NOTES ON THE USE OF HEIGHT AND WEIGHT STANDARD CHARTS, (1959)

MEASURING TECHNIQUE

Weight should be taken in the nude, or as near thereto as possible. If a surgical gown or minimum underclothing (vest and pants) is worn, then its estimated weight (about 0-1 kg. or } lb.) must be subtracted before weight is recorded. Weights should be recorded to the nearest 0-1 kg. (J lb.) over the age of six months. The bladder should be empty.

Standing height (recommended from 2 onwards) should be taken without shoes, the child standing with his heels and back in contact with an upright wall. His head is held so that he looks straight ahead with the lower borders of the eye sockets in the same horizontal planaas his external auditory meati (i.e. head not with nose tipped upwards). A right-angled block \ (preferably counterweighted) is then slid down the wall until its bottom surface touches the child's head, and a scale fixed to the wall is read. During the measurement the child should be told to stretch his neck to be as tall as possible, though care must be taken to prevent his heels coming off the ground. Gentle but firm traction upwards should be applied by the measurer under the mastoid processes to help the child stretch. In this way the variation in height from morning to evening is minimised. Standing height should be recorded to the **nearest** 0-1 cm. or } in.

Supine length (recommended up to the age of 3 so that there is overlap of records of this with standing height at 2 to 3) is taken on a flat surface, with the child lying on his back. One observer holds his head in contact with a board at the top of the table and another straightens the legs, turns the feet at right-angles to the legs and brings a sliding board in contact with the child's heels.

USE OF CHARTS

The heights and weights may be most easily charted by using a transparent ruler, especially if the measurements have been recorded in inches and pounds. The charts give the third, tenth, twenty-fifth, fiftieth, seventy-fifth, ninetieth and ninety-seventh percentiles. The meaning of the tenth percentile, for example, is that 10 per cent of all normal children are shorter than the height corresponding to it at the age concerned. The percentile status of the child should be recorded approximately, interpolating to the nearest fifth by eye.

The limits of normality taken must depend on the purpose for which the standards are being used. They also depend on the level of the average values obtained in a given clinic; regional variations may require a slight shifting of the scale from place to place. Some allowance for Registrar-General Occupational Category differences may also be made. As a rough guide, however, one might say that children outside the area of the tenth to ninetieth percentile range should be regarded with slight suspicion, and those outside the third to ninety-seventh range as unhealthy until proved otherwise.

GROWTH PROGRESS: ADOLESCENCE: USE OF SKELETAL AGE

The growth progress of a child may be followed by repeated plots on the charts and recorded on the front page. It must be borne in mind, however, that these standards are of height and weight achieved at a given age and not of rate of growth from one age to another. Hence they do not provide a sure guide to knowing whether an increase in percentile status from one year to another (following a period of treatment perhaps) is significant or not. Obviously, however, a child whose height lies at the ninetieth percentile at 5 and at the fiftieth at 6, though normal at both from the point of view of size-achieved standards, has suffered a significant retardation of growth rate. At present insufficient longitudinal data exist for standards for rate itself to be constructed.

At adolescence any individual child has a different, and more sharply accelerated, curve than the average child depicted here. Consequently at adolescence most children are to be expected to leave the percentile on which they were previously travelling. If the adolescent growth spurt occurs late the child will sink in percentile status for a year or two and then suddenly catch up again; if adolescence is early, the reverse will occur.

This difficulty may be partly overcome by plotting height and weight in relation to skeletal age rather than chronological age. This is simply done by using the age scale printed but entering the height, etc., at the skeletal age rather than the chronological. At earlier ages also this method is useful, particularly in cases of abnormal growth, for seeing to what extent a small size is due to a proportionate retardation in overall bodily development and to what extent to smallness itself. The range of normality is somewhat narrower when plotted against skeletal age, hence all positions outside the tenth to ninetieth area may be regarded as probably abnormal.

Source of standards

The details of the source data and of the construction of these standards are set forth in Tanner, Modern Trends in Paediatrics, London, Butterworth, 1958). For the most part heights and weights for the ages 0-5 are from the data of the University of London, Institutes of Education and Child Heath, Child Study Centre, and the Oxford Child Health Survey, and for the ages 5J-15 figures from the London County Council survey reported by Scott in 1955. Adjustment for weight of clothing has been made where necessary to reduce the to nude weight, and also a correction for increase in variation due to use of yearly grouping rather than exact age. Height percentiles were calculated on the assumption of a Gaussian distribution at each age; weight percentiles were estimated directly from the frequency distributions. Smoothing was in general carried out graphically.

Stages of puberty

Stages of development of the secondary sex characters may be recorded on the front page. The following standard ratings on a scale of I to 5 may be used. (Taken by kind permission of the publishers from, the standard illustrations in Growth at Adolescence; Oxford, Blackwell Sci. Publ., 1955,)

Boys: genital development:

- Stage I. Pre-adolescent. Testes, scrotum and penis are of about the same size and proportion as in early childhood.
- Stage 2. Enlargement of scrotum and testes. Skin of scrotum reddens and changes in texture. Little or no enlargement of penis at this stage.
- Stage 3. Enlargement of penis, which occurs at first mainly in length. Further growth of testes and scrotum.
- Stage 4. Increased size of penis with growth in breadth and development of glans. Testes and scrotum larger ; scrotal skin darkened.
- Stage 5. Genitalia adult in size and shape.

Girls: breast development:

- Stage 1. Pre-adolescent: elevation of papilla only,
- Stage 2. Breast bud stage: elevation of breast and papilla as small mound. Enlargement of areolar diameter.
- Stage 3. Further enlargement and elevation of breast and areola, with no separation of their contours.
- Stage 4. Projection of areola and papilla to form a secondary mound above the level of the breast.
- Stage 5. Mature stage: projection of papilla only, due to recession of the areola to the general contour of the breast.

Both sexes: pubic hair:

- Stage 1. Pre-adolescent. The vellus over the pubes is not further developed than that over the abdominal wall, i.e. no pubic hair.
- Stage 2. Sparse growth of long, slightly pigmented downy hair, straight or slightly curled, chiefly at the base of the penis or along labia.
- Stage 3. Considerably darker, coarser and more curled. The hair spreads sparsely over the junction of the pubes.
- Stage 4. Hair now adult in type, but area covered is still considerably smaller than in the adult. No spread to the medial surface of thighs.
- Stage 5. Adult in quantity and type with distribution of the horizontal (or classically " feminine ") pattern. Spread to medial surface of thighs but not up lines albs or elsewhere above the base of the inverse triangle (spread up linea alba occurs late and is rated stage 6).

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