

Growth charts, 'curative' or 'preventive'?

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SUMMARY The type of growth chart now becoming widely used in developing countries is described; its objectives differ from those of the charts used by paediatricians in industrialized countries. Alternative weight standards to the Harvard have been suggested by a WHO Working Party and adopted for the chart described here. The -3 and -4 standard deviations from these standards are also available printed on plastic overlays.

As the title of this paper suggests, there are advantages in distinguishing two varieties of growth charts. It is not implied that one variety is entirely curative and the other entirely preventive, but the difference in nature and objectives of two distinct varieties of charts can perhaps be best understood under these two headings (Table). A brief description will be given of the preventive chart now widely used in developing countries, and some suggestions made for the use of more recent and satisfactory standards than those currently in use.

Growth charts in industrial countries

Growth charts are not widely used on a community basis in the UK, though they are in general use in some European countries. The more specialized charts described under the 'curative' heading, such as those of Tanner *et al.* (1966), are however widely established, and these have added greatly to our understanding of the normal variations of growth.

Growth charts in developing countries

The variety of growth charts described under 'preventive' in the Table are now widely used. The introduction of the 'calendar system' in recording the passage of time in West Africa in the late 1950s imparted a new emphasis to the development of such charts, and at the Institute of Child Health, London, there is a collection of over 100 of these charts, representing many languages and a high proportion of the countries in the developing world. With the use of these simple growth charts, the emphasis in preventing malnutrition is placed on maintaining adequate growth. No child who is

growing adequately will ever develop malnutrition. Unfortunately a number of charts have been designed without an adequate understanding of the circumstances in which they have to be used. Misunderstanding particularly arises over the meaning of the 'standard' growth curve or channel on these charts. Wrongly, too many health workers assume that a child is healthy if he is above a line and malnourished if he is below another line. As the weight of a child at any one point in time will depend more on his genetic potential than his recent nutritional experience, emphasis should always be placed on the direction in which a child's curve is moving rather than its position on the chart. This question of the curves on the chart will be considered after some general points are made about the use of these charts.

Growth charts at primary health care level

Maintaining more than 10 000 records requires expertise and equipment not readily available in most developing countries. Most health centres and hospitals attempt to provide services for populations much larger than 10 000 and so rarely achieve a system that makes records available on return visits. These difficulties led to a trial of home-based record systems. In developing countries, these home-based record systems work remarkably well for children, and surprisingly few records are lost.

As the growth chart is the only record of the child's health, other essential information is included on it. This has been described in detail elsewhere (Morley, 1973) and will only be listed here.

(a) Parents and sibs: only the essential information is included. (b) Immunizations: a back panel is given over to this. (c) Reasons for special care: these are set out in a prominent place on the chart (Fig. 1). (d) A record of how long breast feeding is main-

Table Two varieties of children's growth charts

Preventive
Used by health workers with limited training. As complete a coverage of all the children as possible in the community is attempted.

Simple and easily understood by health workers, personnel from other disciplines, and by some parents. The calendar system for recording the passage of time is used (Fig. 1). The charts are kept by the parents.

Weighing only is preferred, using simple, robust, and low-cost equipment which should be available and used at every place where the child is in contact with health workers.

Widely used in developing countries to monitor and encourage adequate growth as a means of preventing malnutrition. When used in industrialized countries may help in preventing obesity and identifying insidious conditions which may present with inadequate weight gain.

Curative
Used by paediatricians and others concerned with growth and development for children suspected of growth dysfunction, and for research

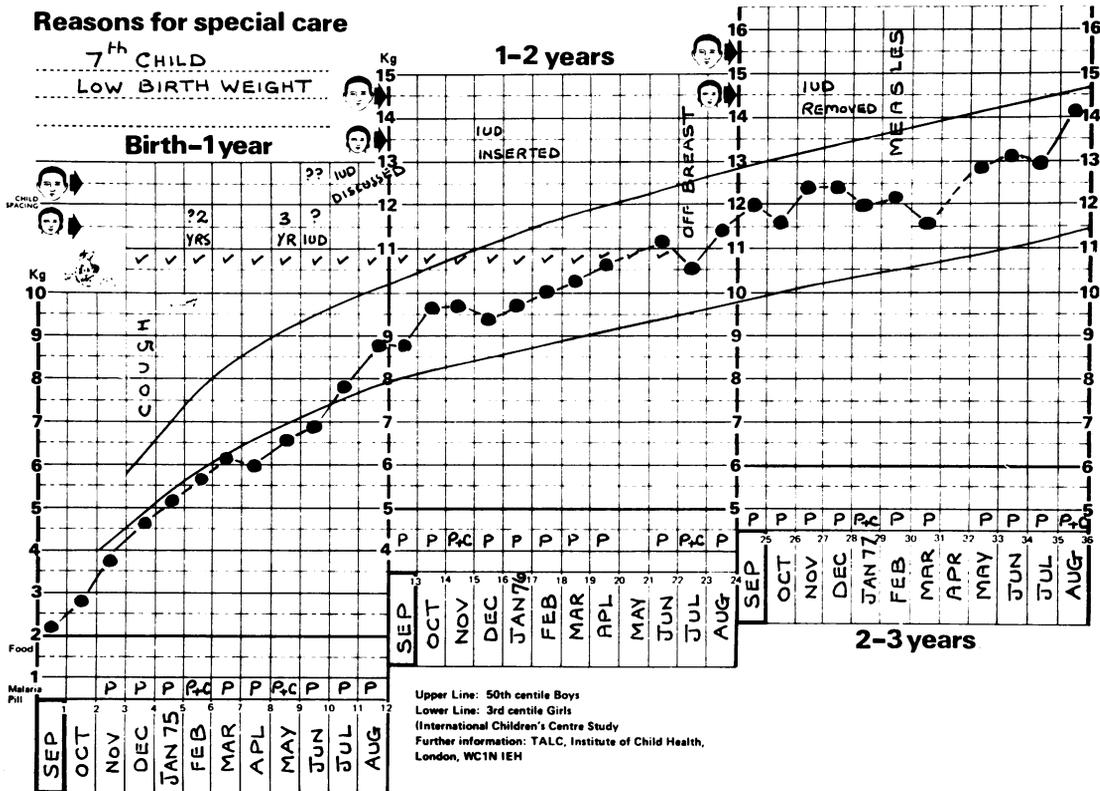
Complex, the charts are intended to identify small changes in growth. The decimal system for recording age is used. The charts are not easily understood by lay people, and are kept in clinics.

Length or height measurements and their change in velocity are emphasized. For these, accurate but expensive equipment is required

Largely used in industrialized countries to assist in the management of growth in a proportion of children. When used under research conditions in developing countries can assist in our understanding of the initial and late effects of malnutrition on growth.

tained and the introduction of other foods. (e) Antimalarials and massive doses of vitamin A in those communities where these are required. (f) Birth spacing: information and a record of discussions on family planning and what steps are taken.

In teaching health workers the use of these charts, emphasis is continually placed on the need for the child's own weight curve to be moving upwards and parallel to the standard lines on the chart. While some countries may wish to use their own



standards, the difficulty arises that if the nutrition of the children in the country is improving the standards will always be changing, and for this reason some countries have wished to use an international standard taken from a group of children no longer subject to change.

Existing and proposed new standards

The weight-for-age Harvard tables (Stuart and Stevenson, 1959) are widely used by nutrition workers as a standard of growth against which to measure the nutrition of children. These tables are based on measurements made between 1930 and 1939 of a low to middle socioeconomic group of Boston children, mostly of Irish descent (Stuart, 1939). Gómez *et al.* (1956) devised a method of assessing malnutrition by relating weight measurements to 90%, 75%, and 60% of the median weight-for-age from the Harvard tables. A similar method was used by Jelliffe (1966) using 90%, 80%, 70%, and 60% of the median.

Although this method has been widely used all over the world, there are a number of errors that may arise in assessing the nutrition of groups of children through its use. These difficulties have been defined by Sykes (1977) and arise partly from the use of this 'percentage method', and also because the

Harvard figures are unlike others in their distribution of the weights of children. An alternative standard from an International Children's Centre (ICC) study has now been suggested by a WHO Working Party (1972).

Applying the suggested new standards to weight charts

For weight charts to be employed in developing countries the use of the 50th and 3rd centiles from the ICC standards has been suggested. For logistic reasons it is inappropriate to have different charts for boys and girls, and so on the growth chart developed at the Institute of Child Health, the 50th centile curve for boys and the 3rd centile for girls were used as the upper and lower lines respectively. The median for village children in most developing countries is likely to lie just above this 3rd centile. As perhaps half of the children in developing countries will be below this 3rd centile, a -3 standard deviation (SD) and a -4 SD were calculated for the European children in the ICC study. The 3rd centile is equivalent to -1.88 SD and therefore lies quite close to the -2 SD. Fortunately the -3 SD is close to the 70% of the old Harvard mean, and the -4 SD to 60% of that mean.

The lines representing these standard deviations have been drawn out and are available on plastic

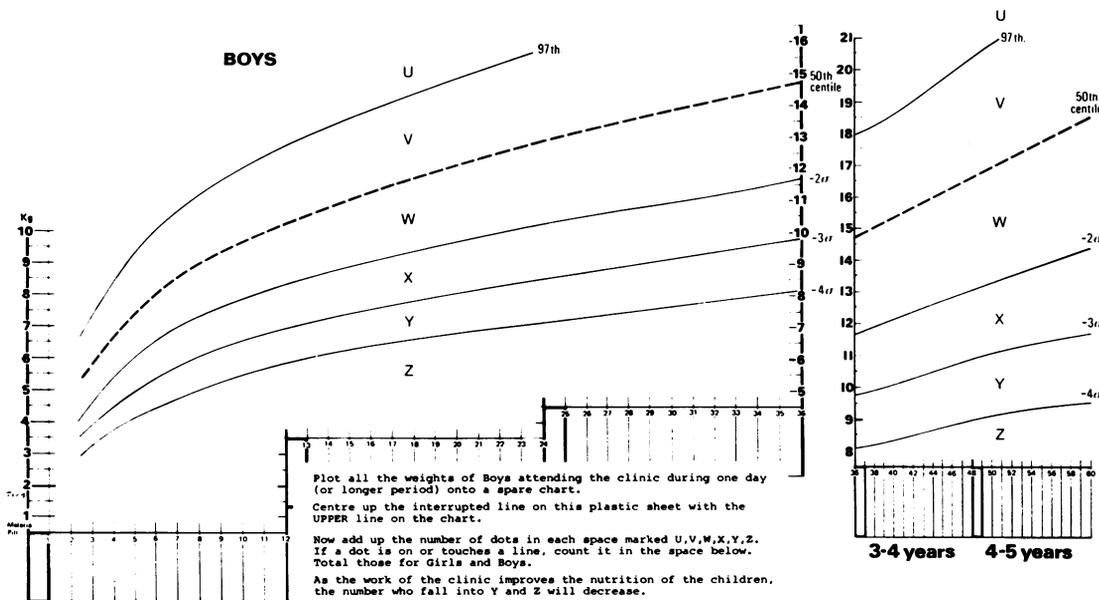


Fig. 2 This represents a plastic sheet which fits over the chart shown in Fig. 1. The plastic sheets for boys and girls are used to check the weight distribution of children attending a clinic over a period as an indication of altered nutrition in the community being cared for.

overlay sheets (Fig. 2) which will fit over the weight chart.* They are not included in the chart itself as this causes misunderstanding by health workers with limited training, who may assume that all children below one line are malnourished. Those wishing to assess whether the weight of children attending a clinic alters from season to season, or from year to year, can plot the weights of all the children attending the clinic over a period of a day or more on a single chart for boys and another chart for girls. If then the plastic sheet is laid over the chart for boys, and the similar plastic sheet is laid over the chart for girls, the number falling into the various weight groups can be counted up, and the figures for the boys added to those for the girls. Such a method will give a more satisfactory assessment of the weight-for-age distribution of the children in a community than using the percentages of the Harvard mean.

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