Introduction
Margaret Ounsted (1971) reminds us that, in a group of infants with birthweights below 2.5 kg, one may expect one-third to owe their low-birthweight to slow fetal growth, the rest to short-gestation. She believes that the use of birthweight alone as an indication of retarded fetal growth should now be wholly abandoned, since the rate of growth of the fetus and the occurrence of early labour appear to be unrelated.

The detection of the small-for-dates infant requires reliable standards of intrauterine growth, and a method of estimating gestational age which is not dependent on a knowledge of the date of the last menstrual period (decreasingly available as the use of oral contraceptives expands).

Tanner and Thomson (1970) have produced charts (based on the data of Thomson et al. 1968) which enable one to place an infant in its correct birthweight percentile (taking into account the baby's sex and birth order and the mother's weight and height), provided the gestational age is accurately known.

Dubowitz et al. (1970) have reviewed the various external and neurological measures of maturity and have suggested an index for estimating gestational age which has 95 per cent confidence limits of ± 2 weeks.

Babson (1970) has claimed that little, if any, of the retardation in weight and length that may be suffered in the fetal or neonatal period is recovered during the first year of life outside the womb if the infant's age is measured from conception.

For the older child being seen by the clinician for the first time, charts are available to determine whether the child's height and weight are within normal limits (Tanner et al. 1966). When standards for rate of growth instead of these distance standards are required, the weight and height velocity standards prepared by Tanner et al. (1966) are appropriate.

Against this background, the author believes that a need exists for percentile charts spanning a good many years, and including the birth junction, which are as sensitive for plotting or reading off at the lower ends of the weight and age scales as at the upper ends. The principles embodied in these charts have relevance to the presentation of the other standards (e.g. height, weight velocity). For consistency, only weight percentile charts are discussed, even though height may be clinically more important in the older child.

Logarithmic Weight and Age Scales
Because there is a 15- to 20-fold increase in weight from birth to late teens and a 10-
to 20-fold increase in the spread of measurements (as indicated for example by the separation of the 25th and 75th percentiles), 3 or 4 hospital medical record charts are usually used to cover the range, e.g., 0–12 months, 1–8 years, 7–14 years. A logarithmic weight scale (Fig. 1) eliminates these disadvantages. The vertical separation of the 25th and 75th percentiles, for example, is much the same over the whole range even though the separation represents a difference of 2 kg at 2 years and 10 kg by 18 years. Such a percentile chart is uniformly sensitive along its age scale for reading off the weight percentile.

The use of percentile charts to watch the progress of an individual child demands that the standards should have been derived from longitudinal studies, in which the weights of a cohort of children have been measured repeatedly over a number of years (Tanner 1958). Fig. 1 is of this type.

Only after about the age of 8 years in girls or 10 years in boys do the longitudinal standards begin to differ from the cross-sectional standards derived at the various ages from different groups of children. The longitudinal standards take account, for example, of the late-maturing child who departs at adolescence from the cross-sectional standard percentile he has previously been following, reaches a lower percentile and later regains the original percentile. In using longitudinal standards, a whole segment of the child's growth curve is compared with the corresponding segment of the standard curves. Tanner et al. (1966) give a fuller explanation of the clinical use of these longitudinal standards.

In the neonate, one is interested in changes in weight over days and weeks but such detail, other than in acute illness, becomes progressively less relevant. Fig. 2, in addition to a logarithmic weight scale, has a logarithmic age scale such that an interval of 8 weeks at birth occupies the same width of paper as 1 year at 5 years. In order that the growth of the younger infant may be measured from conception after the manner described by Babson (1970), fetal growth data (Thomson et al. 1968) have been added to Tanner's postnatal data, the birth junction being smoothed using more detailed data from the Department of Growth and Development at the London Institute of Child Health, and from the Department of Health and Social Security (Tanner 1970). Fig. 2 may be used to trace the growth of a child over the whole period from birth at 32 weeks gestation to 5 years. Since the charts of Thomson et al. (1968) take account of birth order and mother's weight and height, in addition to sex and gestational age (as in Fig. 2), their charts are more accurate as cross-sectional standards for birth-weight.

Finally, since the logarithmic weight and age scales provide the requisite sensitivity at all ages and weights, it is possible to design a suitable reference chart for cross-sectional standards (specific for age and sex only) over the whole range from 32 weeks gestation to 18 years of age (Fig. 3). The same width of paper represents 4 weeks at about 32 weeks gestation and 1 year at about 18 years. On the weight scale the same height on the chart represents 0.6 kg at 32 weeks gestation and 10 kg at 18 years. Around puberty, the 50th percentile for longitudinal standards is shown for comparison.

Each of the three Figures is suitable for clinical use when reproduced on International Paper Size A4 charts (8½" x 11⅝") as used in most hospitals. Larger versions of the three charts for clinical use are available from the author.

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Fig. 1. Longitudinal weight standards from birth to 18 years of age. Logarithmic weight scale and linear age scale. (Data of Tanner et al. 1966.)
Fig. 2. Weight standards (longitudinal or cross-sectional) from 32 weeks gestation to 5 years of age. Logarithmic weight and age scales. (Data of Tanner et al. 1966, Tanner 1970, Thomson et al. 1968.)
Fig. 3. Cross-sectional weight standards from 32 weeks gestation to 18 years of age. Logarithmic weight and age scales. (Data of Tanner et al. 1966, Tanner 1970, Thomson et al. 1968.)
SUMMARY

A percentile weight standard chart is presented which provides for accurate plotting of an infant’s weight from 32 weeks gestation to 5 years of age, including the traditional birth junction at 40 weeks. Another reference chart provides for accurate reading of cross-sectional standards of weight at any age from 32 weeks gestation to 18 years. A third chart is intended for following the growth of an individual child for a prolonged period at any age up to 18 years. These three charts make use of logarithmic scales to provide the desired sensitivity for plotting or reading off.

REFERENCE

— Thomson, A. M. (1970) 'Standards for birthweight at gestation periods from 32 to 42 weeks, allowing for maternal height and weight.' Archives of Diseases in Childhood, 44, 566.