

Growth monitoring

a forgotten subject

The weighing of children is commonly undertaken in developing countries. In South Africa, Zambia, Malawi, Kenya and many other countries almost every child still has a weight chart but, unfortunately, the majority of these charts are poorly completed and not used for decision-making.

Faltering of the growth rate of a child is of major significance and should be easy to recognize on an adequately completed weight chart. However, the literature produced by international organizations and major non-governmental organizations (NGOs) rarely, if ever, mentions growth monitoring. For example, studies of food and nutrition made by the World Health Organization (WHO, 1998), the United Nations Children's Fund (UNICEF, 1998) and FAO (1998) make little mention of growth faltering and do not refer to growth monitoring. This omission from reports is justified by the history of growth monitoring given in this article.

The purpose of the article is to propose a new approach to growth monitoring and to present evidence that when family members can recognize growth faltering they will take action to prevent it.

History of growth monitoring

Weighing and the charting of a weight-for-age graph was started in West Africa in the late 1950s (Morley, 1960). Two innovations were introduced to make the graphing of weights more practical. The first was the introduction of a calendar, which started with the birth month of the child, against which the weights were plotted. The second innovation, which was perhaps even more important, was that these charts were home-based and held by the mother of the child. This initiated a now worldwide trend for patient-held health records. The practice of growth monitoring, as it became known, spread to Sierra Leone and Zambia, and during the 1970s became part of the growth monitoring, oral rehydration, breastfeeding and immunization (GOBI) effort initiated

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by UNICEF to prioritize primary health care. UNICEF and NGOs made large investments to provide dial weighing scales, distribute growth charts and train personnel. Growth monitoring was adopted by all developing country governments and growth charts became widely available.

In the 1980s, health economists became

school teachers in developing countries would have difficulty in teaching the representation of data in terms of a line graph. Even some doctors pass through medical school without knowing how to complete a line graph and make decisions from variations in its growth (Morley, 1994). Line graphs have never been used

undernutrition are less likely to bring their children. Weighing children may absorb a large part of the health worker's time.

The new direct recording scale

The new direct recording scale is robust and remains in the village. As the mother actively participates in the weighing process

When family members can recognize growth faltering they will take action to prevent it

more involved in deciding priorities for primary health care, and cost-benefit analyses were made in many countries. These showed that immunization and oral rehydration could have marked benefits in terms of reducing mortality, but the same could not be shown for growth monitoring. No difference in terms of reduced mortality or improved nutrition could be shown to be caused by the use of weighing and charts. The growth charts were rarely completed, and decisions were not taken when the growth curve faltered (Nabarro and Chinnock, 1988). As a result, emphasis was removed from growth monitoring programmes and growth monitoring is now seldom mentioned in publications concerned with improving the nutrition of children.

Why did growth monitoring fail?

When the concept of growth monitoring was developed, no discussions were held with those involved in the content and practice of primary education in developing countries. Through the Child-to-Child Programme, D. Morley, one of the authors of this article, became deeply involved with people who were experienced in primary education in developing countries at the Institute of Education of the University of London. Jean Piaget (1896-1980) suggested that of all the concepts taught in primary education the line graph was one of the more difficult, and this conclusion was backed up by Morley's experienced colleagues. They suggested that the majority of primary

at the family or community level in Europe or North America, and yet growth monitoring programmes attempted to use them with populations who were largely only semiliterate.

A new approach to growth monitoring

A fresh approach to growth monitoring was made possible by the development of an entirely new method of weighing through the introduction of the direct recording scale, which has a large visible spring (Morley *et al.*, 1991).

Dial scales

In the case of dial scales, the equipment is kept at the clinic. Weighing is carried out by a member of the staff and the mother is not involved. The weight has to be read off the scale and recorded by a dot in the relevant position on the child's chart. For many mothers in developing countries, there is no obvious relationship between the movement of a pointer on a dial scale and the dots on the growth curve recording the kilograms and grams read from the scale. When children queue up to be weighed many become frightened, struggle and cry and, as small children in these societies rarely cry, this may upset the mothers and detract from the accuracy of weighing. Owing to the distance travelled, and often to the long wait, there may be irregular attendance at weighing sessions. For the mothers there may be a loss of farming production or other income-producing activity. The excluded and underprivileged families who are most at risk from

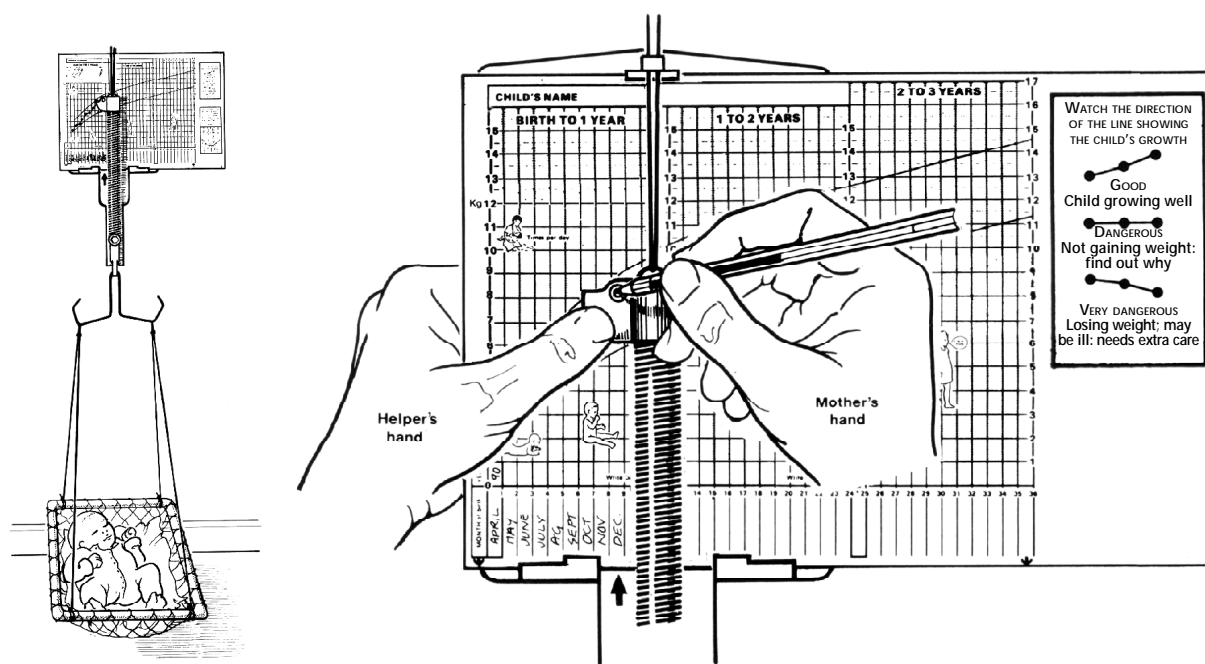
(Figure 1), she is proud to become involved. When the direct recording scale is being used, the mother:

- puts the child in the weighing trousers suspended beneath the scale;
- sees the large spring stretch up her child's chart, which has been positioned with the arrow opposite the current month;
- enters the next point on the child's growth curve through a hole in the pointer, thereby creating a weight-for-age graph without having to read a number off a dial or identify the coordinates of the graph;
- removes the child and the chart from the scale and, as weighing is unhurried and takes place in or near the home, the child is unlikely to be frightened, struggle or cry;
- compares this month's entry with those of previous months;
- discusses the direction of the growth line with other family members, including family decision-makers, neighbours and, if necessary, the community health worker.

As the scale is available in the community, the experienced community health worker will ensure that the less privileged families whose small children are more at risk of undernutrition are involved.

Moving the weighing of small children out of the clinic into the community has obvious advantages but raises a number of new issues. Most existing national weight charts cannot be used with the direct recording scale as the kilogram lines on the chart need to be exactly 1 cm apart, because the spring used stretches this distance per kilogram. In addition, the zero line has to be 3.5 cm from the bottom of the chart.

FIGURE 1
The direct recording scale



Experience with the direct recording scale

Most of the literature on direct recording scales comes from work done among the Maasai in Kenya, where 500 of these scales are in use (Meegan *et al.*, 1994). A blind comparative study was made of the mothers' understanding of the growth charts. The first group weighed their

and a more detailed account of the methodology and results is available in Meegan *et al.*, 1994.

Over the course of a year, about 90 percent of the mothers weighing their children on a direct recording scale came to understand child growth as shown on a weight-for-age chart. They appreciated why children should be weighed, and could

meaning of the growth curve. Even half of the fathers and older boys, who are not usually concerned with small children, gained a reasonable understanding of the growth curve.

An unexpected finding was the frequency of faltering. This was defined as no gain in weight or loss of 250 g for children under two years of age. Compared

Creating growth charts is difficult; simple, practical training methods are needed

children and created the growth curve on a direct recording scale themselves. The second group of mothers had their infants weighed on a dial scale by community health workers, who also created the infants' growth curve. The mothers' replies to a questionnaire used for both groups were recorded on tape. Researchers undertaking the translations and analysis did not know from which group the recording of the mothers' answers came. The findings of the study are described here

recognize a normal and an abnormal growth chart. Among a similar group of mothers whose children were weighed on a dial scale by a community health worker, there was little change in their understanding of growth monitoring.

Over a two-year period, a further study (Meegan and Morley, 1999) showed that a high proportion of the grandmothers, who are the decision-makers, as well as the older girls, who are the future mothers, in the families gained a similar knowledge of the

with those weighed on a dial scale by community health workers, only one-third as many children weighed by their mothers with the direct recording scale showed faltering. For children over two years of age faltering was defined as three months of no gain or a loss of 500 g. Faltering in these cases was five times less frequent than it was among children weighed by the community health worker on a dial scale.

The homesteads of mothers where there had been no gain in weight for one

month were visited and the mothers were asked what action they had taken. They replied that they had given the children extra cow's or goat's milk, or an extra feeding of broth (Meegan, personal communication, 1999).

The Maasai mothers' contribution to growth monitoring.

The Maasai do not have pens or pencils readily available, so the mother uses a thorn to prick the chart and then holds the chart up to the light to see how her child is progressing. The mothers have also identified a memorable description of the three directions printed on the chart (Figure 1). For the upward line, they use the word for an erect penis, the flat line is an erect penis that cannot penetrate and, for the downward line, they use the word for a flaccid penis.

Teaching about the growth charts

As creating the growth curve is difficult and making decisions from it complex, simple but practical methods of training health

Summary points on growth monitoring

- Considerable investment in terms of finances, training and health workers' time have been, and still are being, spent on growth monitoring.
- The worldwide failure of growth monitoring to improve nutrition and reduce child mortality was due to the difficulty in creating and interpreting a line graph.
- Illiterate mothers can understand the concept of growth as shown on a weight chart when they use a direct recording scale to weigh their children and plot the weights.
- The same mothers can identify faltering in their children's growth and take early action.

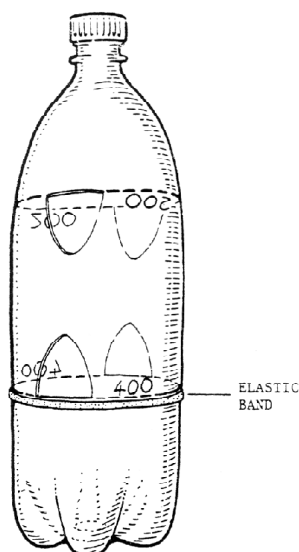
workers and teaching mothers are necessary. One method of illustrating the concept of recording weight gain on a chart that has proved successful (Sohal *et al.*, 1997) involves a plastic bottle cut so that, when immersed in water, one end will deliver 400 cc and the other end 200 cc (Figure 2).

These bottles can be used to provide the equivalent of 200 g, 400 g and 800 g of water into a bucket suspended below a scale. Under guidance, the mothers add the water and mark the chart. Once they have gained knowledge about normal growth, they can be introduced to the concept of faltering at

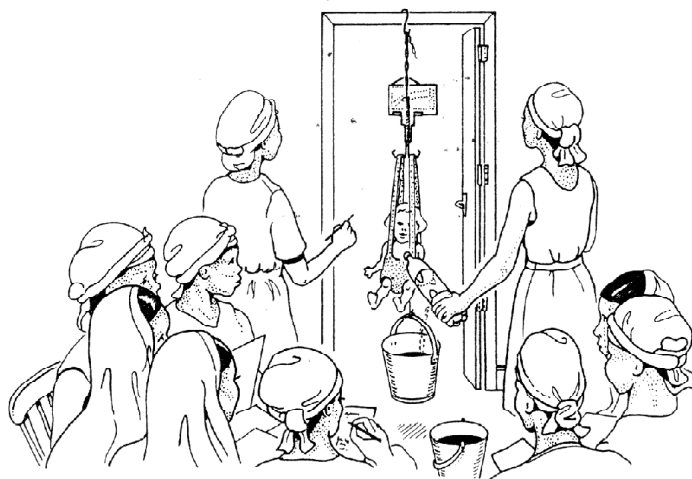
different ages and become involved in discussions of what action they should take. To illustrate the loss of weight that occurs as a result of a child developing diarrhoea, water can be removed from the bucket suspended below the scale. The concept of oral rehydration can be shown by replacing the water in the bucket. Once the workers or mothers have mastered how to plot the charts and what they mean in terms of child growth it may be worthwhile asking them to plot the weight of two children using the 8:4:2 method. The two children both have a birth weight of 3.2 kg (8 x 4). One of the children gains an average

FIGURE 2

Demonstrating how the growth chart works



A
The top section of the bottle measures 200 cc and the bottom section 400 cc.



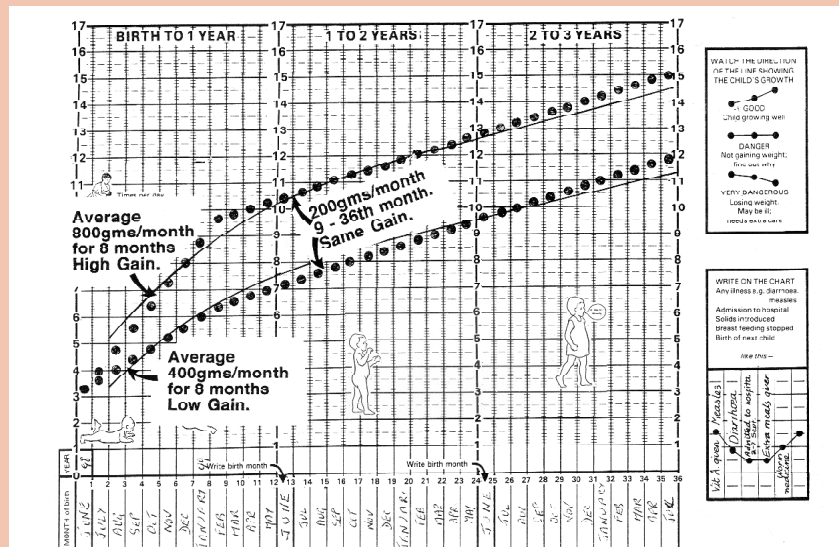
B
With the scale suspended from a beam or doorway, and a doll added for realism, the mothers can see how a child's growth curve goes up as more water (weight) is added.

of 800 g per month for the first eight months, the other gains an average of 400 g per month for the first eight months. After this, both gain 200 g a month. The resulting chart is illustrated in Figure 3. In the subsequent discussion, the fundamental importance of successful breastfeeding in a child's growth should become apparent.

Discussion

The involvement of mothers and families in the weighing of children may be part of a movement to increase the involvement of families and communities in health-related measurement (Morley, 1999). As well as improving the children's health, this approach may also assist in teaching adult numeracy, which in many situations may be as important as adult literacy. Mothers who weigh their own children with the direct recording scale will raise many new issues. To them, the monthly increase in the length of the spring as they release the weight of the child into the trousers and record this on the chart, becomes meaningful. They start to appreciate the need for a line that shows a continuing upwards trend. Faltering in weight gain, as shown by a flattening of the growth curve, leads to early action by some of these mothers. The movement of a needle on the dial scale and the occurrence of faltering, even if appreciated by the community health worker, was not communicated effectively to the mothers involved in this method. The research among the Maasai needs to be repeated elsewhere and help should be sought from those with long experience in teaching numeracy and literacy. In communities where direct recording scales are available, these may be borrowed by the local school. Children could then learn, in a practical manner, the meaning of a line graph on charts that are widely available in their community.

FIGURE 3
Sample growth chart for two children using the 8: 4: 2 method



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Growth monitoring: a forgotten subject

Growth monitoring was introduced in the 1960s and spread worldwide in the 1970s. In the 1980s it fell out of favour as cost-benefit analysis showed that, compared with immunization and oral rehydration, growth monitoring could not be shown to improve the health of small children. Current literature on nutrition and child health rarely mentions growth monitoring.

The reasons for growth monitoring's failure became apparent when those concerned with primary education pointed out the complexities of creating a line graph and making decisions based on changes in its direction. The authors of this article introduce a new method of measuring and recording children's growth, which is carried out in the community instead of the clinic. Mothers actively participate in the weighing of their young children. When unschooled mothers use the new direct recording scale and create their own children's growth curve they come to understand its significance. This new knowledge can be shared with grandmothers and older daughters. The research carried out in Kenya provides some evidence that, when growth faltering is observed by mothers, they will take effective action to restore their children's growth.

Suivi de la croissance des enfants – une question oubliée

Le suivi de la croissance a été introduit dans les années 60 et diffusé dans le monde entier dans les années 70. Dans les années 80, il a été relégué au second plan, l'analyse coût-avantage indiquant que, par rapport à la vaccination et à la réhydratation orale, il n'existait pas de preuve que le suivi de leur croissance améliorait la santé des jeunes enfants. La littérature actuelle sur la nutrition et la santé infantile passe pratiquement sous silence la surveillance de la croissance.

Les raisons de l'échec de ce suivi sont apparues à l'évidence lorsque des instituteurs ont signalé la difficulté de créer un graphique linéaire et de prendre des décisions sur la base de son orientation. Les auteurs de cet article présentent une nouvelle méthode pour mesurer et enregistrer la croissance des enfants, qui permet d'assurer ce suivi au niveau communautaire, sans passer par un dispensaire. Les mères participent activement à la pesée de leurs jeunes enfants. Lorsque des mères n'ayant jamais été scolarisées ont commencé à utiliser la nouvelle balance enregistreuse et à dessiner la courbe de croissance de leurs enfants, elles ont rapidement compris son importance. Cette nouvelle compétence a été partagée avec les grands-mères et les filles aînées. Les travaux de recherche menés au Kenya montrent que lorsque les mères observent une anomalie dans la croissance de leurs enfants, elles prennent des mesures efficaces pour y remédier.

Vigilancia del crecimiento: un asunto olvidado

La vigilancia del crecimiento se introdujo en el decenio de 1960 y se difundió por todo el mundo en el de 1970. En el decenio de 1980 cayó en desgracia al mostrar el análisis de la relación costos-beneficios que, en comparación con la inmunización y la rehidratación oral, no podía probarse que la vigilancia del crecimiento mejorara la salud de los niños pequeños. En la bibliografía actual sobre nutrición y salud infantil rara vez se menciona la vigilancia del crecimiento.

Las razones del fracaso de la vigilancia del crecimiento quedaron de manifiesto cuando las personas interesadas en la educación primaria indicaron las dificultades que comportaba la creación de un diagrama lineal y la adopción de decisiones basadas en cambios en la dirección de éste. Los autores presentan un nuevo método para medir y registrar el crecimiento infantil que se lleva a cabo en la comunidad y no en la clínica. Las madres participan activamente en el pesaje de sus hijos pequeños. Madres que no habían asistido a la escuela empezaron a comprender su importancia cuando trazaron la curva de crecimiento de sus hijos utilizando la nueva báscula de registro directo. Este nuevo conocimiento se intercambió con abuelas e hijas mayores. La investigación realizada en Kenya aporta ciertas pruebas de que, cuando las madres observan un retraso del crecimiento de sus hijos, adoptan medidas eficaces para recuperarlo.