

HEALTH BASICS: GROWTH MONITORING



This insert gives a brief overview of practical considerations for growth monitoring: what to measure, how to measure, and types of equipment available for measuring growth. For a discussion of growth monitoring issues, please see the article by Dr David Nabarro in DD 23 and page 4 of DD 24.

WHY MEASURE GROWTH?

For a relatively small expenditure per child, growth monitoring can greatly strengthen preventive health programmes. Growth is the best general index of the health of an individual child, and regular measurements of growth permit the early detection of malnutrition, frequently associated with diarrhoea, and other illnesses, when remedial action is relatively easy. Although acute signs of malnutrition are easily noted by health workers, it is often too late, and always more expensive, to help the severely malnourished child. For early detection of children with growth retardation and high risk of malnutrition and mortality, health workers need special tools and training in growth monitoring. The growth status of children is a measure of the health and well-being of the whole community. (Birth weight is of particular significance in determining the nutritional status of a community: low birth weight is a good indicator of subsequent illness and death in children.)

Key issues to consider when setting up a growth monitoring programme:

- what equipment is required?
- who will use the equipment and where?
- what will be done with the results?
- what is the programme's objective?

Problems associated with growth monitoring programmes include:

- lack of understanding on the part of health workers about the role of growth monitoring; many existing training methods only look at teaching the skills of growth chart completion or checking it for errors;
- lack of involvement of mothers in monitoring the growth and development of their children;
- lack of commitment of senior health personnel to the monitoring of children's growth and development;
- lack of planning and facilities when



Photo by William Cutting

children with growth faltering are detected.

WHAT TO MEASURE

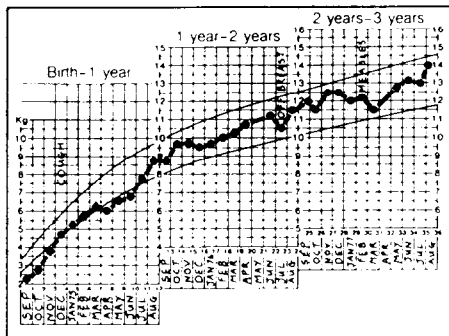
Various body measurements are used to assess growth. Some are easier to use, more accurate and more useful than others. Monitoring the growth of a child usually requires taking the same measurements at regular intervals and seeing how they change. A single measurement only indicates the child's size at that moment; it does not give any information about whether a child's size or weight is increasing, staying the same, or declining. Careful repeated measurements and comparisons with previous measurements are necessary because most children will continue to grow a little, unless they are very ill, and it is

easy to mistake some growth for adequate growth. Growth measures are usually compared to a reference population. Gathering data to establish a local reference population is a major undertaking. Therefore, western standards are usually used for comparison, such as Tanner and Boston, or more recently, those of the National Centre for Health Statistics (NCHS).

Weight-for-age

To obtain weight-for-age, the weight of the child (in kgs) is compared with that of a healthy normal child of the same age from a reference population. This is the basis of the weight-for-age or Gomez classification of nutritional status. A child weighing less than 60 per cent of the reference weight-for-age is considered to be severely malnourished.

Looking at the current weight of a child in isolation is not very useful. Most methods of growth monitoring, including weight-for-age, use a chart on which a child's weight is plotted at intervals, ideally monthly, from birth to five years of age. (Some programmes focus on



The child whose growth is depicted on this chart made good progress, despite set-backs at the time of coming off the breast and after a bout of measles. Weight loss was not allowed to continue once it had been detected by the chart.

Source: See *How They Grow* by David Morley and Margaret Woodland, Macmillan Tropical Community Health Manual, 1979.

children aged between 6 and 36 months, since this group is at greatest risk from growth faltering — poor weight gain, or weight loss.) It is the direction of the growth curve on the chart that is crucial, and a child whose growth curve shows a levelling off or flattening needs help. A falling weight curve is a more urgent sign for investigation and help. It is better to use weight-for-age in children aged 0 to 2 years than other anthropometric measures, because weight is a more sensitive indicator during this period than height.

Advantages of weight-for-age as a monitor of growth

- It is considered to be a useful indicator for growth monitoring in general terms.
- It is sensitive to small changes in the child's nutritional status, as reflected by weight and is a good indicator for detecting growth faltering.

- The only tools needed are weighing scales and charts — usually easy to carry and relatively cheap.
- Weighing is a fairly easy and quick task for inexperienced health workers although it does require a health worker to be numerate.

Disadvantages

- Weighing should be done regularly and this is not always possible.
- It is necessary to know a child's age to the nearest month and this information is not always available. (It is harder to estimate accurately the unknown ages of children over two years old than those aged 0-2 years.)
- Mothers may object to their children being weighed by being suspended from hanging scales, in some cultures, and many children feel frightened and insecure.
- Malnourished children — aged over one year — who have oedema or ascites may not be classed as malnourished when in fact they are.

Weight-for-length/height

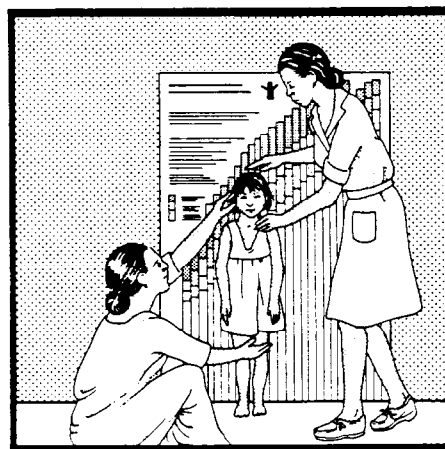
This is a useful indicator where a child's age is unknown, or cannot be accurately determined, or where it is not possible to weigh a child repeatedly over a period of time. The degree of wasting can be assessed by comparing the child's weight with the weight that would be expected for a healthy child of the same height. To obtain weight-for-height, a child is weighed, its height measured and the weight of the child being examined is divided by the weight of a reference child of the same height to obtain a percentage. A child who is less than 70 per cent of the expected weight-for-height is classed as severely wasted. (This cut-off-point is often used in emergency situations to screen children to find who might benefit from special feeding programmes.)

The Nabarro chart, which does not involve the use of tables or calculations, consists of a full-sized coloured chart which is mounted on a wall or a narrow chart mounted on a 12 cm wide plank.

The child is weighed and stood up against the chart opposite the bar representing his weight. The position of the top of the child's head compared with the colour code of the bar indicates if the child is wasted. (For a very young child it is better that the height be measured lying down.)

Advantages of weight-for-height as a monitor of growth

- It identifies the very thin or wasted child with definite malnutrition who requires immediate attention.
- It is a good indicator to distinguish children who are well-proportioned from those who are thin for their height. (Weight-for-age classifies many children as malnourished who are short but have normal body proportions.)
- It does not require age data.

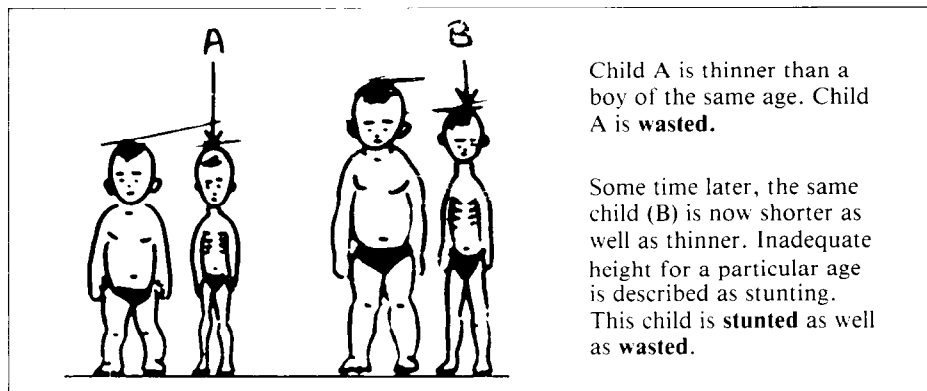


Health Worker and Mother Measuring Child on Nabarro Thinness Chart.

Source: London School of Hygiene and Tropical Medicine, London, U.K.

Disadvantages

- Stunted children with reasonable body proportions are classified as not malnourished, but children who are short (stunted) and also thin, will be classified as wasted, rather than stunted.
- Two pieces of equipment are required, a height as well as weighing scale. This adds to expense and transportation problems.
- Taking two measures takes longer, and this is a problem for the busy health worker, more training is also required and there is more chance of error.
- Some mothers may be reluctant to have their children weighed.
- Measuring height or length requires two people.
- It is more difficult for unskilled workers to learn to take accurate measurements of length and height than to weigh a child.



Child A is thinner than a boy of the same age. Child A is **wasted**.

Some time later, the same child (B) is now shorter as well as thinner. Inadequate height for a particular age is described as stunting. This child is **stunted** as well as **wasted**.

Height-for-age

Height-for-age compares a child's height with the expected height for a healthy reference child of the same age. The measure can be used to assess stunting, which may be an index of long-term nutritional deprivation. A child who measures 85 per cent or less of the standard reference height-for-age is considered to be severely stunted.

Advantages of height-for-age as a monitor of growth

- It can indicate past nutritional problems and illnesses.
- A board for measuring length and height can be made locally at low cost and easily transported.
- Mothers are rarely unhappy about a child being measured with a measuring board.

Disadvantages

- Changes in height occur relatively slowly compared with weight changes.
- It is not recommended as an independent measure.
- It is more difficult for unskilled workers to learn to take accurate measurements of length and height than to weigh a child.
- Two people may be required to measure height/length and accurate age data are also required.

Mid-upper arm circumference

The circumference of the mid-upper arm (MUAC) increases in size during the first year of a child's life quite significantly, but relatively little between the ages of one and five years. At birth an infant's upper arm circumference is about 10.5 cms. By the age of one year it will have grown on average to about 16.5 cms. Over the next four years until the child is five years old, the circumference only grows about 1 cm to 17.5 cms at the most. Any child aged between one and five years whose arm circumference is less than 12.5 cms may be undernourished — and this cut-off point of 12.5 cms is most frequently used. Low MUAC is more closely associated with acute malnutrition (wasting) than stunting. MUAC is useful as a method of screening large numbers of children, during nutritional emergencies for example, but it is less useful in longer-term growth monitoring programmes.

Advantages of MLC as a monitor of growth

- A useful indicator of severe current malnutrition, whether or not stunting is present.
- It is quick to use and the measuring tape can be colour-coded for use by



Photo by Z. Ebrahim. Institute of Child Health

non-literate health workers or the community.

- It does not require age data.
- There are no known objections by communities to this measure.
- Although MUAC does not indicate changes as rapidly as monitoring weight, it can be useful to indicate changes in nutritional status.
- The arm tape is inexpensive and easily portable, and can be easily made by health personnel.

Disadvantages

- It only identifies children with severe malnutrition, and it is not a sensitive early predictor of malnutrition.
- There is a great variability in measurements. Finding the mid-point of the upper arm and placing the tape around the arm without compressing the flesh is not easy.

HOW TO MEASURE

Important criteria for choosing measuring equipment include:

- standardisation — consistent results using an instrument for a known measure;
- ability to maintain accuracy — reliability;
- ease of (correct) use, readability, portability;
- low cost, durability, ease of repair;
- local availability of equipment and cultural acceptability of the method.

Weighing scales

In choosing scales the following criteria should be considered:

- The accuracy of the scale to the

nearest 250 gms (preferably the nearest 100 gms or quarter of a pound, especially for young children).

- A total weight capacity of at least 25 kg, or 50 lbs, for programmes weighing children under six (although the majority of critical weighings will be in children under 15 kg).
- Ease of reading numbers, with no confusion between kg and pound gradients if they are both on the same scale. A direct transfer to growth charts and interpretation of the results should be possible without mathematical calculations.
- Does not lift the baby too high off the ground/floor.
- An adjusting mechanism which allows the scale to be tared (this means to adjust the needle to zero. If the needle rests on one side or other of zero the reading will be inaccurate. When something like a basket to hold the child is hung on the scale this weight needs to be subtracted before the child is weighed. If the scale can be tared it is not necessary to subtract from the indicated weight).
- The reading point of the scale should be at eye level so that it can be read more accurately.

Scales can be locally manufactured, but check accuracy by careful standardisation both during construction and during use. Primitive scales may also be more difficult to use. Advantages include:

- less expensive;
- health workers gain new understanding and skills, if they and the community make the scales;

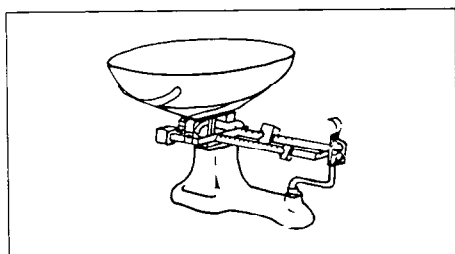
- encourages self-reliance.

* A design for a locally made weighing scale, currently being field-tested, is available from TALC. The scale requires a suitable spring and special weight charts, but, it is hoped, it will involve mothers more closely in monitoring their children's growth.

Commercially manufactured scales are available in a variety of forms.

Beam scales. Two types of single beam balance scales are used; both are easily maintained and remain accurate over time.

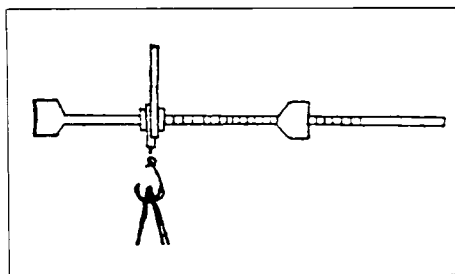
- i) The model shown in the diagram is a floor or table type of scale in which the child can sit or lie, and problems of having to suspend the child to weigh it are eliminated. This variety has the disadvantages, however, of being hard to transport, and being more expensive than most types of scales.



Single Beam Scale for Clinic Use.

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

- ii) The second type of beam scale is called a bar scale and has a free hanging beam. If made from light materials this type of scale is easily transported. One general problem with beam scales is that of keeping the child still.

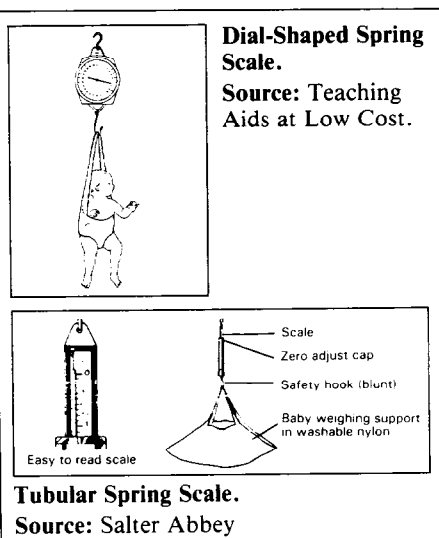


Indonesian Scale—Dacin.

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

Spring hanging scales. These are usually spring scales which have either a dial-face or are tubular.

- i) Dial-faced scales are light, easily transportable, durable, fairly accurate and easy to use. There have been problems with the internal parts of the scale rusting, and this type of scale is one of the most expensive of the dial models.



Dial-Shaped Spring Scale.

Source: Teaching Aids at Low Cost.

Tubular Spring Scale.

Source: Salter Abbey

- ii) Tubular spring scales. These scales are light to transport, but are less durable and more difficult to read than the dial-faced variety. The problem of reading the scale is accentuated if the child is restless. The diagrams show a variety of methods of suspending a child to weigh it. Considerations include the ages of the children to be weighed and cultural acceptability.

In some places, for example, it may be better to use a net, hammock, box or basket, rather than suspend the child in weighing pants.

Bathroom-type scales. Although these are widely used, they are not accurate, and become unreliable but they are portable and cheap.

Digital scales. These electronic scales, a recent development, although quick and easy to use, are still relatively expensive. The scale displays the exact weight so that the health worker does not need to read the number from a continuous scale.

Equipment for measuring arm circumference

Measuring tapes should be made from durable, shrink-resistant material. Suggested materials for home-made tapes include strong card, plastic-coated cloth, and old X-ray film. Each measuring tape, whether commercially manufactured or produced locally should be checked regularly against a standard ruler. The beginning of the tape should be marked clearly on the arm measuring bands. There are several designs from sliding scales for interpretation at different ages. If the "zero" is at the lead end of the tape, it avoids confusion but makes measuring more difficult. The band can be marked in cms or colour coded in risk zones.

Keeping records

The choice of record keeping system is important because the purpose of growth monitoring can be achieved only when repeated measurements can be compared at intervals. This is more useful than comparison with a reference population. The most useful type of record-keeping system is that which requires the least mathematical calculation by the health worker or mother and which shows whether the child is growing at an acceptable rate.

- An important 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.
- Another purpose is as a reminder to health workers about different aspects of child care which should be reviewed.
- Another possible role for growth monitoring is to motivate and educate families. Frequently, the cards are only designed for the record-keepers and not for teaching mothers or other family members. Cards often provide no space to record the action recommended to help the child. This could be a reminder for parents and health workers and a focus for future discussion.

Considerations in chart design

- Size of the chart and the writing space. Size should be determined by the amount of information to be recorded. There should be enough space to see changes in weight and write in comments about diseases, advice given etc.
- Cultural context. The cultural beliefs and understanding of mothers should be incorporated into the design to make the educational task easier. Cards for use by parents should be in the local language with appropriate symbols.
- Ease of interpretation. Overcrowding with information and unnecessary lines only confuses. Use only cut-off lines which are absolutely necessary to determine the appropriate action for the child. Although different systems may be necessary because of varying programme objectives, one type of card should be used in a single clinic or village and preferably throughout the country.

Equipment for measuring height and length

Two types of equipment are needed, for measuring standing height, and length lying down. A well-designed measuring board can be used for both but may not be very portable. Boards can be purchased or made locally.

The *weight-for-height*, or '*thinness*' chart, (Nabarro chart), contains a height scale. It was described earlier, is easily transportable, light, measures approximately 140 cms × 100 cms but is only made of thick paper. It is nailed or taped to the wall so that the bottom of the chart is at ground level. Life size cut-outs are available for training purposes.



ICCDR, B Photo by Asem Ansari

Using a Baby Length Measuring Board.

Estimating a child's age

Where a child's age is unknown the table shows some methods that may be useful in estimating the child's approximate age. A local events calendar which includes harvest time, religious festivals, or natural disasters, is most valuable. Also useful, is comparing the child with other children in the village whose ages are known.

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 teeth	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.

COUNTRY EXAMPLES

Indonesia

- In Indonesia 2.5 million infants and young children are being weighed regularly at the traditional monthly meetings of village women. The results are entered on growth charts kept by the mothers themselves.

Thailand

- In Thailand, a programme based on the home use of growth charts by parents in several villages, helped to eliminate completely third degree malnutrition and reduce second degree malnutrition by 44 per cent during 1981-1982, even though no additional food was provided.

Colombia

- In Colombia, improvements in weight gain for a majority of children suffering from mild, moderate and severe malnutrition have been achieved in poor communities by nutrition programmes incorporating the "Carnet de Salud" or health card kept at home by mothers.

Jamaica

- In Jamaica, a systematic programme to improve the health and growth of over 6,000 young children using growth charts, immunisation and nutrition education and milk supplements, has resulted in a 40 per cent decline in the prevalence of malnutrition and a 60 per cent fall in infant mortality.

Source: *UNICEF State of the World's Children 1985*.

Ghana

- In Ghana a survey was undertaken to find out how mothers measured growth. Many cultures have traditionally used a variety of indicators to measure their children's growth and development. These should be taken into consideration and used by the community health worker to understand the community's perceptions, so that they can be related to the use of growth charts and mothers' participation be encouraged in improving child care. Ghanaian mothers interviewed for the

survey, believed that their children were growing well when they: had a good appetite; were fat rather than thin; were learning new things at the right time; seemed heavier when lifted; had normal bodily functions and healthy skin and general appearance; good humour and were happy and active; and were growing taller. Bead strings tied around the waist, legs or wrists of children were used as indicators to measure growth. By the time a child is five months old, the bead strings around the waist should have been changed or adjusted five times. Reasons given for poor growth included: lack of food; insufficient breastmilk; a new pregnancy forcing the mother to wean too early; bad feeding practices; not taking enough time to prepare food; and the death of a parent. Growth and failure to grow were therefore associated with more than just an increase or decrease in weight.

Source: *Mothers and Children, Volume 5, Number 1. November-December 1985. American Public Health Association.*

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American Public Health Association (APHA), Clearinghouse on Infant Feeding and Maternal Nutrition, 1015 15th Street, NW., Washington D.C. 20005, U.S.A.

AMREF, PO Box 30125, Nairobi, Kenya.

CMS Weighing Equipment Ltd., 18 Camden High Street, London, NW1 0JH. U.K.

Department of Human Nutrition, London School of Tropical Medicine and Hygiene, Keppel Street, (Gower Street), London, WC1E 7HT, U.K.

Departments of Tropical Paediatrics and International Community Health, Liverpool School of Tropical Medicine, Pembroke Place, Liverpool, L3 5QA, U.K.

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

Institute of Child Health, Tropical Child Health Unit, 30 Guilford Street, London, WC1, U.K.

National Center for Health Statistics, (NCHS), 3700 East-West Highway, Center Building 1-57, Hyattsville, MD 20782, U.S.A.

OXFAM, Medical Unit, 274 Banbury Road, Oxford OX2 7DZ, U.K.

Pan American Health Organization (PAHO), 525 23rd Street, N.W., Washington D.C. 20037, U.S.A.

Program for Appropriate Technology in Health (PATH), Canal Place, 130 Nickerson Street, Seattle, Washington 98109, U.S.A. 98109, U.S.A.

Salter Abbey, St Botolph's Lane, Bury-St Edmunds, Suffolk, U.K.

Salter Industrial Measurement Limited, George Street, West Bromwich, West Midlands, B70 6AD, U.K.

Save the Children Fund, (UK), 17 Grove Lane, London, SE5 8RD, U.K.

Teaching Aids at Low Cost (TALC), PO Box 49, St. Albans, Herts AL1 4AX, U.K.*

United Nations Children's Fund (UNICEF), United Nations, T-Plaza 4-1234C, New York, NY 10017, U.S.A.

UNIPAC, UNICEF Procurement and Assembly Centre, UNICEF Plaus, Freeport — DK 2100, Copenhagen O, Denmark.

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

World Health Organization, Distribution and Sales Service, 1211 Geneva 27, Switzerland.

Cautionary note

It must be stressed that the practical benefits of growth monitoring in promoting better nutritional status and child health are wholly dependent on effective follow-up action being taken by mothers and health workers. This means that:—

- mothers must be motivated and enabled to acquire the necessary skills and resources to take action;

- any advice that is given to mothers must be culturally appropriate and compatible with the resources that exist within the home and;

- basic health services must be readily available, including the provision of vaccines, drugs and oral rehydration fluids.

Current experience suggests that growth monitoring programmes are not always fulfilling these prerequisites and consequently are not achieving the desired impact on child health. It is feared that this could lead to a backlash of disillusionment with growth monitoring *per se* and it is therefore urged that growth monitoring should not be instituted unless the proper infrastructure is in place to permit effective follow-up action. Reference: Ashworth, A. and Feachem, R.G. Interventions for the control of diarrhoeal diseases among young children: growth monitoring programmes. Document CDD/86. Geneva: World Health Organization, 1986.

ACKNOWLEDGEMENT

Much of the information contained in this insert is based on material from the World Federation of Public Health Association's information for action issue paper 'Growth Monitoring of Preschool Children: Practical Considerations for Primary Health Care Projects.' 1985. Griffiths M.

More detailed information concerning manufacturers of growth monitoring equipment, costs, availability etc., is available from AHRTAG, 85 Marylebone High Street, London, W1M 3DE, U.K.

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Academy for Educational Development (AED), 1414 22nd Street, N.W., Washington D.C. 20037, U.S.A.