory can work. Nutritional status changes *can* occur and be sustained through educational efforts alone. But in the majority of cases, especially in large or national programs, educational efforts have not fulfilled their promise.

Many efforts are so poor in their conception and implementation that they are difficult to evaluate. Others that have been evaluated show that designing an educational program requires extreme care. An evaluation of the national Indonesian nutrition program (UPGK) provides a specific example:

... despite the success in programme implementation, only slight evidence was found suggesting that UPGK may have had an impact on participating children's nutritional status. The reason for this may be that current nutrition education messages emphasize the composition of meals rather than the importance of maximizing children's total caloric intake (147).

A review of 33 USAID-sponsored feeding programs in 21 countries (30) cites two reasons for poor educational efforts: 1) the staff was insufficiently trained for the work; 2) the number of topics to be covered with the mothers required more time than the staff could afford, and as a result education on growth charts was buried.



*Mother receives nutrition education. P. Koniz-Booher*

Many educational efforts also fail because their underlying strategies overlook the importance of motivation, specific alternatives, and the involvement of the target families. Most manuals instruct health workers to educate families on a number of topics including the growth chart and infant feeding. The worker is given general guidelines but is seldom provided with examples to help adapt the large body of nutrition information to family needs or a scheme for linking growth monitoring results to infant feeding lessons. Without experience in interpreting monitoring results into dietary recommendations and without training in basic communications techniques, health workers will miss lessons that might be learned from the growth chart.

These problems can be overcome in part with an education strategy based on growth monitoring results. Such a strategy neither precludes training the workers nor reduces the number of topics that a worker needs to understand. Rather, it offers workers a way to remember and target their advice.

Relating advice to growth monitoring results will make education less an abstract list of do's and don'ts and more of a guide to practical action tied directly to the

current growth status of the child. The mother will receive advice when she needs it—when a potential problem has been spotted. Consider for a moment the mother's situation at the monitoring session: she has just helped weigh her child; something is recorded on her card; the card is returned to her. What does it mean? A few minutes of explanation at this time will take advantage of the mother's curiosity. Advice about what she can do will be given when she wants to act. In addition, she later can see the consequences of her actions and will learn what is best for her child by observing an upward movement of her child's growth line. Slowly, confidence will build in both her own and the health worker's capability.

Before reviewing programs which as part of their educational strategy link sound nutritional advice to growth monitoring results, a few basic questions about education and growth monitoring merit exploration.

### CAN FAMILY MEMBERS UNDERSTAND?

Often health workers think that mothers cannot understand the significance of the growth chart, since it is sometimes difficult for the health workers themselves to understand. However, projects that have measured mothers' understanding of the chart *after orientation*

have concluded that mothers have little or no difficulty understanding the chart. (In this context, the chart is a weight-for-age growth curve where the adequate growth channel is between two curved lines drawn across the chart.)

Data gathered in Ghana (11, 95) indicate that while the educational level of the mothers was closely related to their readiness to learn about the weight chart, many virtually illiterate mothers had little trouble understanding the chart. Even though only 53 percent of the mothers had more than two years of schooling, after six months in the program, 66 percent of all mothers were able to interpret correctly four different charts with examples of good and insufficient growth.

The experience of Project Poshak in India (47) confirms that mothers can interpret the charts. In this project mothers received weight charts and instructions about their use. By the time of the project evaluation, all mothers interviewed knew that a downward slope in the child's growth line meant illness. Seventy-six percent recalled the meaning of the three growth channels and were able to mark their own child's position and to identify the child's health status correctly.

One exception to the positive experiences described above is reported by the RUHSA project in Vellore,



*Instruction in proper child care is given to Bolivian mothers. ICEF, 7718*

India (177). There, illiterate village volunteers (mothers) could not understand the chart even after training. These project managers now argue that there are easier ways than growth monitoring to educate illiterate women about needed dietary change.

How can the growth chart concept be explained effectively? Before the growth chart can be used as a tool to motivate, family members need to be taught about the importance of growth monitoring as an indicator of health and the causes for changes in the rate of growth. Specifically, the relationship between illness and growth, and between food consumption (especially quantity) and growth need illustration. For this, four educational objectives for family members have been identified (99):

- the ability to explain the line showing the child's growth in relation to the color pattern on the chart;
- the ability to discuss the child's growth in the past month based on change from the previous monitoring session;
- the ability to discuss how the child's health status affects food consumption; and
- the ability to discuss how food consumption affects growth.

To help family members visualize the links between food consumption, growth, and health, and to motivate them to continue to bring their child to monitoring sessions, pictures or illustrations of children and stories about children's growth are useful. One such story developed by the Moroccan Government was used in a Catholic Relief Services nutrition project in Morocco (25). The story compares the life of Rachid, a sick, malnourished child, and that of Ahmed, a healthy, lively, bright child. After telling the story, the health worker asks mothers to compare the growth patterns, behavior, and diets of the two children. The mothers are asked the same questions about their own children. This teaches the mothers to recognize the link between food intake, growth, and good health both in the abstract and in their daily practices.

A story created by the community and about children from the community may be the best beginning. Select children who are different in age but similar in size or ones who are the same age but different in size. The mothers can discuss why these differences exist—why an older child is the same size as a younger one or why two children born at approximately the same time are different sizes. The appropriateness of using examples of community children will vary among cultures, but care should always be taken to ensure that no mother is embarrassed or leaves feeling shamed.

Another way to illustrate relationships of health, food consumption, and growth is with a story about one child. An example is found in the booklet *Better Child Care* (73), which includes pictures of a child taken a

few months apart. In the first picture, the child is badly malnourished. In the second, he is much improved by a better diet. Mothers can discuss whether they think this is the same child and what they think has made the difference in the child's appearance.

In addition to stories, a game board has been developed (185) which illustrates how to complete growth charts and what an ascending and descending growth line means for child health. In this game, two teams play with colored markers which represent two children. Play takes place on a board designed as a growth chart. Each team takes turns drawing a card from its own pile and placing one of its markers properly on the chart. The cards are arranged by age, with the first card used for the child at birth and the last for the child at 12 months. Each card states the child's age and weight and has a drawing of the child as s/he "grows." One child gains weight, moves upward on the chart and is pictured as healthy. The other child loses weight, becomes increasingly thin, and moves downward on the chart. The thin child dies during the final month of weight loss. As developed now, the game centers on interpreting the chart, but it could easily be adapted to illustrate reasons for weight gain or loss, or these topics could be discussed once the game is over.

#### **How Is Growth Monitoring Linked to Teaching About Dietary Practice Improvement?**

Understanding the importance of growth monitoring and how to interpret the growth chart is not enough. The mother needs to know what to do about the results, what action to take to correct faltering growth. It is precisely because of the diagnostic nature of growth monitoring that it presents an ideal forum for nutrition education. Nutrition education done in the setting of a growth monitoring activity breaks with tradition: it is an individual counseling session rather than a group lecture. The diagnosis of weight gain or loss, or of growth or no growth, can be a stimulus for action. The action to be taken can be specific, individually tailored (at least by age), and take into account key health status indicators such as presence of diarrhea or upper respiratory infection, and growth and nongrowth. Standard recommendations for each situation can be formulated and then during a brief discussion with the child caretaker adapted to suit the particular family situation. The framework for which individual counseling messages may be used follows.

Specific recommendations differentiated in such a way can be combined appropriately by the health worker for the child's condition. Working with the mother to find one or two actions she can implement is a much more effective tactic than having her participate in a group lecture from which she must extract recommendations relevant to her own child. By linking action-

**Figure 33: Message Design Matrix for Individual Counseling at Growth Monitoring Sessions**

Age	Weight Gain**	No Weight Gain One Time	No Weight Gain Two Times	Diarrhea	Other Illness
Age categories should be appropriate for significant changes that need to take place in a child's diet as the child ages.*	Always congratulate mother and give an age specific message to promote good nutrition practices.	Encourage one or two improvements that can be made in current practices that if followed will result in increased calorie intake. The actions for no weight gain the second time need to be especially bold.		Encourage appropriate feeding and oral rehydration practices during the illness plus adequate rehabilitative practices for the age of the child once the illness is over	

\*For example: 0-4 mo.; 5-9 mo.; 10-12 mo.; 13-18 mo.; 19-24 mo.; 25-36 mo.

\*\*Inquiries should always be made as to the child's health between weighings and immunization status

oriented nutrition education with a well-executed growth monitoring activity, most countries could have a highly effective nutrition intervention at an affordable cost.

The first program to develop this type of strategy linking recommendations to growth monitoring results was Indonesia's Family Nutrition Improvement Program (UPGK). The basic message of this program is "A healthy child gains weight as he grows older" (80). A child's inability to gain weight becomes the warning sign for the health worker. The number of months the child has failed to gain weight and the age of the child determine which message is communicated to the mother.

Examples of the Indonesian messages follow (20):

- For a child zero to three months old who has not gained weight over a one-month period of time: 1) the child should be breastfed three to five times more than usual every day; 2) the mother should drink a total of six glasses of water every day.
- For a child four to six months old who has not gained weight for two months: the child should eat a medium-sized plate of soft food five times a day.
- For a child 12 to 24 months old who has not gained weight for two months: 1) the child should eat adult food five times a day. 2) the child should be given food between meals.

The flipchart designed by the Indonesian Government that contains all of the dietary recommendations and the protocol for health center referral is being distributed by:

The Clearinghouse on Infant Feeding and Maternal Nutrition  
 American Public Health Association  
 1015 15th Street, N.W.  
 Washington, D.C. 20005 U.S.A.

During the initial development stage of the Family

Nutrition Improvement Program, the Indonesian government supported a pilot project (Nutrition Communication and Behavior Change Project (NE) 1978-1982) which worked even more intensely on the education component (170). The NE Project had as its mandate development and dissemination of messages that would provide self-sufficiency, produce changes in practices, and reduce levels of malnutrition. The project perfected the messages through intense work with a small sample of mothers who tried and adopted all of the recommendations before they were used in the program. The program messages were specific and persuasive, emphasizing one to three actions for children of a particular age. Innovative materials to counsel mothers were designed for radio broadcasting and for use by field workers at growth monitoring sessions; intense field worker training on the concepts behind the messages and materials was given; and officials at all levels were involved in the project planning and implementation.

The evaluation of this project, based on a sample of 600 households in the project and 400 in the comparison areas, indicated:

... that the project had considerable effect not only on the knowledge and attitudes of the families who participated, but also on their practices. In addition, these practices favorably influenced the growth of their young children. The Nutrition Education (NE) group differed positively and significantly from the matched comparison group in all indicators, including participation of mothers in nutrition activities and their nutrition knowledge scores. Other evaluation results reveal that 1) more children in the NE villages ate the foods stressed in the messages; 2) children of the families in the NE villages had higher protein and calorie intakes; and 3) children in the NE areas grew significantly better after 5 months of age than children whose families participated in other nutrition programs. By 24 months of age, 40 percent of the NE infants were better nourished than infants in the comparison group (170).



The experiences of Indonesia have been consolidated and adapted and are now being tried in several countries. In the Dominican Republic, for example, a Catholic Relief Service-sponsored community nutrition program (ANEP) has growth monitoring and nutrition education as its core activities (154). The communications strategy has several components: 1) individual counseling based on growth monitoring results; 2) group sessions using taped open-ended stories to explore the ideas which are most questioned by mothers during individual counseling, and 3) follow-up reminders on radio of important concepts. A set of cards, used by village promoters to counsel mothers based on monitoring results, include questions for the mother, and the answers help the promoter in tailoring advice and persuading the mother to try the recommendations. Examples from these cards are shown below:

**Figure 34: Mother's Cards from the Dominican Republic** Source: ANEP



*The card above is used with a mother whose child is 5-8 months of age and has gained weight during the month.*



*This card is used with a mother whose child is 5-8 months of age and has not gained weight during the month.*

## MOTHERS' PARTICIPATION PERMITS WORKABLE MESSAGES TO BE FORMULATED

Specific messages similar to the ones above can be developed for any program and can offer valuable guidance to health personnel in counseling mothers. If they are to prove useful to village mothers, these messages should not be designed in an office isolated from the health workers and mothers who will use them. Instead, the intended audience for any message should be invited to help formulate it (51). This participation goes beyond the usual surveying by most educators to understand the target audience before designing educational contents.

The community participates in message design through trials in which the mothers or families actually test, comment upon, modify, and retest a recommendation. The original recommendations are made because they appear practical and because they are nutritionally sound. The testing and retesting assures that they mesh with villagers' perceptions and practices. What emerges after intense work with carefully selected participants is a synthesis of traditional practice and a new technique—a message that can affect daily feeding practices or actions taken during illness because it addresses the mother's/family's fears, doubts, and aspirations. This synthesis is impossible to formulate without the participation of the family, especially the mother, no matter how well persons designing the recommendations may believe they understand village families.

This methodology should help avoid a pitfall of many health education efforts—that the recommended actions are not practical or feasible to actually carry out because of cultural, economic, and other barriers. For instance, there are numerous demands on the time of women in developing countries. In many circumstances, asking them to add a new time-consuming task, such as preparing an improved weaning food several times a day, will simply not be effective, even if women *want* to follow the health worker's advice that would help their children (152).

## HOW SHOULD EDUCATION BE UNDERTAKEN?

Explaining growth charts and monitoring results can be done in either group or one-on-one sessions. The most common setting is the group lecture conducted during or after the monitoring activity, although the most effective may be individual counseling. Regardless of the setting, some basic points about the education or training sessions should be considered:

1. Mothers should have an explanation of the results of the weighing or measuring as soon as possible and should leave the session with a clear idea of what they are going to try between this session and the next. The mother should not have to wait until everyone is finished or until a health worker comes to her house. As



described in Chapter 5, a health worker should be stationed in an area where the mother can go immediately after her chart is completed. The best way to reach a decision is through individual counseling. At that time the health worker can find out about medical problems and what foods the mother feeds the child and make specific recommendations. The mother discusses what she can do practically, given family size, time, income, and food available. The recommendation with modification becomes a mutual decision about what she will try. If there is space on the growth card, this decision can be noted for follow-up. If individual counseling is not feasible, the mother can be given the result and referred to a small group session for further discussion. The group sessions can be conducted as a few mothers finish so that no one has to wait hours after the weighing for an explanation.

In a group session, tailoring recommendations becomes much more difficult. If there is no alternative to the group session, it is best to keep the group small and have everyone agree to try something, such as feeding an extra four large spoonfuls of rice at each meal to all children between nine and eighteen months.

2. *Community leaders should be invited to attend the monitoring session or to open an educational discussion.* Often this gives more credibility and importance to what will follow (56, 133).

3. *The mothers should be engaged in open discussion rather than be lectured to.* Mothers are more likely to resolve their own doubts or misunderstandings if they actively participate in the discussion (133). Mothers should be encouraged to air their beliefs about the signs and origins of illness or malnutrition, as well as other ideas concerning health. The use of open-ended questions\* will promote this type of discussion. (Special communications training for health workers, particularly in the use of open-ended questions, may be well worth the time. A Philippine project reportedly increased the effectiveness of its education program with just one day of communications training for field staff (6).

4. *Examples from the mothers' experience should be used to illustrate specific points.* An advantage of group sessions is that women with healthy children can discuss how they feed their children and at the same time

can receive positive reinforcement for their current practices. Also, women who have tried to alter recommended feeding practices should be called upon to discuss their experiences: how they felt, what modifications they made on standard recommendations, and what the result was on their children's growth. Whenever culturally appropriate, traditional ideas about food and growth should be enlisted to explain or reinforce the principle of the growth chart (3, 51).

5. *Mothers with malnourished children should not be singled out or embarrassed (56).* Reference to a child who is not growing well should be made by using a fictitious name, by telling a story, or by showing an unidentified growth chart. Mothers with malnourished children sometimes will not attend weighing sessions because they are afraid of being identified as bad mothers (51).

6. *Sessions should be brief.* Particularly when mothers bring all of their children along, it is difficult for them to focus full attention on the discussion for more than ten to fifteen minutes (56). For this reason, only one point should be discussed during an individual or group session.

7. *Whenever possible, visual aids should be used to illustrate the points in the discussion (56).* An effective technique is to ask mothers what they see in a picture or graph before it is explained. The mothers' perceptions can then be incorporated into the explanation of the picture, and the health workers need only reinforce particular concepts.

The opportunity provided by growth monitoring to offer the mother specific, behaviorally oriented messages to help her child should be utilized. Mothers can understand how to interpret their child's position on the chart, but this is not enough. Referring her child for more medical treatment, while important, does not often involve her in her child's recovery. Involving the mother in the improvement of the child's daily dietary pattern provides the opportunity for the mother to participate actively. The dietary change messages should be designed by project staff along with the mothers (or those who will implement the messages). This assures that messages will be practical and within the cultural patterns of infant feeding, so that if sufficiently motivated, mothers will try to follow the advice. Whenever possible, mothers should participate in the ultimate decision about what they will try. If the mothers do participate, the positive reinforcement offered by watching changes in the growth curve cannot be equalled for its power of persuasion or its ability to boost their self-confidence.

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\*An open-ended question is one that cannot be answered with only "yes" or "no." It requires that more information be given, in this case a description of the mother's experience or thoughts about a particular practice. An example of an open-ended question for the discussions described above "What is your opinion about feeding your child more often?"

# Training Primary Health Care Workers

In most programs, community health workers have prime responsibility for growth monitoring. Teaching them skills and maintaining needed knowledge and attitudes are thus crucial to a program's success in upgrading nutritional status.

Participatory instruction and on-site practice can help ensure that community health workers are able to carry out all phases of monitoring. This training need not be lengthy and will serve to reinforce training in other health concepts or community participation.

## TRAINING THE TRAINERS

Health professionals responsible for training and supervising community workers often need inservice orientation on the nutritional goals of primary health care projects, on the community health worker's nutrition-related role, and on how to train community health workers. Such a course for health center personnel has been designed by Dr. Jon Rohde *et al.* and reprinted in *Tropical Pediatrics and Environmental Child Health* (100). Other manuals are also available (see Box).

It is important that growth monitoring goals conveyed to national or regional trainers, health center workers, community volunteers, and mothers be consistent. In an attempt to alleviate the significant variations in program implementation among communities of different regions, Indonesia changed its training approach from an inverted "pyramid" approach to a "vertical" approach. Originally, detailed training was given to those personnel in higher levels of the system, and at each lower level the training was abbreviated and simplified. This led to inconsistencies in interpreting program goals. Consequently, a vertical training method was introduced using a standardized training module for all levels to eliminate some of the message distortion occurring during the simplification of the training for the next level (148, 160).

## IDENTIFYING SKILLS TO BE TAUGHT

Identifying the knowledge and skills necessary for health workers to carry out growth monitoring activities is the first step in planning a training session.

The list below is a composite of health workers' responsibilities in several growth monitoring projects. Skill objectives have been enumerated for each responsibility.

**Table 11: Training Objectives**

<i>Responsibility</i>	<i>Skill Objective</i>
1. Establishes a growth monitoring activity in the community	1.1 Knows value of growth monitoring and can explain it meaningfully to community members 1.2 Interests and involves community leaders in the activity
2. Weighs and measures children	2.1 Can structure monitoring procedure to minimize confusion 2.2 Can set up and use tools correctly 2.3 Can accurately weigh or measure children
3. Completes growth chart	3.1 Can interview the mother 3.2 Can calculate child's age or birth date if required 3.3 Can graph or mark card correctly
4. Offers advice or education to mothers	4.1 Can correctly interpret chart 4.2 Can communicate effectively with and involve mothers 4.3 Can offer proper dietary advice for child not growing adequately and can refer child in need of additional assistance
5. Stimulates community to work together to help malnourished children	5. Can discuss the community nutrition profile given by monitoring results and recommend community actions to alleviate the situation
6. Keeps information that will help evaluate the program or the progress of the community	6. Can compile a community record for each session or keep a simple tabulation

## TEACHING GROWTH MONITORING TECHNIQUES

The training session has two purposes:

- to provide knowledge and skills; and
- to foster a belief in the usefulness of growth monitoring, a commitment to community action, and a desire to transmit these attitudes to communities (126).

To accomplish these goals, educators must teach not only technical skills but also skills for communicating with the community. Although specific techniques taught will vary according to program requirements and choice

### Training Materials that Include Growth Monitoring

- The World Health Organization's *Guidelines For the Training of Community Health Workers in Nutrition* (230) has a chapter on growth monitoring.

- Werner and Bower's *Helping Health Workers Learn: A Book of Methods, Aids and Ideas for Instructors at the Village Level* (126).

- An Indonesian publication *Manual for Community Based Under-Fives Weighing Program* by Hendrata and Johnston (56).

- A self-instructional unit for nursing and midwifery students in Africa *Weight: Charting and its Significance in Child Health* (187).

- *Weighing and Measuring Children: A Training Manual for Supervisory Personnel* (26) which can be obtained by writing to:

Center for Health Promotion and Research, Educational Branch  
Building 1 South, Room SSB 249

Center for Disease Control  
Atlanta, Georgia 30333, U.S.A.

or:

Health Services Administration, Bureau of Community  
Health Services

5600 Fishers Lane

Rockville, Maryland 20857, U.S.A.

- A training package for program managers and people working with donor agencies is also available from the:

London School of Hygiene and Tropical Medicine

Human Nutrition Department

Keppel Street (Gower Street)

London WC1E 7HT, United Kingdom

The package contains both slide-tape sets and written guides to the assessment of nutritional status. The five units cover:

1. an introduction to assessment
2. techniques of anthropometric measurements
3. interpretation of anthropometric measurements
4. assessing problems of the community
5. workbook for units 2-4.

The complete package is available for £275.00 plus 15% VAT, or each unit can be ordered separately, one slide-tape set costs £90.00 and each workbook is £5.00.

of measurements, there are some general guidelines to be followed.

Since the learning environment and teacher-student relationship experienced by health workers during their training will likely be reproduced when they teach in the community, techniques employed during community health worker training should exemplify teaching and communication practices. Formal presentations have not proven conducive to the open and active discussions that health workers should aim to create in their communities. Instruction should be action-oriented, should emphasize practical aspects, and should avoid complicated theory. Moreover, the learning environment should be similar to the one in which the student eventually will work (11). Initially, students should learn to handle the equipment and structure a monitoring

session within the typical household or clinic. Later training can take place during an actual monitoring session.

Obviously, the duration of the training session will vary widely depending upon the number of other primary health care activities for which health workers are responsible and upon their previously acquired skills and knowledge. In addition to allotting time for knowledge acquisition, sufficient time should be scheduled for practice at the training site and in communities. It was found in Indonesia that while the semiliterate workers successfully carried out the technical aspects of growth monitoring, such as weighing and recording, after three days of training their ability to interpret and offer advice to solve individual problems was frequently lacking (147). Thus, either more time should be scheduled for this type of training or only selected individuals should be trained for this job.

Practice in the community is essential. The trainees should have a chance to go through the entire process, from convincing local officials to support the program, through the actual growth monitoring, to presenting the results at community meetings. Every step of the practice should be accompanied by discussion about the experience and constructive comments about how the health workers can improve activities in their own communities. If possible, these different activities should be carried out on different days since this allows time to discuss what happened and to plan for the next activity. If time does not permit this schedule, an entire day in the community should be planned to complete all activities.

Suggested techniques for the different segments of a training session follow.

**Explain the principle behind growth.** One technique to illustrate the relation between age and growth is to show health workers pictures of healthy village children of different ages. Ask the health workers to order the pictures by the children's age and explain how they decided the age, noting that body size is one criterion. Next, to illustrate the importance of knowing both age and body size, pictures of children who are the same weight but different ages can be compared.

To demonstrate the links between growth and food intake and between growth failure and illness, the health worker can use a doll made out of a gourd or a clay pot with top and bottom openings that can be corked (126). The doll can be filled with water or objects representing the intake of breast milk or food and weighed to show that weight will be gained as more is added. Similarly, a diarrheal episode can be demonstrated by unstopping the full vessel, releasing the fluid it contains, and weighing it to show rapid weight loss.

**Illustrate why measurements are recorded.** Once the health workers see the relationship between increasing

age and body size, and the effects of food intake and illness on growth, they can discuss monitoring growth. Again, pictures of children can be used to illustrate the importance of measuring and completing growth charts and the need to follow a child's growth over time. First, the health workers are shown a series of pictures and asked to determine if the children are healthy. Then the results of weight or height measurements are given. Some results confirm and others disagree with the health workers' estimates. The health workers can examine completed growth charts for these same children, some charts indicating children recovering from a long illness, others indicating children just beginning to get sick. These records explain why some of the health workers made incorrect estimates of the child's health status and emphasize the importance of completing growth records.

**Teach health workers how to weigh and measure through practice.** The sequence of steps the students will follow each time they weigh or measure should be specified clearly. (Appendix B presents a weighing and measuring protocol.) One exercise, for small classes, is to have all the health workers weigh or measure the same child or object and write down the results. The answers can be compared and the variance between results discussed in terms of commonly committed errors. This same procedure should be continued during supervision visits, when the supervisor and health worker weigh and measure the same child and then compare results and discuss the source of any errors (33).

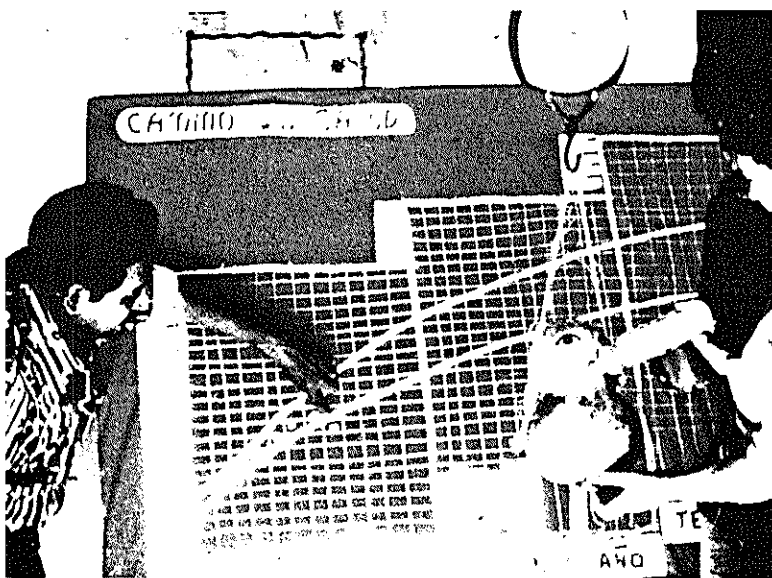
**Train health workers to complete the growth chart by example and practice.** A great deal of training is dedicated to teaching community health workers how to complete the growth chart, especially the weight charts that have a calendar system. Reading the scale or height board and completing the record are the only parts of growth monitoring that usually require literacy. Non-literate people, however, should not be excluded from growth monitoring programs. Even non-literate workers have learned to organize monitoring sessions, interpret cards, and educate families (50, 83, 132). Family or community members and school children can be invited to training sessions to learn to complete the charts and do other written work. For the initial explanation and group exercises, an enlarged, erasable growth chart is useful. In one project, large weight graphs were drawn and the paper was coated with plastic. Marks could then be made on the plastic with an erasable grease pencil (50). Flannelgraphs of the Road-to-Health weight chart or transparencies for an overhead projector can be ordered from:

Teaching Aids at Low Cost (TALC)  
P.O. Box 49, St. Albans  
Herts AL 1 4AX,  
United Kingdom

The flannelgraphs cost £5.00, and the transparencies sell for £1.75. Project personnel also can use their sewing skills to make a flannelgraph identical to the chart used in their program.

For individual exercises, health workers need cards to complete. Often it is too expensive to practice on the actual cards, but a stencil of the card can be made and reproduced on cheaper paper. Stencils of the Road-to-Health card are available from TALC for £1.75.

**Teach health workers how to interpret the chart through example.** A large growth chart or the individual samples completed by the health workers will serve this purpose. The lessons should focus not only on the child's position on the chart but also on the child's growth pattern: is the child's weight increasing, remaining constant, or decreasing? The recommendations that the health worker will give to the mother to improve her child's nutritional status depend on these observations. The two cases most often misinterpreted are: 1) the child who is within the normal range on the chart but whose growth has stopped or who is losing weight; 2) the child who is classified as undernourished on the chart, but who is gaining weight. In the first case the health worker will often believe that the child is healthy because the mark is still in the normal range on the chart, while in fact the child has a problem that needs attention. In the second case, because the child has



*Flannel-board chart and gourd representing a baby are used to show relationship between weight-loss and diarrhea. Hesperian Foundation*

remained in the same category on the chart, the health worker may believe that the child is in danger and may fail to reinforce positive dietary changes made by the mother that have started the child on the road to recovery.

The pictures below illustrate the kind of discussion that should take place with the health workers (126).

Health workers should also be instructed to ask a few basic questions of the mother whose child has failed to grow or who has lost weight. The questions to be asked depend on the capabilities of the worker and what they have been trained to offer. Examples of questions are the following:

- Has your child been eating normally or has s(he) claimed not to be hungry?
- Have you noticed anything different in your child (cough, cold, fever, etc.)?
- Does your child currently have or has your child in the past weeks had diarrhea or vomiting?
- Have you noticed any blood, mucous, or worms in your child's stools?

Use role playing to teach communication techniques like open-ended questioning. In one-to-one role playing, health workers can practice interviewing, discussing results, and planning dietary changes with other health workers who play the role of mothers. Any visual aids used with mothers should also be tried during training; too often when they are not handled properly they distract from rather than add to the presentation. The ability of health workers to speak in front of groups or with community leaders can be greatly strengthened if they have the opportunity to practice during training.

Offer the health workers instructions and practice in completing any other forms required for monitoring activities. Do not assume that, because written instructions accompany forms, all details are always understood.

If health workers are expected to make a community chart, this should be practiced during training, preferably with the results obtained during the community visit. The community chart can be compiled during or after the monitoring session. To make the chart, the health workers place a dot representing that child's current position on the same chart for any children

Figure 35: Example of Discussion That Should Take Place During Health Worker Training

Source: Hesperian Foundation

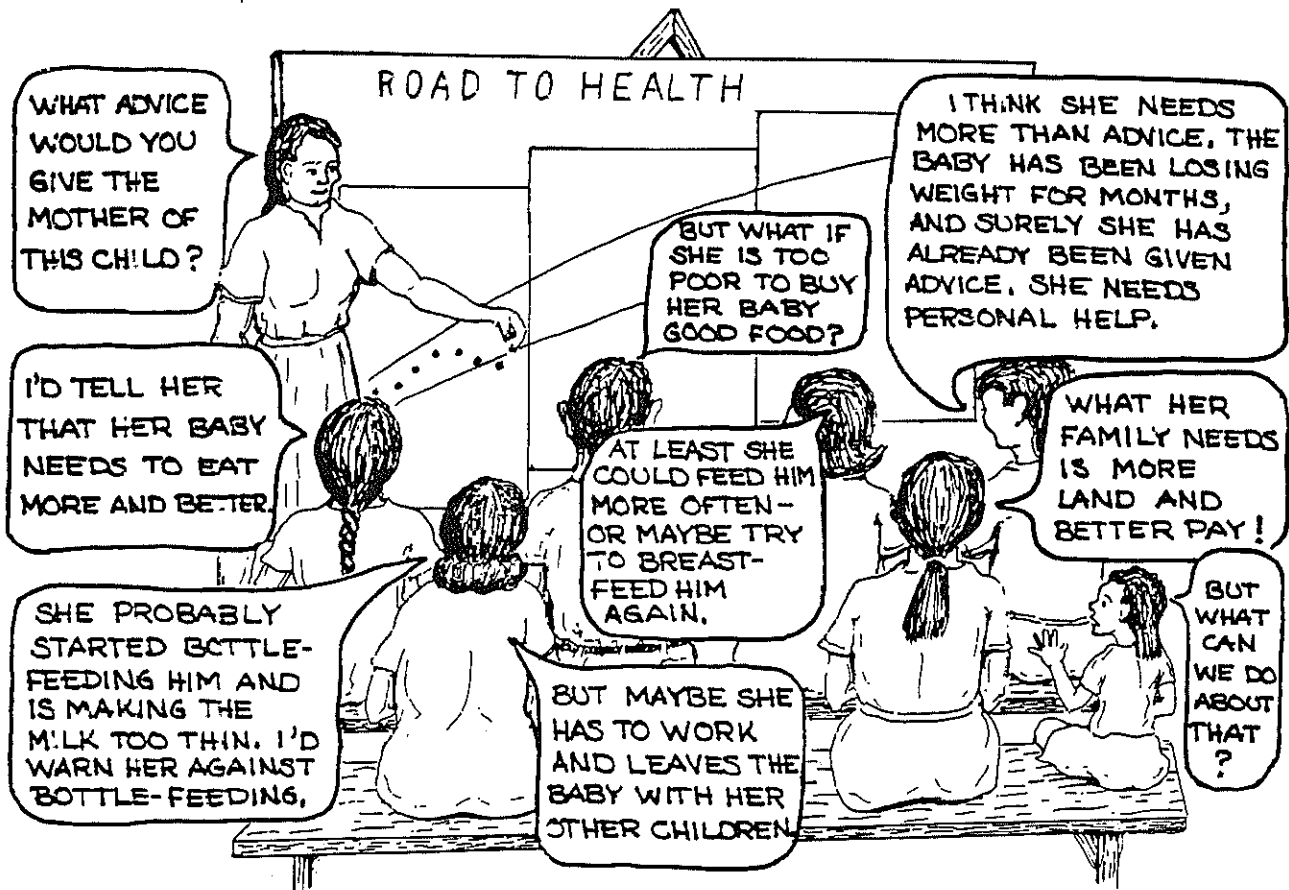
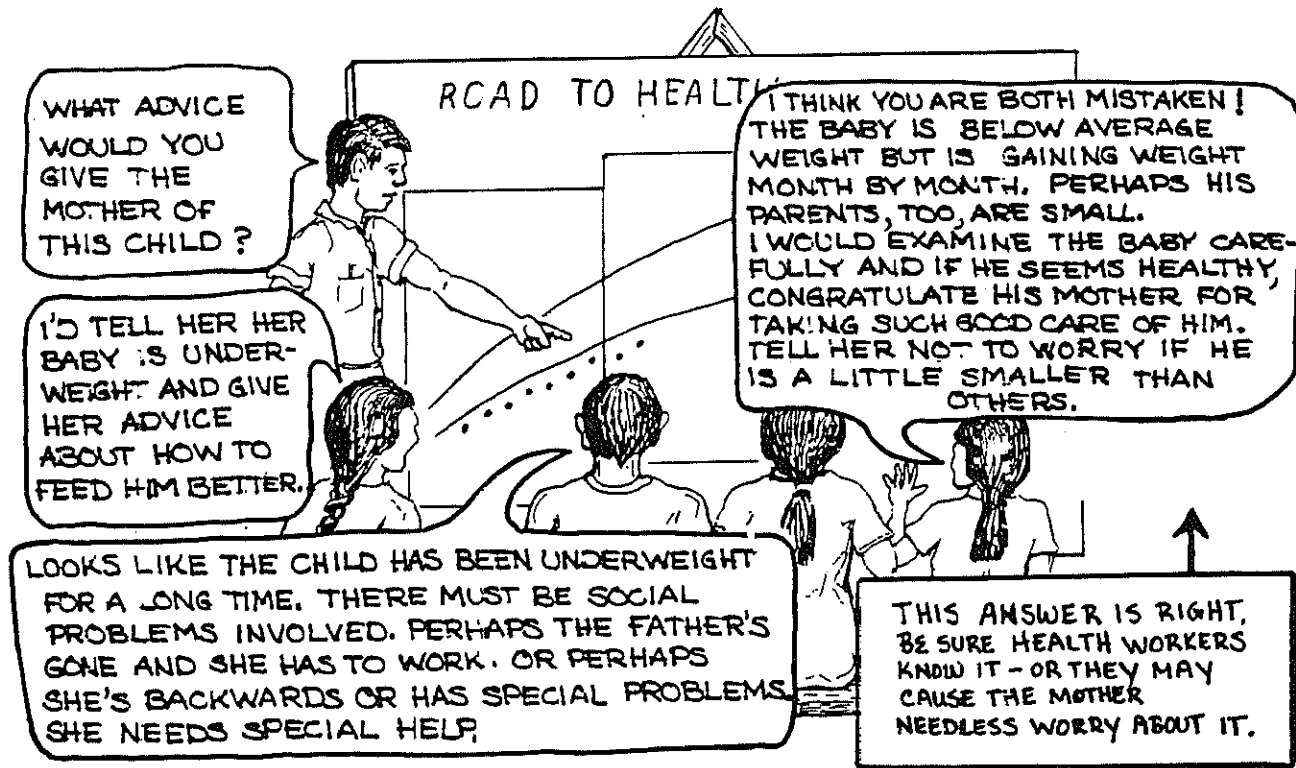


Figure 36: Example of Discussion That Should Take Place During Health Worker Training

Source: Hesperian Foundation



seen. Or the workers can make a column graph as described in Chapter 8. These charts should then be examined for dips at particular ages, general status of the community, and changes over time.

Just as health workers should ask open-ended questions to individual mothers, they should practice the same techniques with a community group for problem diagnosis and resolution based on the interpretation of the community chart.

If health workers have sufficient education, they can be trained to make further analyses of the growth data. For example, they can identify families with more than two children under age five and then compare these children's nutritional status to that of children from families with only one or two children under five. Similar comparisons could be made for such groups as immunized and unimmunized children, and children whose water comes from a well or from a river.

**Make learning a continuous process.** As growth monitoring activities from small or pilot projects are adopted by national programs, community health workers often have growth monitoring activities added to their responsibilities for several other health interventions of equal complexity. Particularly in such cases, it is crucial to provide effective initial training and ongoing supervision of the health workers' understanding and abilities vis-a-vis growth monitoring.

The health workers' learning experience should not end with the completion of an initial two or three-day course. Questions and ideas will almost certainly arise as the worker experiences the challenges of a field situation on a daily basis. The supervisory visit is one opportunity that the program has to assess workers' performance and to clarify goals and techniques. An example of a form used for making these supervisory visits is found on page 49 Chapter 5.

Inservice training can range from scheduled monthly sessions to giving training reminders over the radio on a regular basis. One project in Bolivia (174) experimented with a weekly radio show specifically designed for health workers. During the broadcast, reminders about activities and skills taught in the training session were given and the content of shorter broadcasts designed for rural families were discussed in advance so that workers could respond to requests and questions. These programs also contained announcements about future meetings and areas where the project was being implemented especially well. Including this type of information ensured listenership, and the reminders about skills and activities helped keep quality high.

As the *State of the World's Children 1985* points out: "The training of . . . community health workers is clearly the most important pre-condition for the spread of growth monitoring and growth advice to the majority of mothers and children in the developing world.(152)"

# Problem Identification and Program Evaluation

Initially developed to identify individual children with health or nutrition problems, growth monitoring has become a means of nutritional surveillance capable of identifying some nutrition problems by geographical region, or season and of monitoring program progress in a community or larger population. The growth record for an individual child can be used for other purposes when the data are aggregated and compared over time:

- examination of program coverage and its impact on communities; and
- examination and comparison of neighborhoods, communities, regions, or countries according to the nutrition profiles.

The normal information flow for growth data can be directly to intermediate levels and then on to central levels, or to both levels simultaneously (148). At these levels data from different communities should be compared to identify geographic problems, and each community's information should be compared over time to detect seasonal variations or harmful trends early. If the information system can be designed in a way that is not too time-consuming and the results are clear, then growth monitoring programs have a valuable role to play in health program planning, management, and evaluation. However, operationally the state-of-the-art concerning the best way to aggregate growth data, even locally, is far from perfect.

The key to the usefulness of the individual data for program management is how it is aggregated. If individual growth cards had to be collected at a district

(much less a regional) level, program assessments could only be periodic (24). Therefore, the first step in data aggregation is usually assigned to the community-level health worker—the task of making a community profile using the results obtained at each weighing session or at the end of a specific period of time. If community workers find this task too difficult their supervisors can assist them.

Unfortunately, local workers seldom understand the reason for compiling growth results. Consequently, the blanks are filled on the forms and the forms returned to a distant office and never used again to help the villages in which they originated. A few programs have attempted to change this trend.

## COMPILING INDIVIDUAL RESULTS AT THE COMMUNITY LEVEL

The National Family Nutrition Improvement Program (UPGK) in Indonesia has focused attention on record keeping at the village level rather than on a lengthy reporting system (20). These village records are reviewed during supervisory visits by staff from the health center and then go directly to the central level (160). In this program, health workers are encouraged to keep a roster during the weighing session in addition to maintaining the individual weight cards. An example of the roster is presented in Figure 37. Unlike many, this roster does not record the actual weight of the child each month or the area of the chart in which the child falls, but rather whether the child has gained weight,

Figure 37: Village Weight Roster from Indonesia

Source: *Buku Pedoman Petugas Lapangan UPGK*, Division of Nutrition Ministry of Health Jakarta, Indonesia

1980 No. Child's Name	Date of first weighing	Age at first weighing	Weight first time weighed													Weight of the child at the end of participation in the program (36 months)		
				Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.			
1 Lestari	5/2/79	4 mo.	5kg		B	N	N	T	N	N	N	T	N	T	T			
2 Kliwon	8/3/79	30 mo.	11.2kg			B	N	T	N	N	T							12kg
3 Rawit	7/5/79	5 mo.	5kg					B	T	N	N	N						moved
4 Ribut	7/5/79	16 mo.	9kg					B	T		O	N	T	N	O			
All Children Increasing Weight .....							2	0	2	3	2	2	1	1				
All Children Decreasing Weight .....								2	2	0	1	1	1	1	1			
All Children Attending .....					1	2	2	4	4	3	4	2	2	2	2			
All Children under 3 yrs. in village .....																		

Key: B = New Child N = Increased Weight T = Decreased Weight O = No change

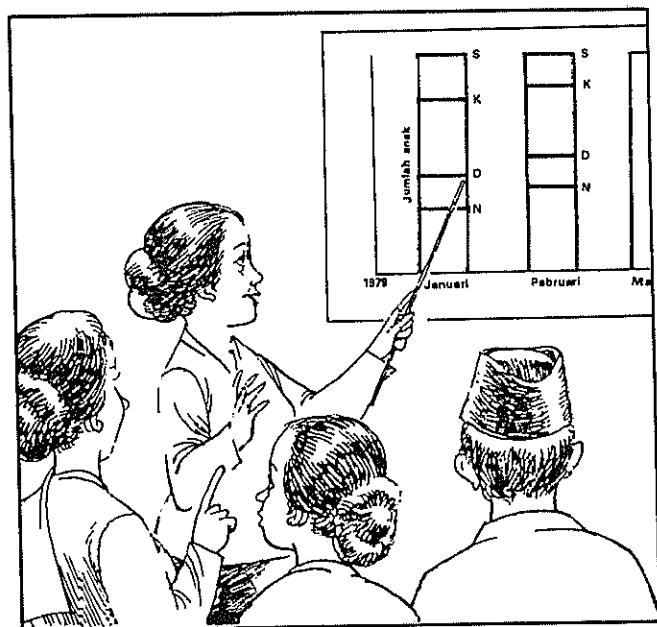


stayed the same, or lost weight. At the bottom of each roster a tally is made of the number of children seen and the number who have gained weight, stayed the same, or lost weight.

The health workers in the UPGK program are also encouraged to compile a community graph (Figure 38) for use by the community in decision making. In this graph a column based on the roster is drawn for each month's weighing session. The top of the column (Line S) represents all of the children under three years of age in the community. The level of Line K represents the number of children who have growth charts because they attended at least one weighing session. Line D is determined by the number of children who attended the session that month, and Line N by the number of children whose weight increased between weighings. This column graph allows each village to measure progress clearly toward the goal of 100 percent participation in the growth monitoring and weight gains each month for all children.

**Figure 38: Community Nutrition Profile Compiled at the Village Level in Indonesia**

Source: *Buku Pedoman Petugas Lapangan UPGK*, Division of Nutrition, Ministry of Health, Jakarta, Indonesia



The trial in Indonesia over several years has indicated shortcomings which policy makers are trying to remedy. The emphasis on weight gain, which works well for evaluating the progress of the individual child, needs to be supported with nutritional status data to be meaningful for administrative levels, which use the data for planning and evaluation. In addition, the bar graphs used in the community are under revision because they are not as clear to community members as they might

be (147). In Indonesia the focus will remain on weight gain with improvements sought in how to use and supplement this information (160).

In Morocco a column graph system similar to the one in Indonesia is used in the health centers to monitor changes in nutritional status. In the health center a roster is maintained marked with P, N, or S, indicating whether the child has above normal (P), normal (N), or subnormal (S) nutritional status. During monthly supervision by an auxiliary nurse, the totals for each nutritional rank are calculated and discussed with health center personnel for their follow-up in the community. This roster proved extremely valuable to a team of evaluators who were assessing the nutritional impact of a nutrition education and food supplementation program (2).

When statistics are based on nutritional status, a column graph similar to the one used in Indonesia can be made to show the growth monitoring results to the community. In each column the top line would represent the total number of children; the K line would show the number of children measured; a line beneath K would represent the number of children who were of normal weight. Each month the number of normal weight children can be compared.

Using either of these two "column" systems, percentages of children in attendance or of those well nourished can be calculated. If percentage calculations are too complicated for the village workers, they can be done by supervisors. Data stated as percentages are often more meaningful than absolute numbers (11), especially for growth monitoring programs in which the number of children weighed does not remain constant from month to month.

Another useful way to compile growth statistics at the community level is to plot all children's weights on one large chart every few months so community members can easily visualize progress (154). If the health worker has also made a map of the community, different colored markers can be placed on the houses according to whether the child has gained weight or according to his/her nutritional status (see discussion of the Philippine system p. ). This activity makes it easier to spot areas of the village needing special attention. Both the community chart and the map are good tools to use to motivate community activity to improve health and increase self-reliance.

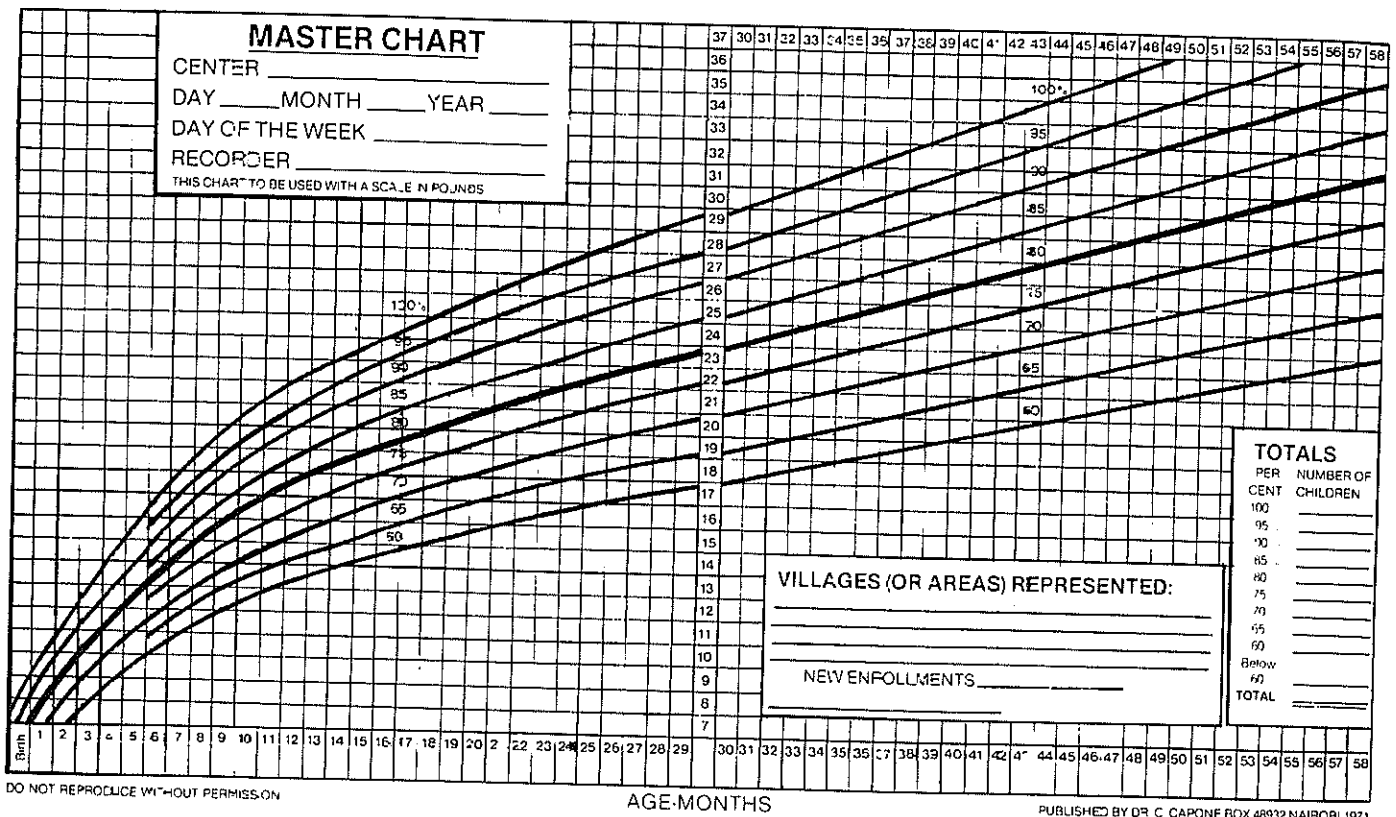
### AGGREGATING STATISTICS AT A REGIONAL AND NATIONAL LEVEL

Various programs have developed effective mechanisms for moving useful statistics from the village level to the regional and national level. One such program is Operation Timbang in the Philippines. This mass weighing program has an effective information exchange



**Figure 39: Master Chart for Growth Surveillance System—CRS/Africa**

Source: Catholic Relief Services Africa Regional Office, Nairobi, Kenya



and response system between the municipal level (the Rural Health Unit-RHU) and the village (42), despite its lengthy data aggregation system from the village to the national level. This interchange allows for immediate follow-up care to children with problems as well as for an evaluation of changes taking place within the village. After each weighing session, all growth data and village maps are submitted to the RHU, where statistics are compiled for each of the different Gomez classifications. Each child's house is marked on the village map with a colored sticker indicating the child's nutritional status. Children with poor nutritional status are visited immediately by a worker from the RHU and brought to the attention of the village nutrition committee. The RHU can also assess which villages in their area have the worst health or nutrition profile. Any village with 30 percent or more of its children in second or third degree malnutrition is eligible for outside help. The process of identifying high priority areas for nutrition interventions continues to the national level.

The system designed and used by Catholic Relief Services (CRS) in Africa puts data in a form that is useful both to the community and to program planners and supervisors (74, 127). As children are weighed throughout the month, their weight is first plotted on the Master Chart (Figure 39). The result (the percent

area in which the child falls) is then transferred to an individual chart that the mother keeps. At the end of the weighing period (usually one month) each child is represented on the Master Chart, making a composite growth chart for the community. A comparison of monthly Master Charts yields both cross-sectional and longitudinal pictures of the community.

The Master Chart is kept in the clinic until the food distribution has been finished and the children weighed. The health worker then completes the summary box in the lower right corner and sends the chart to the CRS office. There the following is quickly determined (24):

- number of children attending the weighing session;
- age composition of those attending;
- gross errors by the health worker in weighing or recording;
- comparisons of one community with another at a given time; and
- comparisons within the community over time (regularity of attendance, long-term upward or downward trends in nutritional status).

A summary report is returned to the clinic with the following:

- the total number of children attending for the month;
- the number and percentage of undernourished children;
- the number of percentage of children in each percentage of the median range using the Boston reference population (100-91, 90-86, 85-81, 80-76, 75-71, 70-65, and 65 and below);
- change occurring over time in the community;
- other highlights.

This system deserves further consideration because of its relative simplicity and graphic presentation of the results of a month's weighing, which allows for easy interpretation in the clinic and more sophisticated interpretation at other levels. Currently the system is not being used to its full potential in the clinic and community. The individual record goes home with the mother, the only copy of the Master Chart is sent to the CRS office, and the returned summary is unlikely to be shared with program participants. Enlarging the Master Chart and keeping a copy in the community would show participants their community profile, or a column graph could be drawn each month when the summary report is returned from the regional office. Enlarging the Master Chart might also alleviate the high error rate noted in Botswana when the child's weight/age was plotted for a second time on the Master Chart (189).

With increasing frequency, the growth monitoring systems of nutrition programs are being linked with national nutrition surveillance schemes as one source of anthropometric data (199, 173). Two country examples are Botswana and Zambia. In Zambia (144) a tabulation form has been made to record results as the



Community growth chart used in the Dominican Republic. P. Koniz-Booher

child is being weighed (see Figure 40). The form includes four types of information: program enrollment (new or returning), age, growth status (gaining, static, or losing), and nutritional status. These tally sheets are used to make weekly and/or monthly summaries (see Figure 41) which are kept in the clinic and community and sent to the regional and national offices for further compilation. The experience so far in the use of growth data for decision making depends on the ability of program managers to incorporate this variable in national health reporting systems. Where it remains an additional activity reports become sporadic and eventually are not sent.

Although the principal purpose of growth monitoring will remain the detection of growth faltering in individual children early enough to take actions to prevent serious illness, there is value in investing the time to establish and manage a system which will use this information for decision making at a community, regional, and possibly national level.

**Figure 40: Tally Sheet from Zambian Growth Monitoring Program** Source: C. Chikamba, National Food and Nutrition Commission

Health Centre: .....		CHILDREN'S CLINIC RECORD				
Date: .....		TALLY FORM				
		0-12 months				
New Attendances	<del>0000</del>	0000	0000	0000	0000	0000
	<del>0000</del>	0000	0000	0000	0000	0000
	<del>0000</del>	0000	0000	0000	0000	0000
	<del>0000</del>	0000	0000	0000	0000	0000
	<del>0000</del>	0000	0000	0000	0000	0000
Re Attendances	<del>0000</del>	0000	0000	0000	0000	0000
	<del>0000</del>	0000	0000	0000	0000	0000
	<del>0000</del>	0000	0000	0000	0000	0000
	<del>0000</del>	0000	0000	0000	0000	0000
	<del>0000</del>	0000	0000	0000	0000	0000
Growing	<del>0000</del>	0000	0000	0000	0000	0000
	<del>0000</del>	0000	0000	0000	0000	0000
	<del>0000</del>	0000	0000	0000	0000	0000
	<del>0000</del>	0000	0000	0000	0000	0000
	<del>0000</del>	0000	0000	0000	0000	0000
Static	<del>0000</del>	0000	0000	0000	0000	0000
	<del>0000</del>	0000	0000	0000	0000	0000
	<del>0000</del>	0000	0000	0000	0000	0000
	<del>0000</del>	0000	0000	0000	0000	0000
	<del>0000</del>	0000	0000	0000	0000	0000
Losing weight	<del>0000</del>	0000	0000	0000	0000	0000
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# Appendix A

## Growth Monitoring Tools

### I. Arm Circumference Tapes

A. Instructions for making and using tricolored and insertion arm circumference tapes are available, with samples, from: Teaching Aids At Low Cost

P.O. Box 49  
St. Albans  
Herts AL1 4AX United Kingdom  
Price: samples free

and:

Voluntary Health Association of India  
C-14 C. Centre S.D.A  
New Delhi 110016 India

Price: U.S. \$20. insertion tapes, and U.S. \$10. tricolored tapes, plus postage. Money must accompany order.

### B. Commercially Manufactured

The following tapes can be ordered in bulk:

#### Cimder Strips (38)

Description:

- two tricolored strips
- age specific 0-3 mo.; 4-7 mo.; 8-11 mo.; 12-23 mo.; 24-47 mo.; 48-59 mo. and 60-

Price: U.S. \$20

Write to:

CIMDER  
attn: Dr. Jorge Saravia  
Apartado 3708  
Cali, Colombia

#### Sinaps Strip

Description:

- one insertion tape with dual colored bands
- bands are for specific age groups (0-30 days; 1-5 mo.; 6-30 mo.; 31-60 mo.)
- made of durable sun and rain resistant material
- tested in Mexico, Guatemala, and Brazil

Price: approximately U.S. \$50. Price decreases for bulk orders.

Write to:

Aaron Lechtig  
UNICEF/Brasilia  
Setor Bancario Sul  
Edificio Seguradoras 13 andar  
70072 Brasilia DF, Brazil

#### Echeverri Tape And Chart

Description:

- a plasticized paper arm strip marked in centimeters
- a growth chart with dimly shaded undernourished zone and a normal zone
- chart can be used through child's sixth year

Price: £ 2.00

Write to:

TALC  
P.O. Box 49  
St. Albans, Herts AL1 4AX United Kingdom

### II. Scales

#### A. Locally Manufactured (9)

The designs and procedures for making scales are available from:

Teaching Aids at Low Cost  
P.O. Box 49  
St. Albans  
Herts. AL1 4AX United Kingdom

Hesperian Foundation  
P.O. Box 1692  
Palo Alto, California 94302, U.S.A.

#### B. Commercially Manufactured

##### 1. Scales for Clinics

Description:

A wide variety of clinic scales are manufactured, each slightly different. Therefore, it is suggested that one write directly to the distributor for details.

Price:

The table top model for weighing small children usually costs between U.S. \$150-300. The pillar models on which older children can stand cost a minimum of U.S. \$300.00

CMS Weighing Equipment, Ltd.  
18 Camden High Street  
London, NW1 0JH, United Kingdom

or:

Salter Industrial Measurement, Ltd. (table top, pan model only)  
George Street  
West Bromwich, E70 6AD, United Kingdom

##### 2. Single Beam or Bar Scales

#### The Philippine Bar Scale (41)

Description:

- This is a hanging bar available in 10, 25, and 50 kg. capacity.
- It is manufactured in the Philippines and is a type of scale with which these health workers are already familiar.
- The scale is made of iron, but is zinc plated, and is heavier than many (scale alone weighs slightly more than 3 kgs.).
- Counter weights are lead, covered with colored rubber.
- The bar has machine etched .00 gm gradations.
- The scale can be tared.\*

Price:

U.S. \$14.50 (10 kg.); U.S. \$18.20 (25 kg.); U.S. \$22.50 (50 kg.)

\*Tare: the deduction of weight made in allowance for a weight hung on the scale. For example, if a basket is used to hold the child, the basket can be placed on the scale and the scale tared to read "0".

Write to:

Dr. Florentino Solon  
Executive Director  
Nutrition Center of the Philippines  
MCC P.O. Box 653  
Makati, Metro Manila, Philippines

#### **Kumudini Bar Scale (67)**

Adaptation of the 25 kg. Philippine scale to a Bangladesh project.

Description:

- The same as the Philippine scale except that units of measure are local—seer and chatak.
- Calibrations cut into iron rod and painted.
- Harness for children available.
- Scale can be tared.

Price:

U.S. \$20–\$25

Write to:

Mrs. Pati  
Kumudini Welfare Trust of Bengal  
P.O. Box 62  
Narayargarj, Bangladesh

#### **Chinese Wood Scale (34)**

Description:

- The capacity of this scale is 30 kgs. in 100 gm. gradations.
- It is manufactured in Thailand from wood and is lighter than many (scale weighs 2 kgs.).
- Since numbers are etched on wood, they may be difficult to read over time.

Price:

U.S. \$25 (comes with two harnesses for suspending the child).

Write to:

Nutrition Division  
Department of Health  
Samsen Road  
Bangkok, 10200 Thailand

#### **Tansi Bar Scale (49, 75)**

Description:

- Lightweight metal scale (scale, basket, and weights weigh 2.4 kg.).
- The bar is short; thus, it is not a direct reading scale. The bar only has a capacity to weigh 10 kg. If the child weighs more than 10 kg., a 10 kg. weight must be added on the bar. The health worker, then, must remember to add 10 to the number indicated on the bar.
- The bar is not notched at each kilogram or gram marking. Therefore the sliding metal piece indicating the weight when the scale is balanced can not be firmly fixed and the worker must hold it in place while reading the weight.
- The scale is made in India and Korea.
- It can be tared.
- Enumeration is clear.
- Capacity is 20 kg. (This may not be sufficient if 6 and 7-year olds are in the program).

Price:

200 Indian Rupees. Allow three months from date of order for delivery. Scale made in Korea is less expensive.

Write to:

P. Sivaraj  
General Superintendent  
Tansi Tool Room  
Tamil Nadu Small Industries Cooperative, Ltd.  
Industrial Estate, Guindy  
Madras 600-032, Tamil Nadu, India

or:

UNICEF/India for information on the Korean-made scale.

### 3. Dial Spring Scales

#### **ITAC Model 800 (78, 116)**

Description:

- Lightweight (1 kg.) in durable metal case with unbreakable plastic face.
- Case painted with enamel, which may chip and expose metal.
- Easy to read; large numbers mark five kilogram increments and small numbers mark every kilogram with lines at every 100 grams (not available in pounds).
- Capacity 25 kgs. in one rotation.
- Scale can be tared although taring screw in tongue of scale is not as easy to adjust as that of the Salter Scale.
- Accuracy is 1/2 of 1% of full capacity.

Price:

U.S. \$60. Price includes two waterproof weighing pans and carrying bar, FOB\*, sturdy export packing extra at cost. A discount is available for large orders.

Write To:

ITAC Corporation  
P.O. Box 1742  
Silver Spring, Maryland 20902, U.S.A.  
(Note: This company also makes a scale for weighing newborns with an 11 kg. capacity.)

#### **CMS Model MP25**

Description:

- Lightweight in unbreakable plastic case, with ventilated plastic dial cover.
- Easy to read, although ITAC scale is clearer.
- Capacity 25 kgs. in one rotation with 100 gm. divisions, or available in pounds—capacity 56 lbs. in 1/4 lb. divisions. (Not recommended to get both kgs. and lbs. on the same scale face.)
- Scale can be tared.
- Has proven to be extremely durable under rough treatment.

Price:

£24.00 FOB. Orders can be filled immediately from London stock. The cost is for weighing pack that includes the scale, a shoulder bag, and 3 baby-weighing trousers. A discount is available for large orders. A hang bar for older children and a folding door bracket are available separately.

#### **CMS Model DM 20**

Description:

- This is the same scale as CMS MODEL MP25 but with a dial on each side of the scale.
- The dial on one side will register 20 kgs. in one rotation with 100 g. divisions, while on the reverse side of the scale another dial has drawings of stages of a child's development and basic feeding routine. The drawings are to aid mothers but may be misleading for malnourished children.

Price: Same as above.

Write to:

CMS Weighing Equipment, Ltd.  
18 Camden High Street  
London, NW1 0JH, United Kingdom

#### **Salter Model 235 (78)**

Description:

- Lightweight in durable non-rust aluminum case with an unbreakable plastic face.
- Easy to read although ITAC scale is clearer.
- Capacity 25 kgs. in one rotation with 500 gm. or 100 gm. divisions.
- Scale can be tared without difficulty.
- Scale has been well tested and modified to improve performance.

\*FOB = Freight on board

Price:

£18.50, FOB for scale only, or £27.50, FOB with five pair of weighing trousers. Allow 12 weeks for delivery. A discount is available for large orders.

Write to:

Salter Industrial Measurement, Ltd.  
George Street  
West Bromwich B70 6AD, United Kingdom

#### Marsden Model 165

Description:

- Lightweight, stainless body with vented plastic dial cover.
- Single or dual faced.
- Capacity 25 kg. in single rotation with 100 g. divisions or 56 lb. with 4 oz. divisions. (It is not recommended to purchase a dial with both kilogram and pound divisions.)
- Scale can be tared.
- Two year guarantee

Price:

£25.75, FOB. Weighing trousers cost an additional £3.00 each.

Write to:

Marsden Weighing Machine Group, Ltd.  
388 Harrow Road  
London, W9 2HU, United Kingdom

#### 4. Tubular Spring Scales

##### Chatillon IN-50

Description:

- Small, extremely lightweight, made of non-corrosive brass.
- Capacity in 25 kgs. or 50 lbs.
- Difficult to read; the marker is hard to distinguish and the scale is marked in both kilograms (250 gm. intervals) and pounds (8 ounce intervals).
- Scale can be tared.

Price:

U.S. \$37, FOB. Discounts of 25-30 percent are available for large orders.

Write to:

John Chatillon and Sons  
83-30 Kew Gardens Road  
Kew Gardens, New York 11415, U.S.A.

##### Super Samson

Description:

- Extremely lightweight—made of durable plastic.
- Overload protection.
- Difficult to read because of small space between numbers.
- Capacity 20 kgs. with 200 g. divisions, or 44 lb. with 8 oz. divisions.
- Scale can be tared.

Note: This scale is best for weighing newborns or children under 2, not for weighing children under 5 years of age.

Price:

£5.95 for 20 kg. scale alone. If ordered in a package with a nylon sling, tape measure, and carrying case, the total price is £9.75, FOB. Less expensive scales with a capacity of 10 kg. are also available.

Write to:

Salter Industrial Measurement, Ltd.  
George Street  
West Bromwich, B70 6AD, United Kingdom

##### CMS Plastic tubular weigher

Description:

- Similar to the Salter Super Samson.
- Capacity 10, 15 or 20 kg.

Price:

£5.00, FOB.

Write to:

CMS Weighing Equipment, Ltd.  
18 Camden High Street  
London, NW1 0JH, United Kingdom

##### ITAC Model 100

Description:

- Lightweight (40 ), easily grasped
- Polystyrene with metal parts, nylon pinon and rustproof pointer
- Capacity 11 kg in 200 gm divisions.
- Coded in red between 0 and 2500 gms.

Price: U.S. \$12.50. Substantial reductions for large orders.

Write to:

ITAC Corporation  
P.O. Box 1742  
Silver Spring, Maryland 20902, U.S.A.

#### 5. Digital Scales

##### Pathweight Electronic

Description:

- Small (fits into a pocket)
- Light
- Digital reading
- Runs on a 9 volt transistor battery with other options available
- Electronically dampened to improve readability
- 20 kg. capacity
- Scale can be tared

Note: This scale is still being developed. Field trials will begin in early 1985.

Price: Expected to be inexpensive

Write to:

PATH  
Canal Place  
130 Nickerson Street  
Seattle, Washington 98109, U.S.A.

### III. Length/Height Boards

Many models exist. Those mentioned below are available commercially.

A. Instructions for making a measuring board are available from:

AHRTAG (board only for measuring length, not standing height)  
85 Marylebone High Street  
London W1M 3DE United Kingdom

Price: free

and:

Short Measuring Board Construction Kit

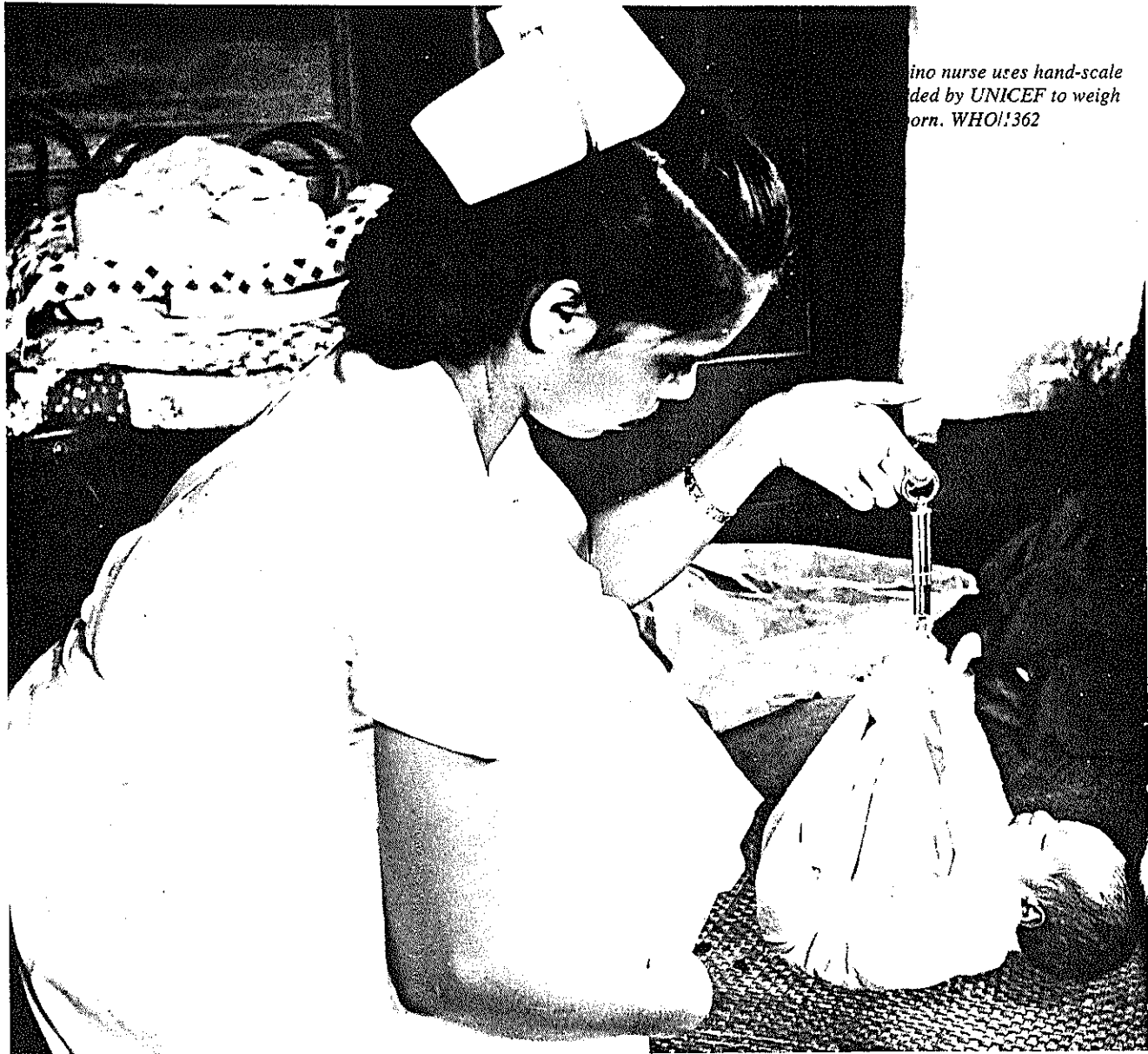
Description:

- board is suitable for length and height
- kit includes everything but the wood: hardware, shoulder strap, measuring tape, glue and instructions on how to construct the board and how to weigh and measure

Price: U.S. \$25. The construction booklet can be purchased separately for U.S. \$3. The manual "How to Weigh and Measure Children" is also available separately for U.S. \$3.

Write to:

International Science and  
Technology Institute  
2033 M St. N.W.  
Suite 300  
Washington, DC 20036, U.S.A.



ino nurse uses hand-scale  
ded by UNICEF to weigh  
orn. WHO/1362

**B. Commercially Manufactured Length/Height Boards or Measurers.**

**Shorr Portable Measuring Board**

**Description:**

- durable portable board (comes with carrying straps) for measuring height and length
- 130cm x 35cm x 2.8cm
- weighs .3 lbs.
- water resistant

Price: U.S. \$175 (includes illustrated manual "How to Weigh and Measure Children")

**Write to:**

International Science and  
Technology Institute  
2033 M St. N. W.  
Suite 300  
Washington, DC 20036. U.S.A.

**Microtoise Height Measure**

**Description:**

- light and portable
- measures 0-2 meters in 1mm gradations
- can be suspended from a wall or door frame or run along a table

Price: £7

**Write to:**

CMS Weighing Equipment, Ltd.  
Camden High Street  
London NW1 0JH, UK

**IV. Weight-for-Height Wall Chart—"Thinness Measure" (120)**

As described in Chapter V.

Price: £ 1.30 in black and white, teaching aids £ 5.00.

**Write to:**

Teaching Aids At Low Cost  
P.O. Box 49  
St. Albans  
Herts, AL1 4AX United Kingdom

# APPENDIX B

## Protocol for Weighing and Measuring

To facilitate accurate measurement and to minimize confusion at monitoring sessions, a protocol (step-by-step guide) for weighing and measuring should be prepared and adhered to during the training of health workers. The protocol should be discussed and practiced to ensure that each technique as well as the rationale for the process are clear.

In compiling the protocols for each anthropometric measure the following sources were used:

- 1) *Weighing and Measuring Children: A Training Manual for Supervisory Personnel* (26);
- 2) "Anthropometric Field Methods: General," in *Nutrition and Growth* (137);
- 3) *The Assessment of the Nutritional Status of the Community* (61).

### Weighing

#### 1. Check the equipment:

- Is the scale in working order? Before each weighing session, standardize the scale. To do this, weigh an object of a known weight. The scale should register the correct amount each time.
- Is the apparatus to suspend or hold the child in poor condition (pants ripped, chair broken)?
- Is there an adequate structure for suspending the scale (good rope, a hook, beam, or tree limb)?

2. Position the scale at eye level so that the numbers can be easily read. Be sure that the child cannot hold onto the wall while on the scale and that even the largest child, if suspended, cannot touch the ground.

3. *Tare* the scale (bring the needle to zero or balance the scale). Most scales have an adjustable screw or small weight for this purpose. It is best to place the pan, pants, basket, or whatever will hold the child on the scale and then tare the scale so the health worker will not need to subtract this weight from the weight of each child.

4. Ask the mother to remove all heavy objects (amulets, shoes, thick jackets) from the child. If it is impossible to remove the objects or clothing for cultural reasons or because the environment is too cold, weigh an equivalent amount of clothing and subtract its weight from the child's weight. If this procedure is impractical, note on the card that the weight of the child includes a heavy jacket, etc.

5. Ask the mother to stay with her child. Help her place the child on the scale. Wait until the scale is steady or the needle has stopped swinging to read the weight. If the needle is fluctuating slightly, estimate the midpoint of the swing, and use this number as the weight.

To balance a beam scale, move the weight away from the zero position until the indicator shows that too much weight has been added. Then bring the weight back toward zero until the indicator shows that *slightly* too much weight has been removed. Make the fine adjustment by either moving the light weight or gently tapping the larger weight until the scale is balanced.

6. Read the scale. If the child is weighed frequently (more than once per month) and/or the recording chart has sufficient spaces, read the weight to the nearest 100 gm. or quarter pound. If the child is weighed once a month or less frequently, read the weight to the nearest 250 gm. or half pound.

### Length/Height

ALWAYS HAVE TWO PEOPLE AVAILABLE TO MEASURE (one can be the mother). Measure the recumbent (lying down) *length* of all children less than two years of age.

1. Check the measuring board to be sure it is in working order. The numbers should be easy to read and the moveable block sturdy, forming a right angle with the backboard.
2. Put the board on a flat, firm surface. It is easiest to take the measurement if the board is placed on a table top.
3. Ask the mother to help measure the child. Ask her to remove any shoes or hat from the child.
4. Ask the mother to position the child on the board. The child should be lying back down, in the center of the board with shoulders and buttocks flat and the crown of the head against the fixed end of the board.
5. Ask the mother to help hold the child. She can stand or kneel at the head or to one side of the board, keeping the child centered and the head in position.
6. Check to be sure the child is completely extended. Place the left elbow and arm on top of the child's knees and grasp the child's ankles, holding the feet perpendicular to the headboard.
7. Use the right hand to slide the moveable block to meet the child's heels. Press down on the child's knees and press the block against the feet.
8. Read the measure to the nearest  $\frac{1}{2}$  cm. or  $\frac{1}{8}$  inch.

### Measure the *height* (standing) of all children two years and older.

1. Check the measuring board to be sure it is in working order. The numbers should be easy to read and the moveable headboard sturdy, forming a right angle with the backboard.
2. Place the bottom of the board on a flat, hard surface and the back of the board against an upright structure (door frame or wall). The measuring board stands vertically.
3. Ask the mother to help measure the child. Ask her to remove any shoes and headgear.
4. Ask the mother to help the child stand correctly at the board. The child should stand
  - in the center of the board with feet flat and slightly apart.
  - with knees fully extended and arms at the side.
  - with the back of the heels, calves, buttocks and shoulders touching the back of the board (or the wall if no board is used).

• with eyes looking straight ahead.

5. Ask the mother to hold the child in position while the moveable headboard is brought down to rest firmly on the crown of the child's head (be sure it touches the top of the head and not just the hair).

6. Read the measurement to the nearest  $\frac{1}{2}$  cm. or  $\frac{1}{8}$  inch.

#### Mid-Upper Arm Circumference

1. Ask the mother to help measure the child's arm. Ask her to sit comfortably and either hold the child in her lap or have her child stand by her.

2. Sit or kneel at the left side of the child.

3. Ask the mother to bare the child's left arm and shoulder. This may require removing the child's shirt.

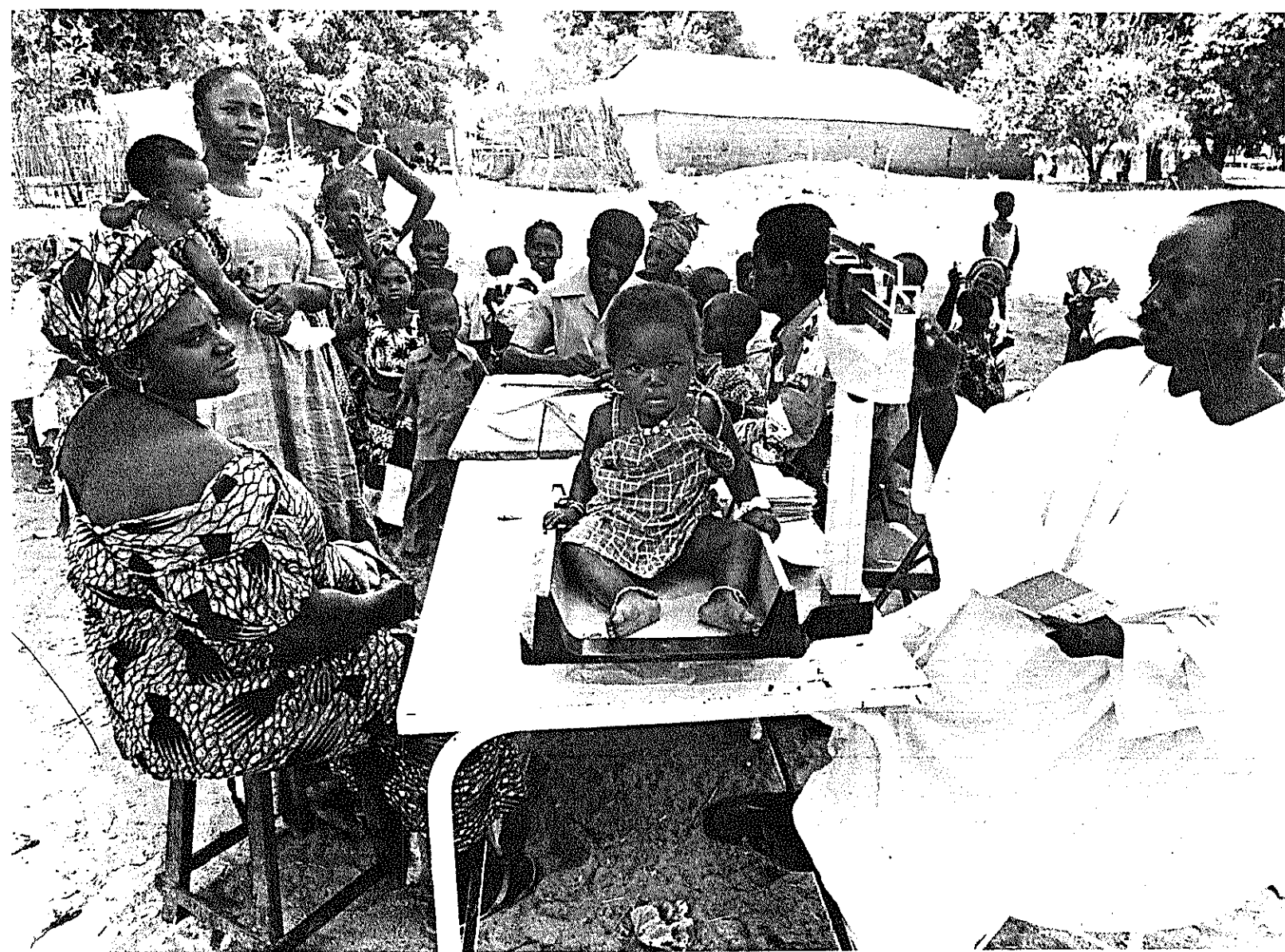
4. Find the mid-point of the child's arm. Place the end of the tape at the top of the shoulder (where the arm appears to connect with the shoulder) and measure to the elbow

tip. Take half of this distance by folding the measuring tape in half, bringing the point on the tape at the tip of the elbow even with the tape end on the shoulder. Where the tape folds in half make a small mark with a pen on the child's arm.

5. Straighten the child's arm so that it is relaxed and hanging loosely. (For children under 6 months, ask the mother to hold the child's arm still and away from the body.)

6. Loop the tape around the child's left arm at the mid-point mark. Level the tape and pull it until it gently touches the skin all the way around the arm. NOTE: The tape should not be pulled so tight that any of the soft tissue is compressed, a common error in measuring arm circumference.

7. Read the tape, noting the color or the number to the nearest  $\frac{1}{2}$  cm. or  $\frac{1}{8}$  inch.



# APPENDIX C

## Educational Materials for Growth Monitoring

The materials included in Appendix C are examples of support materials for training workers in growth monitoring, or educational materials for the community. They are drawn from the publication *Guide to Mass Media and Support Materials* written by Griffiths et al., 1985. The guide was first published by the International Nutrition Communication Service (INCS) and funded by the Agency for International Development, Office of Nutrition. The complete guide may be obtained from INCS, Educational Development Center, Inc., 55 Chapel St., Newton, MA 02160. Price: U.S.\$:0 (All orders must be prepaid. Distributed free of charge when requested by a developing country.)

### INDONESIA/UPGK Family Nutrition Improvement Program

#### 1. Keluarga Sehat

(*Healthy Family*)

DESCRIPTION: flip chart, 10 × 14", sturdy paper, color, spiral bound, 28p.

REVIEW: This flip chart begins with the question to families, "Do you want to know if your child is healthy?" The message is that healthy children gain weight as they get older. Parents are encouraged to weigh their children monthly and to keep the weight chart. After a discussion of general nutrition information, the flip chart presents advice to parents based on the outcome of the weighing and the age of the child. This format is good, providing the community workers with sound recommendations and the family with concrete activities to initiate. Examples of the recommendations: A baby 0-3 months old whose weight does not increase during one month should be breastfed 3 to 5 times more often every day; a child 4-6 months old whose weight does not increase for 2 successive months should be given one medium size dish of soft food 5 times a day, and breast milk should be continued.

#### 2. Menuju Keluarga Bahagia Sejahtera

(*Towards a Happy and Prosperous Family*)

DESCRIPTION: flip chart, 18 × 24", color, spiral-bound, 13p.

REVIEW: This flip chart for religious leaders to use with the community stresses weighing a child each month as the duty of every parent, as well as the special care for children not growing well. The community in general is also reminded that to glorify God children must be healthy and therefore the community must provide for nutrition activities such as weighing.

#### 3. Membina Keluarga Bahagia dan Sejahtera

(*Building a Happy and Prosperous Family*)

DESCRIPTION: wall poster, 24 × 36", color

REVIEW: This comic strip tells the story of the family of Abdul Samad and the marriage and subsequent child of his daughter Fatimah. Part of the comic strip shows Fatimah taking her child to be weighed. The child increases in weight and grows "in keeping with the Plan of God."

### INDONESIA/Nutrition Education Improvement Project

#### 4. Penimbangan

(*Weighing*)

DESCRIPTION: wall poster, 15 × 27", color

REVIEW: This poster was designed to encourage community self reliance in health activities. The color photograph shows village volunteers and mothers at a weighing session. The poster says: "Weighing all children under 5 years can be done by the community itself."

#### 5. Timbanglah Anak Anda Setiap Bulan

(*Weigh Your Child Every Month*)

DESCRIPTION: poster, 20 × 15", color

REVIEW: This poster for the home is given to parents the first time they bring their children to be weighed. It says "Weigh Your Child Every Month—A Healthy Child Gains Weight as S/he Gets Older." Under the drawing of the child being weighed are 60 boxes, representing each month between birth and 5 years. The parent is told that each month when the child is weighed a box should be marked on the poster. The intention is that, even if boxes are not marked, the poster will serve as a reminder of the importance of monthly weighing.

### INDONESIA/Yayasan Indonesia Sejahtera Children's Materials

#### 6. Weighing Puzzle

DESCRIPTION: game, 8 × 10" cardboard jigsaw puzzle, color

REVIEW: A colored picture of a child being weighed has been made into a jigsaw puzzle as a way of familiarizing children with weighing and of reminding parents of the community weighing activity.

#### 7. Anak Sehat—Naik Berat Badan

(*A Healthy Child—Increasing Weight*)

DESCRIPTION: 28 cards, 3 × 4", color

REVIEW: One of the sets of cards in this game for school children is about child weighing—the messages are "Weigh your brother or sister every month" and "If the weight goes down s/he needs more to eat; the regular progress is for the weight to increase every month."

#### 8. Dominos for Health

DESCRIPTION: 28 dominos, color drawings, 2 × 3.5"

REVIEW: One of the messages in this domino game for school children is that their younger brothers and sisters should be weighed every month until they are 5 years old.

#### 9. Keluarga Sehat

(*Healthy Family*)

DESCRIPTION: game (Snakes and Ladders), heavy cardboard board with 4 markers and dice

REVIEW: Rewards are given in this game for weighing children, bringing the players (school children) closer to the goal of a healthy family.

### INDIA/Tamil Nadu Integrated Nutrition Project

#### 10. Arm circumference strip and folder

COUNTRY: India

LANGUAGE: Hindi and English

**DESCRIPTION:** cardboard folder with instructions and a tricolored arm circumference tape

**REVIEW:** This strip, designed by Doctors Morley and Shakir, is to be used by community volunteers on a monthly basis to determine if children between one and 5 years are healthy. The link between the assessment and education is clear and well done. The strip has green (healthy), yellow (caution), and red (danger) zones. The major message for the community health worker to convey to the mother is: "with more food the child grows healthier; with more food his arm grows thicker." Simple messages for mothers, corresponding to the outcome of the arm assessment, are listed on the inside of the folder. For example, if the child is in the red area: 1) the child needs more of the foods s/he usually eats; 2) feed 5 or 6 times a day; 3) if the child has not begun to eat soft food, begin now; and 4) feed more food than before. The back of the card specifies proper feeding for a one-year-old including that the daily quantity should be half that which the mother eats.

**CONTACT:** VHA1

#### 11. At the Beginning . . .

##### **Your Child, Is S/He Underweight?**

**DESCRIPTION:** posters, 20 × 29", color

**REVIEW:** These 2 posters promote one of the core activities of this nutrition project—growth monitoring. The posters stress the importance of continuous weight gain and the relation of weight to health. The respective texts of the posters read: (1) "At the beginning . . . the baby's smile, understanding and knowledge indicate growth, but you also need to know the weight of your baby," and (2) "Your child . . . Is S/He Underweight? For proper growth, weight gain must be continuous."

#### 12. PAKISTAN/UNICEF-Pakistan

**DESCRIPTION:** wall poster, 17 × 23", color, with 32-page training manual for workers

**REVIEW:** The purpose of this poster is to create community awareness about growth monitoring. The healthy child suspended from a scale in weighing pants is the symbol for this program and serves as a reminder to families. It is assumed that this image was pretested with the community and was correctly understood. The drawing of the child is removed from the context in which weighing normally occurs: a crowded room with a health worker nearby and a floor somewhere under the child.

#### 13. ZAIRE/Bureau d'Etudes

**DESCRIPTION:** The "Nutrition" series is available as 56 hand-colored 8.5 × 11" pictures; a full or partial series of posters, 13 × 25", wood-mounted and plastic-covered; slides; or in a wooden carrying case of posters, flannelgraph, and a nutrition manual.

**REVIEW:** The "Nutrition" series illustrates a comprehensive set of concepts in family and child nutrition. The first section deals with infant feeding; the second, with *weaning foods* (see p.65) and *young child feeding* (see p.65); and the third, with *family feeding* (see p.14). Throughout, the theme of 3 *food groups* is repeated, with small illustrations of the groups on each page. The 3 food groups, as shown in example 4, are foods for construction (protein food), fuel (staples, sugar, and fats), and protection (fruits and vegetables). Meal planning is discussed in terms of including the 3 food groups in proportions appropriate to individual needs for growth, energy, etc. In the initial section on infant feeding, illustrations of appropriate supplementary foods are shown alternately with illustrations of the mother continuing to *breast feed* the infant, up to 18 months (see p.52). The final section on family feeding also discusses *growth monitoring* (see p.73)

and special nutritional needs of children and pregnant and breast feeding *women* (see p.28). The Bureau also produces health booklets on several topics, including malnutrition and general nutrition education with an emphasis on protein foods, to be used in conjunction with this item. Some materials may also be ordered in Spanish and Portuguese.

#### 14. GUATEMALA/Materiales Maria Maya

**DESCRIPTION:** 6 guidebooks with large, detached black and white illustrations, a pamphlet on group work, and an instruction book

**REVIEW:** These materials on *weaning* (see p.62), *growth monitoring* (see p.75) and *diarrhea and oral rehydration* (see p.98) were designed to help community health promoters address the principal health problems among Mayan Indians in Guatemala and to help them conduct community campaigns to remedy the problems. Before subjects were chosen, promoters and women in communities were surveyed, and local statistics on morbidity and mortality were studied. The work on each subject began with an extensive literature review. All of the guidebooks are divided in 2 parts: Part I has studies for the promoter and helps the promoter review his or her own knowledge of a topic as well as giving detailed information, which is certain to be new. Most of the guidebooks conclude Part I with a section called "What Mothers Say." In this section several typical answers from mothers to questions about a health practice or problem are listed and their merits or errors discussed. Part II contains suggestions for activities—demonstrations, discussions, and instructions for using the large illustrations. The project emphasized not only what to communicate but also how to do so. The materials were continuously tested with Mayan mothers to ensure the relevance of the contents, cultural agreement, and the mothers' understanding of remedies proposed for health problems. Care was taken to ensure that the materials presented factual information adapted as much as possible to the Mayan belief system. Promoters were encouraged to conduct meetings in the language of the community, and because the promoters had an average of a third grade education, the materials have large type and simple words. Feedback from promoters, which was solicited, was enthusiastic, and demand from government health clinics was high. The materials were also requested for Western-trained doctors, to educate them about Mayan health beliefs. The materials derive a campaign look from the style of the drawings and the use of the cartoon promoter "Rosita."

#### 15. LATIN AMERICA/Jueco de Crecimiento (*Growth Game*)

**DESCRIPTION:** playing board in form of growth chart, 2 sets of differently colored markers, and 2 sets of 24 cards.

**REVIEW:** This game is the product of workshops conducted with field workers to improve their nutrition education skills. The game is simple, involving 2 players who place their markers on the growth chart according to the age and weight recorded on their sets of cards. Players see how the nutritional status of 2 children can be equal at birth and be very different at 2 years of age. This is a good discussion starter on the causes of growth failure.

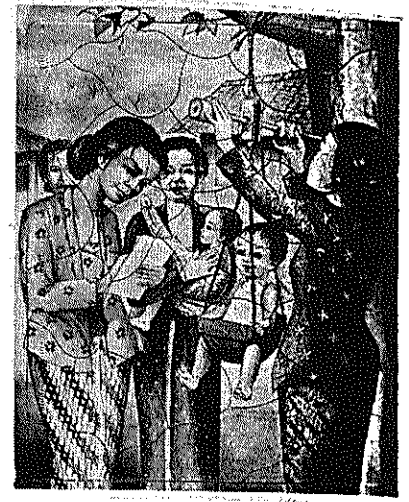
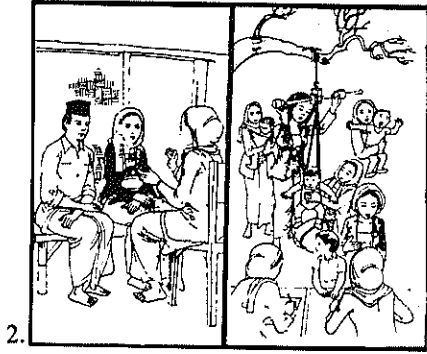
**CONTACT:** Save the Children or SARAR International

#### 16. COLOMBIA/CAMINA PROGRAM "Vigilancia de Crecimiento"

**DESCRIPTION:** Four 15 minute radio programs and two 12 minute video shows.

**REVIEW:** (Produced for low income, urban families) The programs were carefully created with mothers and touch on their doubts, fears, and misunderstandings about growth monitoring.





**ANAK BALITA SEHAT**  
Makanan Tambahan Penimbangan  
A.S.I. Sehat

Timbanglah Jpik setiap bulan. Bila berat badan turun, beri makan lebih banyak. Usahakan agar setiap bulan naik timbangannya.

