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Standards from Birth to Maturity for Height, Weight, Height Velocity, and Weight Velocity: British Children, 1965

Part II*

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(C) Whole-year Velocity Standards: Chronological Age-based and Individual Type

We now consider how to construct velocity standards, to answer our second question 'Has this child's rate of growth been within normal limits?' We are again confronted with the alternatives of plotting against chronological or developmental age at adolescence and we have adopted the same solution as before. First we give, in the conventional manner, centiles plotted against chronological age, over the whole age span. These are calculated simply from two measurements a year apart, without using further longitudinal data. They depend on a two-occasion longitudinal study, nothing further. At adolescence these standards are greatly scattered by the phase-difference effect. If we know nothing about a boy except that he is 12 years old and grew 3 cm. during the last year, we must plot 3 cm. at 11·5 years and interpret this according to the chronological age centiles. If, however, we know that he is mid-pubescent, or that his skeletal age is 14·0 years, then in theory we could make a more effective interpretation if we had the appropriate standards.

We have to remember, however, that in one important respect velocity standards differ from distance ones. In velocity standards a child does not have the same strong tendency to stay in the same centile position from one age to another; there is always a contrary tendency to a move from the outer centile positions towards a more central position in the subsequent year. Though a child can follow the 60th or even 70th centile of velocity from the pre-school years till maturity and end up a large but normal adult, a child who follows the 97th centile for very long would become pathologically enormous. Another way of saying the same thing is to note that while in general the correlations of height at age 5, say, with height at the subsequent age, i.e. 6, is of the order of 0·9, the correlation of height gain from 5 to 6 with gain from 6 to 7 is only around 0·3. This is not to say that patterns of continuously increasing or decreasing velocities do not occur, particularly in pathological cases; but velocity plots must be regarded in a more episodic way than plots of distance.

Chronological age velocity standards of whole-year velocity. To obtain the conventional centiles we began by plotting the yearly increments of height and weight of the Child Study Centre series and the six-monthly increments of the Harpenden Growth Study on probability paper to see whether or not the increments were Normally distributed. Up to adolescence all the height increments were closely fitted by straight lines, but during adolescence considerable curvature occurred, indicating the presence of fairly complex deviations from Normality in the distributions, as indeed would be expected, particularly at ages when some children have actually stopped growing.

The standard deviations of the height increments of these two sets of data from birth to age 8 are plotted on the left hand side of Fig. 16. The lower line represents the smoothed curve of the whole-year SDs from the Child Study Centre, together with similar values from Heierli (1960), which are consistently a little lower, and from Deming and Washburn (1963). The sexes are averaged in all instances. The upper line gives the smoothed curve of six-monthly SDs from the Harpenden Growth Study, with earlier points from the Child Study Centre, Heierli, and Deming data. The six-monthly increments have a consistently higher variability than the yearly increments (when both are converted to cm./yr.). This is so even in the same children. It occurs because the season of the year exerts a considerable effect on the growth of some, though not all, children; in the extreme case a child may grow in height during the spring at one and a half times its rate of growth during the autumn

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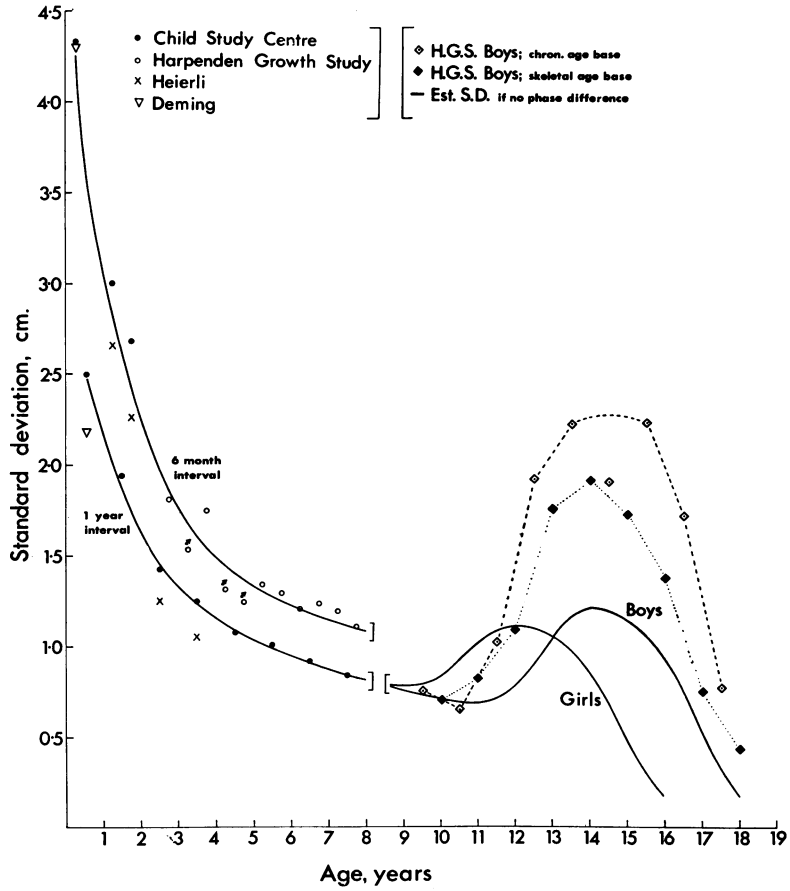

FIG. 16.—Left: *Standard deviations of 6-monthly increments (upper line) and one-yearly increments (lower line) of height, both converted to cm./yr. Various data, smoothed, sexes averaged in pre-adolescent ages. Arrowed points refer to upper line.*

Right: *Smoothed standard deviations of one-year increments computed in years-from-peak-height-velocity as age base, with SD of boys plotted against chronological (note the one aberrant point) and skeletal age. (See text.)*

(Tanner, 1962a). Any six-monthly age period therefore includes children growing rapidly and children growing slowly, except in the relatively rare type of cohort survey, where all children recruited are born in a particular week or month. Over a whole year these seasonal variations are ironed out.

After much deliberation we have decided to present our increment standards in terms of whole-year increments, since this is the minimum period over which seasonal differences between children are eliminated. Any drug having a long-term effect on growth should be administered over a whole year before its final effects are assessed, since otherwise the seasonal influence may be confused with the result of treatment. We routinely see growth-disordered patients three-monthly and compute and plot their three-monthly velocities; but the total yearly velocity is also computed and plotted, and it is this that as a rule governs further therapeutic or scientific decisions (for an example of plotting, see below). The six-monthly SDs are about 30% higher than the whole-year SDs. Thus as a rough guide for interpreting six-monthly increments on the whole-year chart we can say that a six-month centile line is nearly coincident with the next furthest-out centile line on the whole-year chart. Thus a child at the 97th centile over a six-month period is only a little more unusual than a child at the 90th centile over the whole-year period, and his status should be interpreted correspondingly. Three-monthly periods have a still greater variability than six-monthly periods, but the data are too

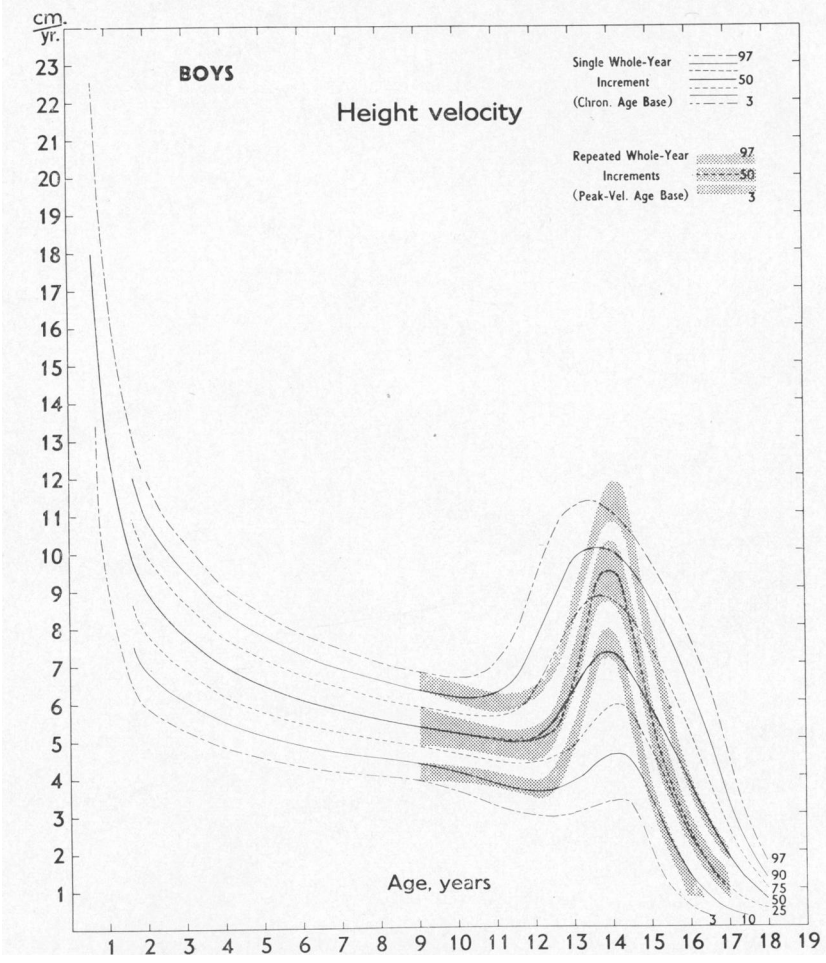

FIG. 17.—*Whole-year velocity standards for height* (boys). *For construction see text.*

scanty to allow an estimate of the magnitude of the difference.

The SDs of increments over a two- or three-year period are lower than the SD over 1 year. Presumably this is because children growing faster at the beginning of such a period decelerate harder than children growing more slowly. Thus the fast beginners end the period relatively slower while the slow beginners end relatively faster. The upshot is that our one-year SDs and centiles cannot be used quantitatively in respect of increments calculated over more than one year any more than they can for increments calculated over less than one year.

For the chronological-age type standards, then, the SDs of the yearly increments from birth till adolescence were calculated and smoothed, and the centiles computed from them. During adolescence the centiles were obtained by smoothing the actual centiles observed in the two sets of admittedly scanty data available to us (covering about 100 children of each sex up to peak velocity and progressively less thereafter).

These centiles are listed in Appendix Table VII and displayed in the conventional manner in Fig. 17 and 18 by means of the continuous and broken lines. These are the standards to use before adolescence, and during adolescence if no data on developmental age are available.

Peak height velocity-centred graphs. At adolescence, as we have seen, the situation is unsatisfactory because of the widely different chronological ages at which children experience their adolescent growth spurt. We had hoped that by the

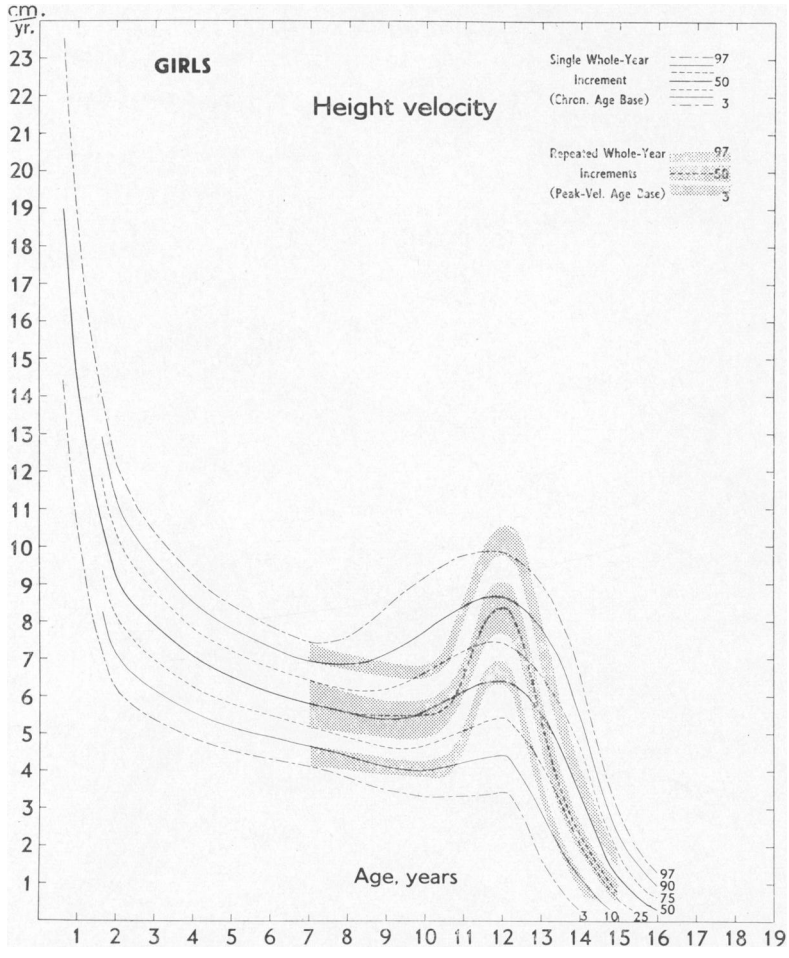

FIG. 18.—*Whole-year velocity standards for height* (girls). *For construction see text.*

use of skeletal age as the time base we would be able to eliminate most of this phase-difference effect, and thus provide more powerful standards. Surprisingly, however, it turned out that skeletal age was not linked closely enough to peak height velocity age to reduce the phase difference very greatly. Some reduction is certainly made; it is illustrated for boys in the right-hand section of Fig. 16. The broken line shows the increase in standard deviation of height velocity at adolescence (note the one aberrant point, through which the line has not been drawn); the next line below, dotted, shows the SD when plotted against skeletal age, and the continuous line far below represents the estimated SD on peak height velocity age, when phase differences have been eliminated. Looked at another way, we may note that the SD of chronological age at the moment of peak height velocity is 0·86 yr. in boys and 0·87 yr. in girls, and the SD of skeletal age at the same point is 0·50 yr. and 0·62 yr. But we need a standard deviation of zero, and skeletal age leaves us far from that.

Accordingly, instead of plotting, as we had hoped, skeletal age centiles superimposed on the chronological age centiles in Fig. 17 and 18, we have put in the rather impractical, but theoretically very important, channels based on peak height velocity age. As in the case of distance, these are plotted as shaded bands, with a dashed 50th centile typical-individual curve in the centre of the middle band. This typical-individual curve represents the velocity taken at each successive year by an individual who has his peak at the average age and an average velocity throughout adolescence. Such an individ-

ual will *not* travel up the 50th centile of the conventional (single-increment) velocity standards, just as he did not travel up the 50th centile of the conventional distance standards. But here the resemblance to the two distance standards ends; for we have to remember that a child does not usually travel throughout adolescence along one of the outer centiles even of the individual velocity plots. Some children may do so; a boy who remained at the 90th shaded centile from age 12 to 17 would gain a total of 24 cm. compared with the 20 cm. gained by the 50th centile boy. This is not a big difference; but it probably represents a bias, as there is little evidence that a boy whose peak velocity is at the 90th centile actually has a velocity curve which is wider than the boy whose PHV is at the 50th centile, as the charts may seem to indicate. With this proviso, however, the shaded curves do represent the *shape* of the individual child's growth spurt at adolescence much better than the single-increment line centiles.

Besides being able to judge whether the magnitude of a child's peak velocity is within normal limits we need to know whether the age at which it occurs is normal too. The standard deviation of the age of peak height velocity is about 0·9 yr. Thus we may take the individual 50th peak height velocity point, and imagine two age limits for its occurrence, one 1·8 yr. earlier nd the other 1·8 yr. later. Since, however, early maturers have on average a higher PHV than late maturers, this 'early-50th' point will be raised some 1·4 cm./yr. above the 'middling-50th' point and the 'late-50th' point will be lower by the same amount. These two points represent the same probability of occurrence of a peak height velocity as the 97th and 3rd magnitude points at average age. Other similar points could be found and an ellipse constructed, which would define the limits within which the normal PHV would lie. However, this would be unduly cumbersome and we can instead find a simpler, and approximately equivalent guide in the 97th centile of the *single-increment* lines. This was constructed so that 97 out of 100 peaks fell below it, irrespective of whether they were occurring early or late.

Thus we can use the 97th single-increment line as the outer normal limit for peak height velocity points, whether they are early or late. Similarly we can use the 3rd single-increment line as the lower limit. In other words, nearly all normal individuals' velocity curves have the shape of the repeated-increment shaded curves, and are wholly contained within the shell defined by the single-increment 3rd and 97th percentile lines. The same principle applies to weight velocity.

The peak height velocity-centred curves, as we may call the shaded ones, were calculated from the smoothed standard deviations observed in the Harpenden Growth Study data when these were lined up on a peak height velocity age basis, so that the SDs for PHV-3 years, PHV-2 years, etc. were computed. The distribution of height velocity at these 'ages', i.e. when the phase difference was removed, became indistinguishable from Normal. The values are given in Appendix Table IX, and the smoothed SDs plotted in the right-hand panel of Fig. 16.

The 50th centile of this system of curves relates to increments taken over a whole year and so is slightly different from the individual-type 50th centiles given in Fig. 8 and 9 (p. 466), which represented the instantaneous velocity. The instantaneous velocity median can only be used for a standard when a curve has been fitted to the height-attained values of a child and then differentiated to give an estimate of the true instantaneous velocity of the child. The difference between whole-year increments and instantaneous velocity is only quantitatively important when the curves show a sharp peak or trough, i.e. at peak adolescent velocity. We have calculated graphically for each boy and girl the average increment over the whole year containing, at its centre, the peak velocity. Naturally this 'peak' whole-year increment is less than the instantaneous peak velocity, the boys' average being 9·5 cm./yr. (compared with 10·3 for instantaneous peak velocity) and the girls' 8·4 cm./yr. (compared with 9·0 instantaneous). The SDs are, respectively, 1·1 cm./yr. and 0·9 cm./yr. (compared with 1·5 and 1·0 for instantaneous). We have thus flattened out the very steeply rising curves.

A small further modification should perhaps also have been made. The curves we have now produced relate to children whose peak height velocity falls exactly at the mid-point of their interval between measurements. This follows from the way in which we modified the instantaneous curves to obtain whole-year ones. But a child's peak height velocity might actually occur the day after his measuring day and hence six months away from the central point. In practice we must deal with whole-year velocities calculated on this basis, in which peaks occur any time within the year. This lowers again the average peak height velocity, though not very greatly. In the case of boys the peak height velocity calculated from the actually observed whole-year increments in the Harpenden Growth Study data comes to 9·0 cm./yr. (compared to 9·5 for whole-year centred) and for girls 7·9 (compared to 8·4 for whole-year centred). This would bring our average peak velocities down to just about the level observed by others who have reported simply the maximum yearly increment without resorting to curve-fitting to find the instantaneous peak. Kiil (1941), for example, in 135 Norwegian boys, found an average peak of 9·5 cm./yr. (at 14·3 years) and in 189 girls a peak of 7·6 cm./yr. (at 12·2 years). The Bayer and Bayley (1959) standards, based presumably on similarly computed whole-year-increments give peaks of 9·0 cm./yr. and 8·0 cm./yr. for boys and girls maturing at an average age. In our standards, however, we have let the whole-year centred velocities stand.

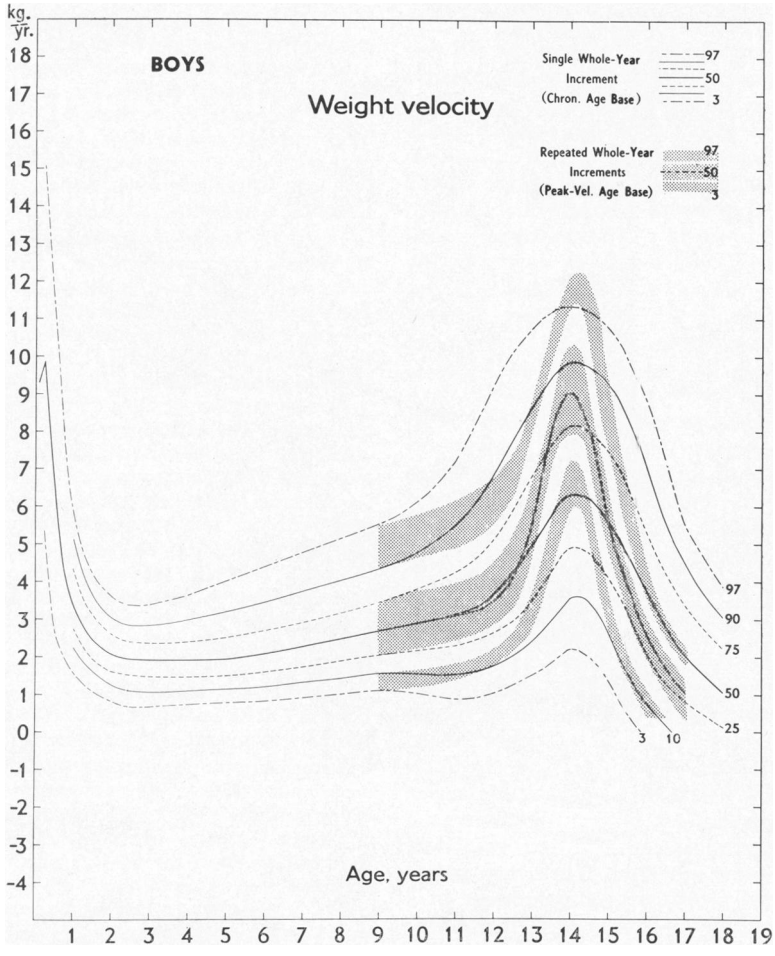

FIG. 19.—*Whole-year velocity standards for weight* (boys). *For construction see text.*

We have plotted out the centiles for our data against a time base of Tanner-Whitehouse skeletal age, and confirmed that they lie, as expected, between the two sets of curves given in the Figures. It seems, however, that the increased precision of the skeletal-age-based assessments is insufficient to be really important. The skeletal age curves are more peaked and lie approximately one degree further towards the centre than the chronological-age curves, that is the 97th on the skeletal age base very roughly corresponds to the illustrated 90th on the chronological base, and the 3rd to the 10th. This, however, is when the bone-ageing is all done by one experienced rater; in less accustomed hands the relative lack of reliability of any technique of bone-ageing compared with counting chronological age would make the two sets of curves more nearly coincident.

When skeletal age is used as a time base, the child's increment from one occasion to another should be worked out in terms of the actual time elapsed between the two occasions, that is from the chronological age change. Skeletal ages are subject to too much unreliability to be usually suitable for calculating an increment in terms of cm./yr. But the increment, when calculated, should be plotted at the mid-point of the two skeletal ages, one corresponding to the beginning of the increment period, the other to the end of it. In special circumstances menarcheal age could be used instead of skeletal age. If the average age of menarche is taken as 13·0, a girl whose menarche occurred at 12·0 has her 14·0-

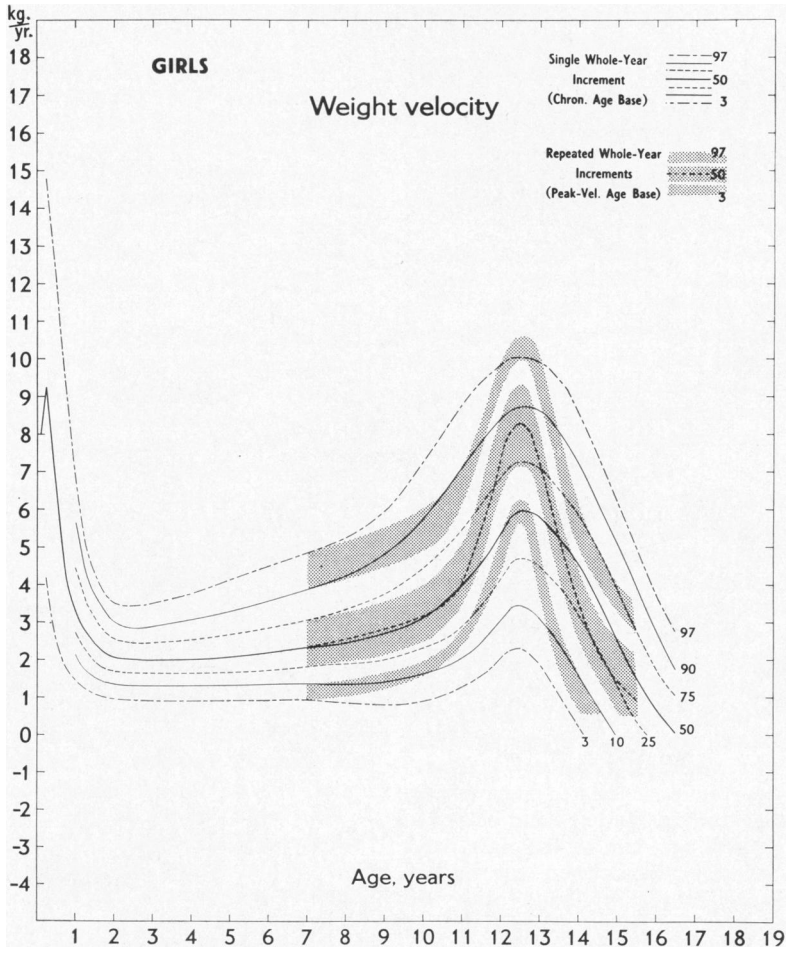

FIG. 20.—*Whole-year velocity standards for weight* (girls). *For construction see text.*

15·0 increment plotted at 15·5, i.e. 14·5 plus 1 year. If her menarche was at 14·0, her 14 to 15 increment would be plotted at 13·5. The stages of development of secondary sex characters could be used in a similar way once their median ages of occurrence had been well established in a population. However, this would probably entail a considerably greater degree of inaccuracy than skeletal age.

Weight velocity standards. The weight increments did not fall in a straight line when plotted on probability paper. Weight increments, like weights themselves, are somewhat skewed. Curved lines were, therefore, fitted by eye to the distributions at each age, the curves making a regular progression in shape from one age to the next. From these the centile points at each age from birth to adolescence were read off, and these are the figures used in the standards, after final smoothing. Boys and girls had to be treated separately as significant differences were clearly present. The chronological age standards are given in Fig. 19 and 20 and Appendix Table VIII.

For the peak weight velocity-centred curves whole-year peak increments had again to be calculated, and these were 9·1 kg./yr. for boys and 8·3 kg./yr. for girls, compared with instantaneous peak weight velocities of 9·8 kg./yr. and 8·8 kg./yr. These curves are shown shaded in Fig. 19 and 20 and are tabulated in Appendix Table X.

Standards for degree of advancement. The degree of advancement is an important statistic from the clinical point of view. No formal standards for it are needed, since it is adequately measured by the difference between chronological age and skeletal

age (or, less well, menarcheal age). The standard deviation of this difference during adolescence is approximately 1·0 years. Thus a deviation of greater than 2 years either way may be regarded as beyond the usual normal limits. At ages before adolescence the standard deviation of the difference is less, but the degree of advancement then is better read directly from the centile charts for skeletal maturity (Tanner *et al.*, 1962).

In the individual-type distance chart, degree of advancement can to some extent be appreciated if the child has been followed for some time. The curve of an early-maturing boy at adolescence rises approximately parallel with the median line, but at an earlier age. The distance apart of the two lines at their steepest points therefore gives an indication of the degree of advancement when peak velocity is reached.

(D) Clinical Use of the Standards

Two examples of the use of the standards follow: one concerns a healthy boy followed from age 3 to 16; the other illustrates a clinical case in which the effect of treatment is by no means obvious when looked for in the distance plots only.

The course of the healthy boy's growth in height is plotted in Fig. 21, the distance curve on the left, the velocity curve on the right. We routinely plot height against skeletal age as well as chronological age; in this way we can assess the degree of smallness and retardation separately, at least to some extent. Thus the stars represent in the left-hand chart the height at each skeletal age, and in the right-hand chart the height velocity over a period between two skeletal age points. In the left-hand chart the round dots represent the height plotted against chronological age every six months, and the stars represent the height plotted against skeletal age at yearly intervals. The horizontal distance between corresponding dots and stars therefore shows the amount in years by which chronological and skeletal age differ. For example, at chronological age 5·0 (and height approx. 105 cm.) skeletal age is 5·5 years. At chronological age 3·05, however (the first point), skeletal age is 2·8 years. Note that we use the decimal system of age throughout, and the charts* are printed with the vertical grid lines in tenths of a year. (The charts are printed in two colours so that the grid disappears on photographic reproduction, except in the shaded area.) We find decimal age far easier to handle than the traditional division into years and months, both for clinical and research purposes, and its use is virtually essential for calculating velocities. The table for converting the regular calendar into decimals (Jan. 1, 1966 = 66·000, July 1, 1966 = 66·496, Dec. 31, 1966 = 66·997) and the methods for calculating the age of the child in decimals are given in Appendix II.

The height of the healthy boy (Fig. 21) lies mostly at about the 25th centile, but his first three points are distinctly below this. On entry to the children's home at age 3 he had a history of neglect and undernourishment, and it is probable that at that time he was retarded in his growth. The first few points probably represent a catch-up towards his normal curve.

At adolescence he follows the individual-type curve as expected, but then as adolescence finishes he drops back to about the 10th centile. His skeletal age, though initially retarded, soon becomes about a year in advance, and maintains this pattern throughout the rest of his growth. Thus his final height, while seeming to be smaller than expected from his chronological age plot, is just what would be predicted from his skeletal age plot, where he is mostly at or a little below the 10th centile.

In the velocity graph (Fig. 21, right), the average yearly velocity is plotted, with the dot at the centre of the year concerned, i.e. the velocity from 3·0 to 4·0 is plotted at 3·5 years. The stars represent the same rates of growth, but plotted at the mid-interval between the two skeletal ages, that is, in this example, between the skeletal age at chronological 3·0, and the skeletal age at chronological 4·0.

This boy's velocity of height growth during the first year after admission to the home was above the 97th centile; during the second year it dropped to the 90th centile, and thereafter remained mostly between the 40th and 80th centiles. At adolescence the curve follows the individual-type shaded curve but with a peak about half a year earlier than average. Correspondingly, the growth rate has fallen to the 5th centile by age 15-16 and will clearly soon reach zero. When plotted in skeletal age terms (the stars and dotted line) the same centile positions hold before adolescence, but the peak comes later, about six months after the average time of peaking. Thus in chronological age terms this boy has an adolescent height spurt six months earlier than the average boy, but in relation to his skeletal development the peak is a little later than average.

The second example concerns a dwarfed child believed to be suffering from defective secretion of growth hormone. The distance plots, on the left-hand side of Fig. 22, are self-explanatory. Treatment is shown, the figures representing I.U. of human growth hormone per week. For convenience, horizontal dots are drawn between the corresponding chronological and skeletal age plots at the

* Obtainable from Creaseys of Hertford, Herts. See note at end of this article, on p. 624.

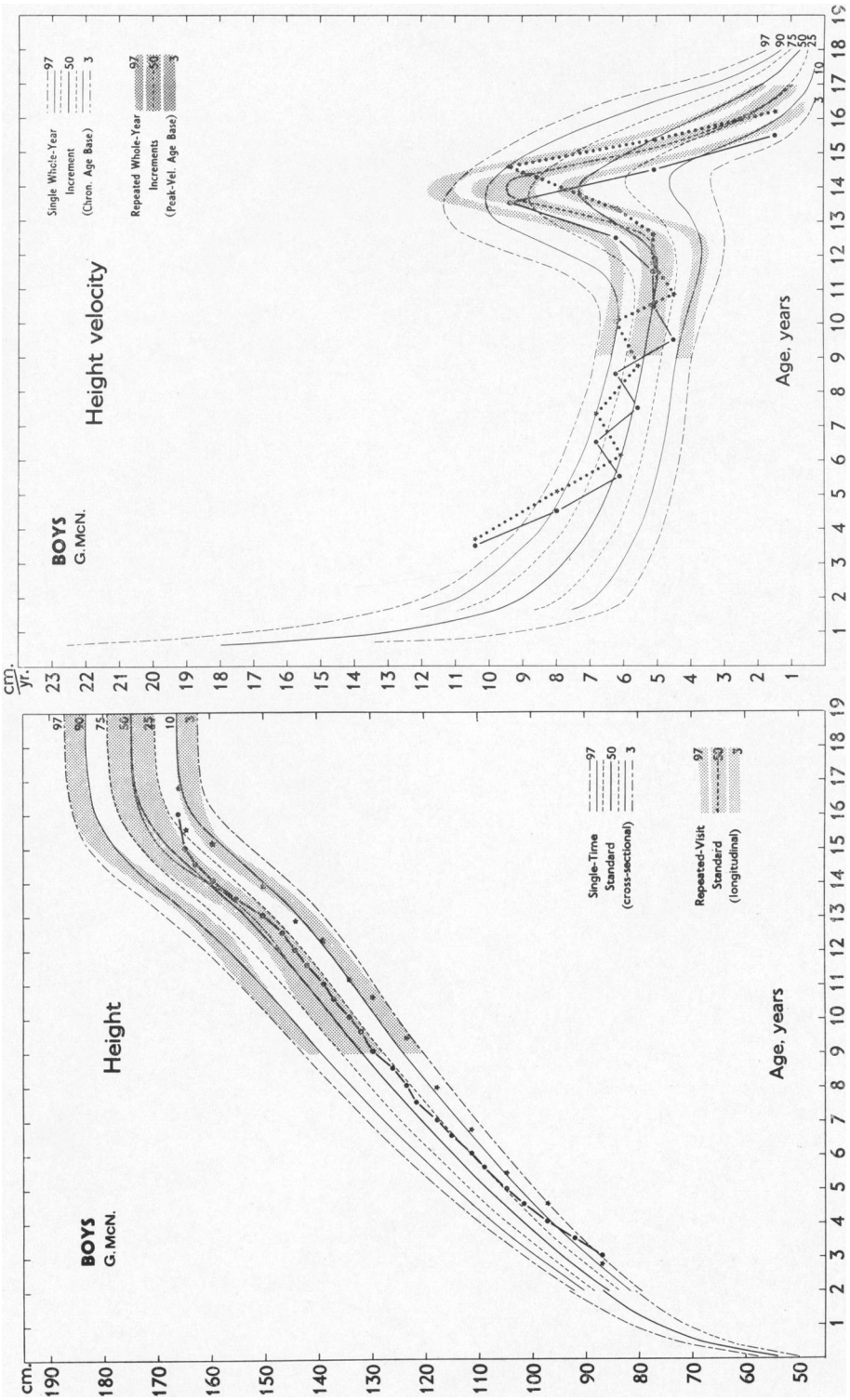

FIG. 21.—*Growth in height of a healthy boy plotted on new standards.* Left, *distance or height-attained curves,* ●—●—● *plotted against chronological age;* * * *, plotted against skeletal age.* Right, *increment curve,* ●——● *plotted at chronological age;* *.....* *at skeletal age.*

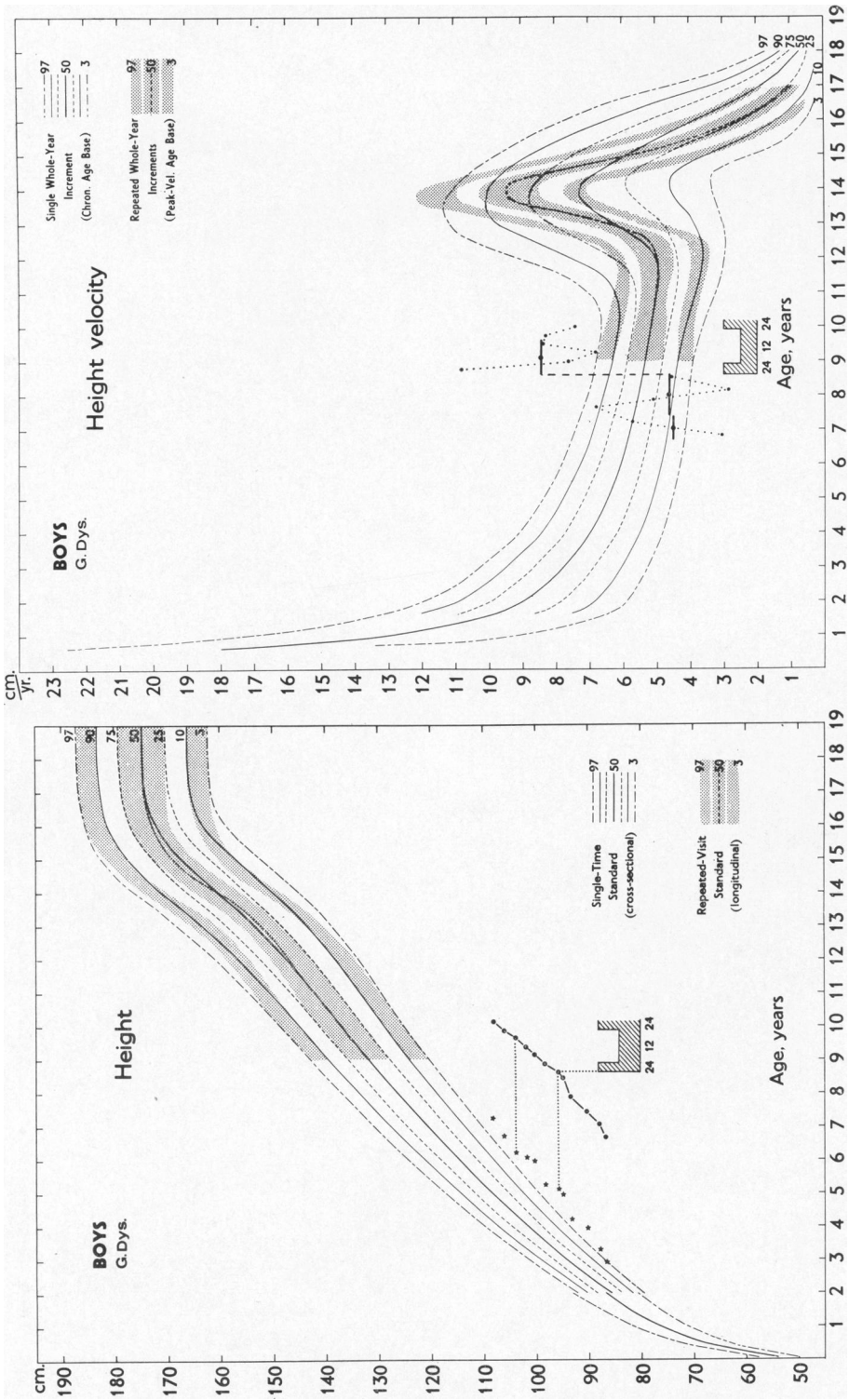

FIG. 22.—*G. Dys., a dwarf treated with human growth hormone.* **Left,** *height achieved.* **Right,** *height velocity, plotted against chronological age. The time and amount of treatment is indicated by the hatching. Figures indicate international units of human growth hormone per week.*

beginning of and after a year of treatment, so that the effect of treatment on skeletal development can be more easily appreciated. (In hypothyroid children treated with thyroxine, for example, the lag of skeletal age greatly diminishes and the lines of dots and stars approach each other.)

In this child, however, it is not at all clear from the distance chart alone whether administration of the hormone had any significant effect. In the velocity curve (Fig. 22, right) however, the effect is seen quite clearly.

A problem arises when plotting the velocity in cases where treatment has been given. Whereas each distance plot represents a measurement taken at a particular point in time, each velocity plot represents only the average velocity over the time elapsed between the measuring sessions. It must not be assumed, therefore, that each velocity point represents the instantaneous velocity at that point in time; on the contrary it would only do so if the velocity curve were rectilinear over the period concerned. We plot the velocity point at the centre of the period considered, since this accords with mathematical practice. But where necessary (not in this instance) we place a horizontal line in relation to each velocity point to indicate the period of time over which the velocity represented was measured. Further, since our standards are whole-year increment standards, we put in with a heavy bar the average velocity over each yearly period as well as plotting 3-monthly velocities, according to the visits to the clinic. (The velocity is represented by the top level of the bar.) It is this yearly velocity which is accorded the chief importance and on which we normally make decisions as to treatment.

A purely illustrational difficulty arises when a treatment is started or stopped, or when other radical change in circumstances occurs. Prof. Andrea Prader has pointed out to us that if the yearly velocity mid-points are simply connected one with another (as in normal individuals' plots) it may look as though the response to treatment began in the middle of the period preceding treatment. In these circumstances, therefore, we do not join up the mid-points, but continue a line along the top of the pre-treatment average until we come to the treatment period. We then go up (or down) with a dashed line vertically to the top of the first treatment velocity, and then along horizontally till we get to the first treatment velocity mid-point (see Fig. 22, right). This system has the double advantage of accentuating visually the time of the beginning of treatment, and approaching more closely to the true velocity situation; for in Fig. 22 the velocity directly after treatment was probably greater than represented, and not less, as would appear if we joined up the two velocity mid-points. We have thus changed our method of plotting from that of a previous paper (Prader *et al.*, 1963).

The small dots, joined before and again during treatment by dotted lines, represent 3-monthly velocities. These vary considerably, perhaps partly due to a seasonal effect, since the maximum velocity for the year was reached at ages $7\frac{3}{4}$, $8\frac{3}{4}$, and $9\frac{3}{4}$ (though not at $6\frac{3}{4}$), irrespective of whether treatment was given or not. But the solid lines representing the whole-year velocities show that the pre-treatment rates were at the 10th centile, whereas the rates during treatment were above the 97th. Almost certainly, then, the hormone has caused significant acceleration. (A case in which the result of treatment was clinically rather poor has been chosen to illustrate the point we desire to make; in suitable cases growth hormone causes a much greater increase in rate of growth than this.)

The effect of treatment on skeletal age can be seen in the distance plot. Skeletal age was 3·5 years retarded at the beginning of treatment, and remained so at the end. The velocity curves plotted against skeletal age therefore reproduce closely those plotted on chronological age, merely shifted to the left. They are, therefore, not reproduced here.

Finally, we would like to stress that the distance and velocity plots are not competitive; they are complementary. Distance plots give some information not present in velocity plots. One treats a hypopituitary patient with growth hormone, for example, and the velocity shows a great success; but only the distance plot shows when to stop.

Summary

Conventional centile standards of height and weight attained at each age from birth to maturity, appropriate for British children in 1965, are given. These differ from previous standards because children have become larger. They answer the question, 'Is this child's size within normal limits?' in a circumstance in which the child has been examined once only.

In the same chart a new type of standard is also given, which is more appropriate for judging whether a whole segment of the child's growth curve has been normal. Conventional charts give an erroneous impression of the course of growth at adolescence if used to follow a single child longitudinally, as in clinical work. This is due to the 'phase-difference' effect which is discussed and illustrated. In conventional charts a late-maturing child, for example, departs at adolescence from the

height centile he has previously been following, reaches a lower centile, and later regains his original centile. In the new 'individual-type' charts this effect is obviated.

Centile standards for the velocity of growth in height and weight from birth to maturity are presented. They relate to increments calculated over the period of a whole year, since over shorter periods the variability of growth rate is higher due to seasonal alterations. In addition to these standards, at adolescence the velocity equivalent of the new type of height-attained standard is given. This shows the curve of velocity where phase differences are eliminated. The use of skeletal age as an alternative time base to chronological age over this period is discussed.

To obtain the curves for the new 'individual-type' standards it is necessary to use longitudinal records extending over adolescence. The records of the Harpenden Growth Study were used for this purpose. In 49 boys and 41 girls measured every three months throughout adolescence, curves were fitted graphically to height and weight measurements and velocities thus derived. The average 'instantaneous' peak height velocity was $10 \cdot 3 \pm 0 \cdot 22$ cm./yr. in boys and $9 \cdot 0 \pm 0 \cdot 16$ cm./yr. in girls. There was a correlation of $-0 \cdot 47$ and $-0 \cdot 40$ in boys and girls between peak height velocity and the age at which it was reached. No such correlation existed for peak weight velocity. The peak weight velocity was $9 \cdot 8 \pm 0 \cdot 30$ kg./yr. for boys and $8 \cdot 8 \pm 0 \cdot 25$ kg./yr. for girls. The correlations between peak height velocity and peak weight velocity were only $0 \cdot 29$ and $0 \cdot 18$ in boys and girls, but the correlations between age at reaching peak height velocity and at reaching peak weight velocity were $0 \cdot 93$ and $0 \cdot 80$.

Curves of distance and velocity for the typical or 50th centile boy and girl are contrasted. In both height and weight boys are growing faster than girls at birth, but are also decelerating more, so that by 7 or 8 months they are growing more slowly than girls.

Examples are given of the clinical use of the new standards, in a healthy child followed from 3 to 16, and in a dwarf treated with human growth hormone. Height and weight are routinely plotted against both chronological and skeletal age. The way in which plots of 'distance' and velocity of growth complement each other is discussed, and the extreme methodological difficulty of providing a valid quantitative answer to the seemingly simple question 'Has this treatment significantly altered the child's rate of growth?' It is shown how the new charts can at least be used to give an approximate answer to this question.

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Charts

Two versions of the charts are commercially available (from Creasey's, Hertford, Herts). The larger is double foolscap size and is the two-colour version described in this paper. The smaller is made to fit inside the usual hospital notes; in this version the age-scale is in two-tenths per year and the vertical scales correspondingly reduced. The hospital version has the table of decimal age instruction for use of the charts printed on it.

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Appendix I

TABLE I

'Instantaneous' 50th Centile Velocities for Height of Boys and Girls from Birth to Maturity

Age (yr.)	Velocity (cm./yr.)		Boys		Girls	
	Boys	Girls	Age (yr.)	Velocity (cm./yr.)	Age (yr.)	Velocity (cm./yr.)
0·16	40·00	36·00	10·25	5·12	10·10	5·44
0·37	30·00	26·00	10·75	5·04	10·30	5·52
0·62	18·00	19·00	11·25	4·98	10·50	5·64
0·87	14·50	15·90	11·75	4·94	10·70	5·84
1·12	12·30	13·50	12·10	4·97	10·90	6·14
1·37	11·10	11·80	12·30	5·04	11·10	6·64
1·62	9·90	10·60	12·50	5·20	11·30	7·20
1·87	9·20	9·60	12·70	5·45	11·50	7·80
2·25	8·60	8·70	12·90	5·88	11·70	8·40
2·75	8·02	8·12	13·10	6·53	11·85	8·86
3·25	7·60	7·64	13·30	7·40	11·95	8·96
3·75	7·16	7·22	13·50	8·50	12·05	8·94
4·25	6·84	6·88	13·70	9·46	12·15	8·76
4·75	6·60	6·60	13·85	10·10	12·30	8·22
5·25	6·36	6·36	13·95	10·30	12·50	7·34
5·75	6·18	6·18	14·05	10·26	12·70	6·52
6·25	6·00	6·00	14·15	9·90	12·90	5·68
6·75	5·84	5·84	14·25	9·06	13·25	4·40
7·25	5·74	5·74	14·50	8·00	13·75	2·82
7·75	5·60	5·60	14·70	7·00	14·25	1·86
8·25	5·50	5·50	14·90	6·10	14·75	1·08
8·75	5·40	5·49	15·25	4·70	15·25	0·52
9·25	5·30	5·46	15·75	3·20		
9·75	5·20	5·44	16·25	2·08		
			16·75	1·22		
			17·25	0·62		

For explanation, see text and Fig. 8.

TABLE II

'Instantaneous' 50th Centile Velocities for Weight of Boys and Girls from Birth to Maturity

Age (yr.)	Velocity (kg./yr.)		Boys		Girls	
	Boys	Girls	Age (yr.)	Velocity (kg./yr.)	Age (yr.)	Velocity (kg./yr.)
0·10	9·30	8·00	11·25	3·14	11·25	4·64
0·20	10·60	9·80	11·75	3·30	11·75	6·20
0·30	9·10	8·70	12·25	3·70	12·10	7·70
0·50	6·80	6·60	12·75	4·68	12·30	8·50
0·70	4·60	4·60	13·10	5·70	12·50	8·80
0·90	3·60	3·60	13·30	6·68	12·70	8·40
1·10	3·10	3·10	13·50	7·74	12·90	7·50
1·30	2·74	2·74	13·70	8·84	13·25	6·10
1·50	2·44	2·44	13·90	9·74	13·75	4·30
1·70	2·29	2·28	14·10	9·74	14·25	2·82
1·90	2·11	2·11	14·30	8·92	14·75	1·68
2·25	1·98	2·03	14·50	7·90	15·25	1·00
2·75	1·92	2·00	14·70	6·90	15·75	0·66
3·25	1·90	2·00	14·90	6·00	16·25	0·44
3·75	1·90	2·00	15·25	4·60		
4·25	1·90	2·00	15·75	3·16		
4·75	1·90	2·03	16·25	2·24		
5·25	1·94	2·08	16·75	1·50		
5·75	2·02	2·14	17·25	1·06		
6·25	2·11	2·21	17·75	0·80		
6·75	2·21	2·28				
7·25	2·31	2·38				
7·75	2·42	2·48				
8·25	2·52	2·60				
8·75	2·62	2·73				
9·25	2·72	2·88				
9·75	2·82	3·05				
10·25	2·92	3·26				
10·75	3·02	3·68				

For explanation, see text and Fig. 9.

TABLE IIIA

Cross-sectional-type Standards for Supine Length (up to 2) and Height Attained, Boys

Age (yr.)	Centiles (cm.)							SD	50th Centile as % Adult Height
	3rd	10th	25th	50th	75th	90th	97th		
0·08	50·2	51·4	52·7	54·0	55·4	56·6	57·8	2·00	30·9
0·25	56·6	57·9	59·2	60·7	62·1	63·4	64·7	2·16	34·7
0·50	63·8	65·2	66·6	68·2	69·7	71·2	72·6	2·34	39·0
0·75	67·9	69·4	71·0	72·7	74·4	75·9	77·4	2·52	41·6
1·00	71·2	72·8	74·5	76·3	78·1	79·7	81·4	2·69	43·7
1·25	74·0	75·7	77·4	79·4	81·3	83·0	84·7	2·85	45·4
1·50	76·5	78·3	80·1	82·1	84·2	86·0	87·8	3·01	47·0
1·75	78·7	80·6	82·5	84·6	86·7	88·7	90·5	3·15	48·4
2·00	80·7	82·7	84·7	86·9	89·1	91·1	93·1	3·30	49·8
2·0	79·7	81·7	83·7	85·9	88·1	90·1	92·1	3·30	49·2
2·5	83·5	85·6	87·8	90·2	92·6	94·8	96·9	3·57	51·6
3·0	87·0	89·3	91·6	94·2	96·8	99·1	101·4	3·83	53·9
3·5	90·4	92·8	95·3	98·0	100·8	103·2	105·7	4·07	56·1
4·0	93·5	96·1	98·7	101·6	104·5	107·1	109·7	4·30	58·2
4·5	96·5	99·2	102·0	105·0	108·1	110·8	113·5	4·52	60·1
5·0	99·4	102·2	105·1	108·3	111·5	114·4	117·2	4·74	62·0
5·5	102·2	105·2	108·2	111·5	114·8	117·8	120·8	4·94	63·8
6·0	104·9	108·0	111·1	114·6	118·1	121·2	124·3	5·14	65·6
6·5	107·6	110·8	114·0	117·6	121·2	124·4	127·6	5·31	67·3
7·0	110·3	113·5	116·8	120·5	124·2	127·5	130·8	5·46	69·0
7·5	112·9	116·2	119·6	123·4	127·2	130·6	133·9	5·60	70·6
8·0	115·4	118·8	122·3	126·2	130·0	133·5	137·0	5·73	72·2
8·5	117·9	121·4	125·0	128·9	132·9	136·4	139·9	5·85	73·8
9·0	120·4	124·0	127·6	131·6	135·7	139·3	142·9	5·98	75·4
9·5	122·8	126·5	130·2	134·3	138·4	142·1	145·8	6·10	76·9
10·0	125·1	128·8	132·6	136·8	141·0	144·8	148·5	6·24	78·3
10·5	127·2	131·0	135·0	139·3	143·6	147·6	151·4	6·44	See Table VA
11·0	129·4	133·3	137·4	141·9	146·4	150·4	154·4	6·67	
11·5	131·7	135·8	140·0	144·7	149·4	153·6	157·8	6·95	
12·0	133·7	138·0	142·4	147·3	152·2	156·6	160·9	7·24	
12·5	136·3	140·7	145·3	150·3	155·4	159·9	164·4	7·48	
13·0	138·7	143·4	148·2	153·4	158·7	163·5	168·2	7·82	
13·5	141·5	146·4	151·3	156·8	162·3	167·2	172·0	8·11	
14·0	145·0	150·0	155·0	160·7	166·3	171·3	176·2	8·31	
14·5	148·4	153·4	158·4	164·0	169·6	174·6	179·6	8·30	
15·0	152·3	157·1	161·9	167·3	172·7	177·6	182·4	8·00	
15·5	155·9	160·4	165·0	170·1	175·2	179·8	184·3	7·55	
16·0	158·9	163·1	167·4	172·2	177·0	181·3	185·5	7·08	
16·5	160·7	164·8	168·9	173·5	178·0	182·1	186·2	6·77	
17·0	161·7	165·7	169·8	174·3	178·8	182·8	186·8	6·67	
17·5	162·0	166·0	170·0	174·5	179·0	183·0	187·0	6·66	
18·0	162·2	166·2	170·2	174·7	179·2	183·2	187·2	6·65	

For source of data and method of construction, see text.

TABLE IIIB

Cross-sectional-type Standards for Supine Length (up to 2) and Height Attained, Girls

Age (yr.)	Centiles (cm.)							SD	50th Centile as % Adult Height
	3rd	10th	25th	50th	75th	90th	97th		
0·08	49·2	50·4	51·6	53·0	54·4	55·6	56·8	2·00	32·7
0·25	54·9	56·2	57·5	59·0	60·5	61·8	63·1	2·16	36·4
0·50	61·1	62·5	63·9	65·5	67·1	68·5	69·9	2·34	40·4
0·75	65·5	67·0	68·6	70·2	72·0	73·5	74·9	2·52	43·3
1·00	69·1	70·8	72·4	74·2	76·0	77·7	79·3	2·69	45·7
1·25	72·2	73·9	75·7	77·6	79·5	81·2	82·9	2·85	47·8
1·50	74·9	76·7	78·5	80·5	82·6	84·4	86·2	3·01	49·7
1·75	77·2	79·1	81·1	83·2	85·3	87·2	89·1	3·15	51·3
2·00	79·4	81·3	83·4	85·6	87·8	89·8	91·8	3·30	52·8
2·0	78·4	80·3	82·4	84·6	86·8	88·8	90·8	3·30	52·1
2·5	82·2	84·3	86·5	88·9	91·3	93·5	95·6	3·57	54·8
3·0	85·7	88·1	90·4	93·0	95·6	97·9	100·2	3·83	57·3
3·5	89·2	91·6	94·1	96·8	99·6	102·0	104·5	4·07	59·7
4·0	92·3	94·9	97·5	100·4	103·3	105·9	108·5	4·30	61·9
4·5	95·4	98·1	100·8	103·8	106·9	109·7	112·4	4·52	64·0
5·0	98·2	101·1	104·0	107·2	110·3	113·2	116·1	4·74	66·1
5·5	101·0	104·0	107·0	110·3	113·7	116·7	119·6	4·94	68·0
6·0	103·8	106·8	110·0	113·4	116·9	120·0	123·1	5·14	69·9
6·5	106·4	109·6	112·8	116·4	120·0	123·2	126·4	5·31	71·8
7·0	109·1	112·4	115·7	119·3	123·0	126·3	129·6	5·46	73·6
7·5	111·7	115·0	118·4	122·2	126·0	129·4	132·8	5·60	75·3
8·0	114·2	117·6	121·1	125·0	128·9	132·4	135·8	5·75	77·1
8·5	116·7	120·3	123·8	127·8	131·8	135·3	138·8	5·87	See Table VB

TABLE IIIB—*continued*

Cross-sectional-type Standards for Supine Length (up to 2) and Height Attained, Girls

Age (yr.)	Centiles (cm.)							SD	50th Centile as % Adult Height
	3rd	10th	25th	50th	75th	90th	97th		
9·0	119·3	122·9	126·6	130·6	134·6	138·3	141·9	6·00	
9·5	121·9	125·6	129·3	133·5	137·6	141·3	145·0	6·14	
10·0	124·5	128·3	132·1	136·4	140·6	144·5	148·3	6·31	
10·5	127·1	131·1	135·0	139·5	143·9	147·9	151·8	6·56	
11·0	129·5	133·7	138·0	142·7	147·4	151·6	155·8	6·97	
11·5	132·0	136·5	141·0	146·1	151·1	155·6	160·1	7·47	
12·0	135·0	139·6	144·2	149·3	154·4	159·1	163·6	7·61	
12·5	139·0	143·3	147·7	152·5	157·4	161·8	166·1	7·21	
13·0	142·6	146·7	150·9	155·5	160·2	164·4	168·5	6·90	
13·5	145·4	149·4	153·4	157·9	162·3	166·3	170·3	6·61	
14·0	147·6	151·4	155·3	159·6	163·9	167·8	171·6	6·38	
14·5	149·4	153·1	156·9	161·1	165·3	169·0	172·7	6·20	
15·0	150·3	153·9	157·6	161·7	165·8	169·5	173·2	6·09	
15·5	150·6	154·2	157·9	162·0	166·1	169·7	173·4	6·04	
16·0	150·9	154·5	158·2	162·2	166·2	169·9	173·5	6·00	

For source of data and method of construction, see text.

TABLE IVA

Cross-sectional Type Standards for Weight Attained, Boys

Age (yr.)	Centiles (kg.)							50th Centile as % 18 yr. Weight
	3rd	10th	25th	50th	75th	90th	97th	
0·00	2·50	2·80	3·10	3·50	3·80	4·10	4·40	5·6
0·25	4·65	5·01	5·43	5·93	6·45	6·99	7·43	9·4
0·50	6·38	6·80	7·32	7·90	8·58	9·20	9·90	12·5
0·75	7·48	7·98	8·55	9·20	9·95	10·63	11·45	14·6
1·00	8·3	8·8	9·5	10·2	11·0	11·7	12·6	16·2
1·25	8·9	9·6	10·2	11·0	11·8	12·6	13·5	17·5
1·50	9·4	10·1	10·7	11·6	12·5	13·3	14·3	18·4
1·75	9·8	10·5	11·2	12·2	13·1	13·9	14·9	19·4
2·00	10·2	11·0	11·8	12·7	13·7	14·6	15·6	20·2
2·25	10·5	11·4	12·2	13·2	14·2	15·1	16·2	21·0
2·50	10·9	11·9	12·7	13·7	14·8	15·8	16·9	21·7
2·75	11·2	12·2	13·1	14·2	15·3	16·3	17·4	22·5
3·0	11·6	12·7	13·6	14·7	15·8	16·9	18·0	23·3
3·5	12·3	13·4	14·5	15·6	16·8	18·0	19·2	24·8
4·0	13·0	14·3	15·3	16·6	17·9	19·1	20·4	26·3
4·5	13·7	15·0	16·1	17·5	19·0	20·2	21·8	27·8
5·0	14·4	15·7	16·9	18·5	20·0	21·5	23·2	29·4
5·5	15·1	16·5	17·7	19·5	21·2	22·8	24·8	31·0
6·0	15·9	17·3	18·6	20·5	22·4	24·0	26·5	32·5
6·5	16·6	18·1	19·5	21·5	23·6	25·4	28·3	34·1
7·0	17·4	19·0	20·6	22·6	24·9	26·9	30·3	35·9
7·5	18·2	19·9	21·6	23·7	26·1	28·4	32·3	37·6
8·0	19·1	20·9	22·7	25·0	27·5	30·0	34·4	39·7
8·5	20·0	21·9	23·9	26·2	28·9	31·6	36·5	41·6
9·0	21·0	22·9	25·0	27·5	30·3	33·4	38·8	43·7
9·5	21·9	24·0	26·2	28·9	31·9	35·3	41·0	45·9
10·0	23·0	25·2	27·5	30·3	33·6	37·3	43·3	48·1
10·5	24·0	26·3	28·7	31·9	35·6	39·7	46·3	See Table VIA
11·0	24·9	27·4	30·1	33·6	37·7	42·6	49·5	
11·5	26·0	28·6	31·6	35·5	40·2	45·4	53·3	
12·0	27·1	29·9	33·2	37·7	42·7	49·0	57·2	
12·5	28·1	31·3	35·0	40·0	45·7	52·5	61·0	
13·0	29·6	33·0	37·1	42·6	49·0	56·0	64·4	
13·5	31·2	35·1	39·7	45·5	52·2	59·4	67·8	
14·0	33·3	37·7	42·6	48·8	55·4	62·5	70·9	
14·5	36·0	40·6	45·7	51·9	58·4	65·4	73·7	
15·0	39·0	43·7	48·7	54·7	60·9	68·0	75·9	
15·5	42·7	47·0	51·7	57·4	63·0	70·1	77·5	
16·0	45·7	49·6	54·1	59·6	65·0	71·7	78·6	
16·5	47·5	51·3	55·6	61·0	66·2	72·8	79·5	
17·0	48·6	52·3	56·6	61·9	67·1	73·6	80·2	
18·0	50·0	53·5	57·8	63·0	68·0	74·5	81·0	
19·0	50·4	53·7	58·1	63·3	68·3	75·0	81·6	

For source of data and method of construction, see text.

TABLE IVB

Cross-sectional Type Standards for Weight Attained, Girls

Age (yr.)	Centiles (kg.)							50th Centile as % 18 yr. Weight
	3rd	10th	25th	50th	75th	90th	97th	
0·00	2·55	2·85	3·15	3·40	3·65	3·95	4·35	6·0
0·25	4·36	4·81	5·18	5·56	6·02	6·41	6·90	9·8
0·50	5·89	6·44	6·90	7·39	7·99	8·49	9·08	13·1
0·75	6·99	7·58	8·13	8·72	9·42	10·02	10·64	15·4
1·00	7·8	8·4	9·0	9·7	10·5	11·2	11·8	17·1
1·25	8·3	9·0	9·6	10·4	11·3	12·0	12·7	18·4
1·50	8·9	9·5	10·2	11·1	12·0	12·8	13·5	19·6
1·75	9·3	10·0	10·8	11·7	12·6	13·5	14·3	20·7
2·00	9·7	10·4	11·3	12·2	13·2	14·1	14·9	21·6
2·25	10·0	10·8	11·7	12·7	13·7	14·6	15·5	22·4
2·50	10·5	11·3	12·2	13·3	14·3	15·3	16·3	23·5
2·75	10·9	11·8	12·7	13·7	14·8	15·8	16·9	24·2
3·0	11·4	12·3	13·2	14·3	15·3	16·4	17·6	25·3
3·5	12·2	13·2	14·2	15·2	16·3	17·6	18·9	26·9
4·0	13·1	14·1	15·2	16·3	17·5	18·8	20·3	28·8
4·5	13·8	15·0	16·1	17·2	18·6	20·1	21·8	30·4
5·0	14·6	15·9	17·0	18·3	19·8	21·4	23·3	32·3
5·5	15·4	16·7	18·0	19·3	20·9	22·9	25·0	34·1
6·0	16·2	17·6	18·9	20·4	22·2	24·4	26·8	36·0
6·5	17·0	18·4	19·8	21·5	23·5	26·0	28·5	38·0
7·0	17·8	19·2	20·8	22·6	25·0	27·7	30·6	39·9
7·5	18·6	20·1	21·9	23·8	26·4	29·3	32·6	42·0
8·0	19·4	21·0	22·9	25·1	28·0	31·2	35·0	See Table VIB
8·5	20·2	21·9	24·0	26·4	29·5	33·2	37·7	
9·0	21·0	23·0	25·2	27·7	31·4	35·4	40·6	
9·5	21·8	24·0	26·4	29·3	33·4	38·0	43·8	
10·0	22·7	25·1	27·7	31·1	35·7	41·0	47·7	
10·5	23·6	26·4	29·2	33·0	38·3	44·1	51·7	
11·0	24·7	27·8	31·0	35·2	41·0	47·7	55·7	
11·5	26·2	29·6	33·2	37·7	43·7	51·2	59·6	
12·0	27·8	31·6	35·5	40·5	46·7	54·7	63·3	
12·5	29·7	33·9	38·0	43·1	49·5	57·6	66·5	
13·0	32·0	36·3	40·7	45·8	52·3	60·0	69·3	
13·5	34·5	38·7	43·3	48·6	54·8	62·3	71·1	
14·0	37·0	41·2	45·5	51·0	57·0	63·9	72·3	
14·5	39·5	43·3	47·4	52·9	58·6	65·3	73·2	
15·0	41·7	45·1	49·0	54·4	59·8	66·3	73·7	
15·5	43·5	46·6	50·2	55·2	60·6	67·1	74·1	
16·0	44·6	47·6	51·0	55·8	61·1	67·5	74·5	
17·0	45·7	48·6	51·9	56·4	61·6	67·9	74·9	
18·0	46·0	48·8	52·1	56·6	61·8	68·0	75·0	
19·0	46·1	4·89	52·2	56·7	61·9	68·1	75·1	

For source of data and method of construction, see text.

TABLE VA

Individual-type (Longitudinal) Standards for Height Attained, Boys

Age (yr.)	Centiles (cm.)							SD (estimate)	50th Centile as % Adult Height
	3rd	10th	25th	50th	75th	90th	97th		
10·0	125·2	128·9	132·7	136·9	141·1	144·8	148·5	6·20	78·4
10·5	127·6	131·4	135·2	139·4	143·7	147·5	151·3	6·29	79·8
11·0	130·0	133·8	137·7	142·0	146·3	150·1	154·0	6·37	81·3
11·5	132·3	136·2	140·1	144·5	148·8	152·7	156·6	6·44	82·7
12·0	134·7	138·6	142·5	146·9	151·3	155·2	159·1	6·48	84·1
12·5	137·2	141·1	145·1	149·4	153·9	157·8	161·7	6·52	85·5
13·0	139·9	143·8	147·8	152·2	156·7	160·6	164·6	6·55	87·1
13·5	143·3	147·3	151·2	155·7	160·1	164·1	168·0	6·57	89·1
14·0	148·3	152·2	156·2	160·6	165·1	169·1	173·1	6·59	92·0
14·5	152·9	156·8	160·8	165·3	169·7	173·7	177·7	6·60	94·6
15·0	156·3	160·2	164·2	168·7	173·2	177·2	181·1	6·61	96·6
15·5	158·6	162·6	166·6	171·1	175·5	179·5	183·5	6·62	97·9
16·0	160·2	164·2	168·2	172·7	177·1	181·1	185·1	6·63	98·8
16·5	161·2	165·2	169·2	173·7	178·2	182·2	186·2	6·64	99·4
17·0	161·8	165·8	169·8	174·3	178·8	182·8	186·8	6·65	99·8
17·5	162·1	166·1	170·1	174·6	179·1	183·1	187·1	6·65	99·9
18·0	162·2	166·2	170·2	174·7	179·2	183·2	187·2	6·65	100·0

For source of data and method of construction, see text. Before age 10 the figures are identical with those of Table IIIA.

TABLE VB

Individual-type (Longitudinal) Standards for Height Attained, Girls

Age (yr.)	Centiles (cm.)							SD (estimate)	50th Centile as % Adult Height
	3rd	10th	25th	50th	75th	90th	97th		
8·0	114·2	117·7	121·2	125·0	128·9	132·4	135·8	5·73	77·1
8·5	116·9	120·3	123·9	127·8	131·7	135·2	138·7	5·80	78·8
9·0	119·5	123·0	126·5	130·5	134·5	138·0	141·5	5·86	80·5
9·5	122·1	125·7	129·3	133·2	137·2	140·8	144·3	5·90	82·2
10·0	124·8	128·3	131·9	136·0	140·0	143·6	147·1	5·94	83·8
10·5	127·5	131·1	134·7	138·7	142·7	146·3	149·9	5·95	85·5
11·0	130·5	134·0	137·7	141·7	145·7	149·3	152·9	5·96	87·3
11·5	134·0	137·6	141·2	145·2	149·2	152·9	156·5	5·97	89·5
12·0	138·2	141·8	145·4	149·5	153·5	157·1	160·7	5·98	92·2
12·5	142·3	145·9	149·6	153·6	157·7	161·3	164·9	5·99	94·7
13·0	145·5	149·1	152·7	156·8	160·8	164·5	168·1	6·00	96·7
13·5	147·7	151·3	154·9	159·0	163·0	166·7	170·3	6·00	98·0
14·0	149·1	152·7	156·4	160·4	164·4	168·1	171·7	6·00	98·9
14·5	150·0	153·6	157·3	161·3	165·4	169·0	172·6	6·00	99·5
15·0	150·6	154·2	157·8	161·9	165·9	169·6	173·1	6·00	99·8
15·5	150·8	154·4	158·1	162·1	166·2	169·8	173·4	6·00	99·9
16·0	150·9	154·5	158·2	162·2	166·2	169·9	173·5	6·00	100·0

For source of data and method of construction, see text. Before age 8 the figures are identical with those of Table IIIB.

TABLE VIA

Individual-type (Longitudinal) Standards for Weight Attained, Boys

Age (yr.)	Centiles (kg.)							50th Centile as % 18 yr. Weight
	3rd	10th	25th	50th	75th	90th	97th	
10·0	23·0	25·2	27·5	30·3	33·6	37·3	43·3	48·1
10·5	24·0	26·4	28·6	31·6	35·3	39·3	45·7	50·2
11·0	25·1	27·5	30·0	33·3	37·2	41·5	48·0	52·9
11·5	26·1	28·6	31·2	34·8	39·0	43·7	50·5	55·2
12·0	27·2	29·8	32·6	36·5	41·0	46·0	52·9	57·9
12·5	28·4	31·0	34·0	38·3	43·0	48·4	55·5	60·8
13·0	29·7	32·6	36·0	40·7	45·5	51·2	58·5	64·6
13·5	32·3	35·3	39·2	44·0	49·2	54·9	62·2	69·4
14·0	36·1	39·4	43·4	48·4	53·4	59·5	66·3	76·8
14·5	40·1	43·6	47·7	52·9	57·8	64·3	70·8	84·0
15·0	43·4	46·9	51·1	56·3	61·3	67·8	74·3	89·4
15·5	45·5	49·1	53·3	58·5	63·6	70·1	76·5	92·9
16·0	47·2	50·7	55·0	60·2	65·2	71·7	78·2	95·6
16·5	48·2	51·8	56·1	61·2	66·3	72·7	79·3	97·1
17·0	49·1	52·6	56·8	62·1	67·1	73·6	80·1	98·6
18·0	50·0	53·5	57·8	63·0	68·0	74·5	81·0	100·0

For source of data and method of construction, see text. Before age 10 the figures are identical with those of Table IVA.

TABLE VIB

Individual-type (Longitudinal) Standards for Weight Attained, Girls

Age (yr.)	Centiles (kg.)							50th Centile as % 18 yr. Weight
	3rd	10th	25th	50th	75th	90th	97th	
8·0	19·4	21·1	22·9	25·1	28·0	31·2	35·0	44·3
8·5	20·2	21·9	24·0	26·4	29·5	33·1	37·3	46·6
9·0	21·0	23·0	25·2	27·7	31·3	35·1	39·7	48·9
9·5	21·8	24·0	26·4	29·2	33·0	37·4	42·3	51·6
10·0	22·7	25·2	27·7	30·7	35·0	39·9	45·1	54·2
10·5	23·7	26·3	29·0	32·3	36·9	42·1	47·7	57·1
11·0	24·9	27·7	30·7	34·2	39·0	44·7	50·6	60·4
11·5	26·7	29·7	32·8	36·4	41·5	47·5	53·8	64·3
12·0	29·4	32·3	35·5	39·6	44·8	50·8	57·6	70·0
12·5	33·0	35·8	39·0	43·6	48·8	55·1	61·9	77·0
13·0	37·3	40·0	43·3	47·8	53·0	59·3	66·3	84·4
13·5	40·2	43·1	46·2	50·7	55·9	62·3	69·3	89·6
14·0	42·5	45·2	48·5	53·0	58·2	64·5	71·5	93·6
14·5	43·8	46·5	49·8	54·3	59·6	65·8	72·9	95·9
15·0	44·7	47·5	50·7	55·2	60·5	66·7	73·7	97·5
16·0	45·5	48·3	51·5	56·0	61·3	67·5	74·5	98·9
17·0	45·9	48·6	51·9	56·4	61·6	67·9	74·9	99·6
18·0	46·1	48·8	52·1	56·6	61·8	68·1	75·1	100·0

For source of data and method of construction, see text. Before age 8 the figures are identical with those of Table IVB.

TABLE VIIA

Whole-year Velocity Standards for Height of Boys (chronological age based)

Age (yr.)	Centiles (cm./yr.)							SD
	3rd	10th	25th	50th	75th	90th	97th	
0·16				40·00				
0·37				30·00				
0·62	13·42	14·88	16·36	18·00	19·64	21·12	22·58	2·43
0·87	10·25	11·60	12·97	14·50	16·03	17·40	18·75	2·26
1·12	8·51	9·72	10·94	12·30	13·66	14·88	16·09	2·02
1·37	7·45	8·61	9·79	11·10	12·41	13·59	14·75	1·94
1·62	6·50	7·58	8·68	9·90	10·94	12·04	13·12	1·81
1·87	6·02	7·03	8·06	9·20	10·34	11·37	12·38	1·69
2·25	5·72	6·64	7·57	8·60	9·63	10·56	11·48	1·53
2·75	5·41	6·24	7·08	8·02	8·96	9·80	10·63	1·39
3·25	5·20	5·96	6·74	7·60	8·46	9·24	10·00	1·28
3·75	4·92	5·63	6·36	7·16	7·96	8·69	9·40	1·19
4·25	4·73	5·40	6·08	6·84	7·60	8·28	8·95	1·12
4·75	4·62	5·25	5·89	6·60	7·31	7·95	8·58	1·06
5·25	4·46	5·07	5·68	6·36	7·04	7·65	8·26	1·01
5·75	4·37	4·94	5·53	6·18	6·83	7·42	7·99	0·96
6·25	4·26	4·81	5·38	6·00	6·62	7·19	7·74	0·93
6·75	4·17	4·70	5·24	5·84	6·44	6·98	7·51	0·89
7·25	4·14	4·65	5·16	5·74	6·32	6·83	7·34	0·85
7·75	4·06	4·55	5·05	5·60	6·15	6·65	7·14	0·82
8·25	4·01	4·49	4·97	5·50	6·03	6·51	6·99	0·79
8·75	3·97	4·43	4·89	5·40	5·91	6·37	6·83	0·76
9·25	3·87	4·32	4·78	5·30	5·82	6·27	6·74	
9·75	3·71	4·20	4·67	5·20	5·72	6·18	6·67	
10·25	3·53	4·05	4·56	5·12	5·66	6·10	6·66	
10·75	3·34	3·90	4·47	5·02	5·62	6·14	6·80	
11·25	3·16	3·75	4·38	4·93	5·68	6·37	7·33	
11·75	3·03	3·64	4·36	4·93	5·93	6·99	8·40	
12·25	2·95	3·62	4·42	5·23	6·70	8·07	9·81	
12·50	2·92	3·66	4·52	5·54	7·20	8·64	10·40	
12·75	2·95	3·75	4·64	5·90	7·68	9·20	10·90	
13·00	3·00	3·87	4·80	6·30	8·13	9·70	11·15	
13·25	3·08	4·02	5·10	6·70	8·46	9·95	11·30	
13·50	3·18	4·21	5·40	7·03	8·72	10·06	11·32	
13·75	3·27	4·43	5·68	7·27	8·80	10·09	11·27	
14·00	3·33	4·57	5·89	7·30	8·72	10·02	11·08	
14·25	3·36	4·58	5·90	7·10	8·53	9·82	10·85	
14·50	3·28	4·41	5·65	6·77	8·25	9·56	10·56	
14·75	2·80	4·01	5·26	6·22	7·90	9·20	10·20	
15·00	2·09	3·49	4·76	5·84	7·46	8·78	9·77	
15·25	1·47	2·87	4·22	5·34	6·97	8·26	9·33	
15·50	1·06	2·32	3·60	4·84	6·42	7·70	8·85	
15·75	0·77	1·82	3·02	4·36	5·81	7·10	8·30	
16·00	0·54	1·40	2·48	3·86	5·20	6·45	7·73	
16·25	0·39	1·07	2·02	3·32	4·55	5·72	7·12	
16·50	0·26	0·80	1·60	2·80	3·90	5·02	6·40	
16·75		0·60	1·30	2·31	3·28	4·22	5·55	
17·00		0·44	1·03	1·88	2·60	3·40	4·60	
17·25		0·34	0·83	1·50	2·09	2·70	3·65	
17·50		0·26	0·69	1·20	1·69	2·17	2·90	
17·75		0·20	0·57	0·95	1·33	1·68	2·28	
18·00			0·47	0·74	1·03	1·30	1·75	

For source of data and method of construction, see text.

TABLE VIIB

Whole-year Velocity Standards for Height of Girls (chronological age based)

Age (yr.)	Centiles (cm./yr.)							SD
	3rd	10th	25th	50th	75th	90th	97th	
0·16				36·00				
0·37				26·00				
0·62	14·42	15·88	17·36	19·00	20·64	22·12	23·58	2·43
0·87	11·65	13·00	14·37	15·90	17·43	18·80	20·15	2·26
1·12	9·71	10·92	12·14	13·50	14·86	16·08	17·29	2·02
1·37	8·15	9·31	10·49	11·80	13·11	14·29	15·45	1·94
1·62	7·20	8·28	9·38	10·60	11·82	12·92	14·00	1·81
1·87	6·42	7·43	8·46	9·60	10·74	11·77	12·78	1·69
2·25	5·82	6·73	7·67	8·70	9·73	10·66	11·58	1·53
2·75	5·51	6·34	7·18	8·12	9·06	9·90	10·73	1·39
3·25	5·28	6·04	6·82	7·68	8·54	9·32	10·08	1·28
3·75	4·98	5·69	6·42	7·22	8·02	8·75	9·46	1·19
4·25	4·73	5·40	6·08	6·84	7·60	8·28	8·95	1·12
4·75	4·62	5·25	5·89	6·60	7·31	7·95	8·58	1·06
5·25	4·46	5·07	5·68	6·36	7·04	7·65	8·26	1·01
5·75	4·37	4·94	5·53	6·18	6·83	7·42	7·99	0·96
6·25	4·26	4·81	5·38	6·00	6·62	7·19	7·74	0·93

TABLE VIIB—*continued*

Whole-year Velocity Standards for Height of Girls (chronological age based)

Age (yr.)	Centiles (cm./yr.)							SD
	3rd	10th	25th	50th	75th	90th	97th	
6·75	4·17	4·70	5·24	5·84	6·44	6·98	7·51	0·89
7·25	4·07	4·61	5·11	5·72	6·31	6·86	7·38	
7·75	3·90	4·45	4·94	5·59	6·19	6·81	7·46	
8·25	3·71	4·30	4·80	5·45	6·12	6·85	7·71	
8·75	3·56	4·17	4·67	5·37	6·13	7·00	8·12	
9·25	3·43	4·06	4·59	5·37	6·25	7·24	8·60	
9·75	3·35	4·00	4·60	5·48	6·48	7·55	9·00	
10·25	3·30	4·02	4·74	5·73	6·78	7·90	9·36	
10·75	3·30	4·13	4·95	6·00	7·09	8·24	9·63	
11·00	3·32	4·20	5·06	6·13	7·20	8·40	9·72	
11·25	3·35	4·27	5·19	6·24	7·30	8·50	9·80	
11·50	3·36	4·33	5·29	6·31	7·39	8·60	9·86	
11·75	3·39	4·38	5·36	6·37	7·43	8·68	9·88	
12·00	3·41	4·40	5·40	6·38	7·42	8·67	9·82	
12·25	3·30	4·23	5·25	6·30	7·28	8·55	9·70	
12·50	2·84	3·84	4·96	6·13	7·10	8·36	9·55	
12·75	2·30	3·41	4·63	5·89	6·85	8·12	9·33	
13·00	1·68	2·95	4·21	5·55	6·55	7·82	9·02	
13·25	1·20	2·45	3·76	5·11	6·20	7·41	8·63	
13·50	0·82	1·95	3·20	4·60	5·75	6·93	8·05	
13·75	0·52	1·53	2·63	4·06	5·23	6·26	7·50	
14·00	0·30	1·20	2·11	3·46	4·63	5·50	6·65	
14·25		0·85	1·65	2·82	3·85	4·60	5·52	
14·50		0·58	1·24	2·15	3·08	3·73	4·55	
14·75		0·35	0·88	1·53	2·37	2·95	3·65	
15·00			0·58	1·12	1·80	2·35	3·00	
15·25			0·40	0·82	1·37	1·90	2·38	
15·50			0·24	0·58	1·03	1·50	1·93	
15·75				0·44	0·78	1·20	1·58	
16·00				0·30	0·65	0·95	1·30	

For source of data and method of construction, see text.

TABLE VIIIA

Whole-year Velocity Standards for Weight of Boys (chronological age based)

Age (yr.)	Centiles (kg./yr.)						
	3rd	10th	25th	50th	75th	90th	97th
0·10				9·30			
0·25	5·35	6·70	7·85	9·85	11·15	13·30	15·10
0·50	2·77	3·85	5·10	6·80	8·15	9·85	11·50
0·75	2·00	2·75	3·56	4·30	5·73	6·80	8·20
1·00	1·58	2·22	2·78	3·33	4·30	5·13	5·86
1·25	1·30	1·85	2·30	2·81	3·58	4·20	4·80
1·50	1·10	1·58	1·98	2·44	3·14	3·66	4·22
1·75	0·95	1·40	1·75	2·23	2·85	3·30	3·85
2·25	0·72	1·17	1·57	1·98	2·49	2·90	3·45
2·75	0·66	1·08	1·48	1·92	2·36	2·83	3·38
3·25	0·70	1·07	1·48	1·90	2·36	2·88	3·46
3·75	0·70	1·09	1·47	1·90	2·38	2·93	3·58
4·25	0·72	1·10	1·47	1·90	2·41	3·02	3·74
4·75	0·74	1·11	1·48	1·90	2·47	3·13	3·92
5·25	0·77	1·13	1·50	1·94	2·53	3·26	4·10
5·75	0·80	1·17	1·54	2·02	2·63	3·40	4·30
6·25	0·84	1·22	1·61	2·11	2·74	3·54	4·50
6·75	0·88	1·27	1·68	2·21	2·85	3·68	4·70
7·25	0·92	1·32	1·75	2·31	2·97	3·82	4·88
7·75	0·97	1·38	1·82	2·42	3·10	3·96	5·06
8·25	1·02	1·44	1·91	2·52	3·24	4·10	5·24
8·75	1·07	1·52	2·00	2·62	3·39	4·25	5·42
9·25	1·09	1·54	2·06	2·72	3·54	4·43	5·63
9·75	1·04	1·52	2·11	2·83	3·71	4·65	5·93
10·25	0·97	1·50	2·15	2·93	3·89	4·94	6·33
10·75	0·90	1·50	2·23	3·03	4·10	5·30	6·90
11·25	0·88	1·54	2·35	3·20	4·40	5·78	7·69
11·75	0·94	1·66	2·53	3·46	4·85	6·47	8·71
12·00	1·02	1·76	2·64	3·67	5·14	6·87	9·24
12·25	1·11	1·88	2·79	3·92	5·50	7·33	9·72
12·50	1·23	2·02	2·96	4·22	5·93	7·79	10·13
12·75	1·36	2·18	3·16	4·55	6·40	8·21	10·46
13·00	1·52	2·40	3·47	4·96	6·81	8·67	10·78
13·25	1·68	2·66	3·83	5·36	7·26	9·09	11·02
13·50	1·85	2·96	4·24	5·75	7·64	9·43	11·19
13·75	2·03	3·29	4·69	6·12	7·96	9·71	11·31

TABLE VIIIA—*continued*

Whole-year Velocity Standards for Weight of Boys (chronological age based)

Age (yr.)	Centiles (kg./yr.)						
	3rd	10th	25th	50th	75th	90th	97th
14·00	2·20	3·58	4·90	6·30	8·14	9·85	11·35
14·25	2·18	3·60	4·90	6·30	8·14	9·85	11·31
14·50	2·00	3·46	4·76	6·20	8·00	9·74	11·18
14·75	1·73	3·12	4·49	5·98	7·78	9·57	11·01
15·00	1·38	2·65	4·11	5·61	7·48	9·30	10·78
15·25	0·94	2·10	3·67	5·19	7·06	8·90	10·43
15·50	0·48	1·57	3·16	4·75	6·54	8·39	9·95
15·75	0·12	1·15	2·61	4·25	5·91	7·72	9·40
16·00		0·75	2·09	3·71	5·31	7·03	8·75
16·25		0·45	1·69	3·22	4·75	6·30	8·02
16·75			1·06	2·38	3·79	4·96	6·29
17·25			0·62	1·77	3·06	4·03	5·03
17·75			0·27	1·30	2·46	3·33	4·21
18·00			0·12	1·08	2·20	3·05	3·85

For source of data and method of construction, see text.

TABLE VIIIB

Whole-year Velocity Standards for Weight of Girls (chronological age based)

Age (yr.)	Centiles (kg./yr.)						
	3rd	10th	25th	50th	75th	90th	97th
0·10				8·00			
0·25	4·20	6·10	7·65	9·25	11·20	13·00	14·80
0·50	2·50	3·70	5·20	6·60	8·60	10·50	12·15
0·75	1·80	2·72	3·53	4·29	6·05	7·90	9·40
1·00	1·45	2·15	2·75	3·32	4·48	5·63	6·89
1·25	1·23	1·75	2·28	2·81	3·63	4·38	5·10
1·50	1·08	1·51	1·96	2·44	3·12	3·75	4·25
1·75	1·00	1·40	1·78	2·20	2·79	3·31	3·78
2·25	0·91	1·31	1·66	2·03	2·50	2·90	3·44
2·75	0·90	1·30	1·64	2·00	2·45	2·85	3·47
3·25	0·90	1·30	1·64	2·00	2·48	2·93	3·56
3·75	0·90	1·30	1·64	2·00	2·50	3·01	3·70
4·25	0·90	1·30	1·64	2·00	2·56	3·11	3·87
4·75	0·90	1·30	1·64	2·03	2·63	3·23	4·04
5·25	0·90	1·30	1·68	2·08	2·71	3·36	4·21
5·75	0·90	1·31	1·70	2·14	2·80	3·50	4·39
6·25	0·91	1·32	1·74	2·21	2·89	3·64	4·57
6·75	0·94	1·33	1·78	2·28	3·00	3·78	4·76
7·25	0·90	1·32	1·82	2·33	3·11	3·93	4·92
7·75	0·86	1·32	1·86	2·40	3·26	4·11	5·14
8·25	0·82	1·33	1·90	2·50	3·41	4·35	5·40
8·75	0·80	1·36	1·96	2·61	3·61	4·64	5·73
9·25	0·79	1·44	2·06	2·76	3·88	5·01	6·21
9·75	0·83	1·54	2·22	2·98	4·23	5·50	6·91
10·25	0·95	1·69	2·40	3·30	4·66	6·10	7·68
10·50	1·03	1·78	2·52	3·50	4·92	6·44	8·05
10·75	1·13	1·89	2·67	3·73	5·19	6·79	8·43
11·00	1·26	2·04	2·87	3·99	5·48	7·13	8·80
11·25	1·40	2·22	3·14	4·27	5·81	7·49	9·14
11·50	1·58	2·44	3·45	4·58	6·17	7·82	9·41
11·75	1·79	2·72	3·81	4·95	6·51	8·14	9·66
12·00	2·02	3·03	4·17	5·38	6·88	8·42	9·88
12·25	2·23	3·34	4·51	5·80	7·18	8·63	10·03
12·50	2·30	3·45	4·70	5·99	7·29	8·73	10·06
12·75	2·16	3·34	4·67	5·97	7·27	8·73	10·04
13·00	1·90	3·10	4·50	5·81	7·11	8·63	9·94
13·25	1·51	2·78	4·27	5·56	6·86	8·41	9·75
13·50	1·09	2·43	3·99	5·27	6·56	8·09	9·47
13·75	0·67	2·04	3·66	4·95	6·23	7·70	9·08
14·00	0·25	1·60	3·23	4·56	5·85	7·25	8·60
14·25		1·20	2·79	4·11	5·44	6·74	8·03
14·50		0·79	2·30	3·62	4·99	6·18	7·45
14·75		0·39	1·81	3·11	4·47	5·63	6·84
15·25			0·81	2·00	3·36	4·53	5·61
15·75				1·10	2·23	3·33	4·38
16·25				0·38	1·35	2·23	3·22
16·50				0·08	1·04	1·76	2·75

For source of data and method of construction, see text.

TABLE IXA

Whole-year Velocity Standards for Height of Boys (peak height velocity-centred)

Age (yr.)	Centiles (cm./yr.)							SD (estimated)
	3rd	10th	25th	50th	75th	90th	97th	
9·25	3·91	4·35	4·80	5·30	5·80	6·24	6·69	0·74
9·75	3·86	4·29	4·72	5·20	5·68	6·11	6·54	0·71
10·25	3·81	4·23	4·65	5·12	5·59	6·00	6·43	0·69
10·75	3·76	4·17	4·58	5·04	5·50	5·91	6·32	0·68
11·25	3·68	4·10	4·51	4·98	5·45	5·86	6·28	0·69
11·75	3·55	3·99	4·44	4·94	5·44	5·88	6·33	0·74
12·25	3·45	3·96	4·46	5·02	5·58	6·08	6·58	0·83
12·75	3·84	4·42	5·00	5·65	6·30	6·87	7·46	0·96
13·25	5·37	6·03	6·70	7·45	8·20	8·86	9·53	1·11
13·50	6·51	7·20	7·89	8·67	9·45	10·14	10·83	1·15
13·75	7·12	7·83	8·55	9·35	10·15	10·86	11·58	1·19
14·00	7·20	7·92	8·65	9·46	10·27	10·99	11·72	1·20
14·25	6·98	7·69	8·42	9·22	10·02	10·74	11·46	1·19
14·50	5·98	6·69	7·40	8·20	9·00	9·70	10·42	1·18
14·75	4·85	5·54	6·25	7·03	7·81	8·51	9·21	1·16
15·25	2·65	3·30	3·96	4·70	5·44	6·09	6·75	1·09
15·75	1·34	1·93	2·53	3·20	3·87	4·46	5·06	0·99
16·25	0·50	1·00	1·51	2·08	2·65	3·15	3·66	0·84
16·75			0·80	1·22	1·64	2·01	2·39	0·62

For source of data and method of construction, see text.

TABLE IXB

Whole-year Velocity Standards for Height of Girls (peak height velocity-centred)

Age (yr.)	Centiles (cm./yr.)							SD (estimated)
	3rd	10th	25th	50th	75th	90th	97th	
7·25	4·14	4·65	5·16	5·74	6·32	6·83	7·34	0·85
7·75	4·06	4·55	5·05	5·60	6·15	6·65	7·14	0·82
8·25	4·01	4·49	4·97	5·50	6·03	6·51	6·99	0·79
8·75	4·02	4·49	4·96	5·49	6·02	6·48	6·96	0·78
9·25	3·99	4·46	4·93	5·46	5·99	6·45	6·93	0·78
9·75	3·94	4·41	4·90	5·44	5·98	6·46	6·94	0·80
10·25	3·86	4·38	4·91	5·50	6·09	6·61	7·14	0·87
10·50	3·91	4·46	5·02	5·64	6·26	6·81	7·37	0·92
10·75	4·10	4·68	5·27	5·92	6·57	7·16	7·74	0·97
11·00	4·60	5·21	5·81	6·50	7·18	7·79	8·40	1·01
11·25	5·23	5·86	6·50	7·21	7·92	8·55	9·19	1·05
11·50	5·87	6·52	7·17	7·90	8·63	9·28	9·93	1·08
11·75	6·21	6·86	7·53	8·27	9·01	9·67	10·33	1·10
12·00	6·26	6·92	7·59	8·33	9·07	9·73	10·40	1·10
12·25	6·10	6·76	7·43	8·17	8·91	9·57	10·24	1·10
12·50	5·51	6·16	6·82	7·56	8·30	8·95	9·61	1·09
12·75	4·56	5·20	5·85	6·57	7·29	7·93	8·58	1·07
13·00	3·52	4·15	4·79	5·50	6·21	6·84	7·48	1·05
13·25	2·58	3·19	3·80	4·48	5·16	5·77	6·40	1·01
13·75	1·15	1·69	2·25	2·86	3·47	4·02	4·57	0·91
14·25		0·87	1·34	1·86	2·38	2·84	3·31	0·77
14·75			0·70	1·08	1·46	1·81	2·15	0·57

For source of data and method of construction, see text.

TABLE XA

Whole-year Velocity Standard for Weight of Boys (peak weight velocity-centred)

Age (yr.)	Centiles (kg./yr.)						
	3rd	10th	25th	50th	75th	90th	97th
9·25	1·12	1·60	2·09	2·72	3·54	4·40	5·60
9·75	1·18	1·68	2·18	2·82	3·68	4·54	5·80
10·25	1·24	1·76	2·28	2·92	3·78	4·69	6·00
10·75	1·31	1·84	2·38	3·02	3·93	4·84	6·20
11·25	1·43	1·97	2·51	3·14	4·10	5·00	6·40
11·75	1·62	2·14	2·70	3·30	4·35	5·28	6·66
12·25	1·98	2·46	3·00	3·70	4·75	5·80	7·07
12·50	2·18	2·75	3·26	4·09	5·05	6·22	7·50
12·75	2·45	3·10	3·70	4·75	5·60	6·85	8·10
13·00	2·90	3·70	4·40	5·50	6·45	7·75	8·90
13·25	3·45	4·60	5·50	6·55	7·57	8·85	9·90

TABLE XA—*continued*

Whole-year Velocity Standard for Weight of Boys (peak weight velocity-centred)

Age (yr.)	Centiles (kg./yr.)						
	3rd	10th	25th	50th	75th	90th	97th
13·50	4·28	5·71	6·88	8·00	8·95	10·18	11·35
13·75	5·50	6·95	7·85	8·80	10·05	11·15	12·55
13·90	6·17	7·17	8·05	9·02	10·37	11·48	12·72
14·00	6·20	7·20	8·08	9·06	10·40	11·50	12·74
14·10	6·17	7·17	8·05	9·02	10·37	11·48	12·72
14·25	5·83	6·95	7·85	8·75	10·18	11·30	12·58
14·50	4·95	6·13	7·12	8·06	9·25	10·22	11·90
14·75	4·07	4·97	5·90	6·82	7·97	9·00	10·68
15·00	3·22	4·00	4·80	5·68	6·74	7·82	9·25
15·25	2·40	3·17	3·97	4·72	5·63	6·73	7·87
15·50	1·66	2·50	3·18	3·89	4·63	5·55	6·52
15·75	0·96	1·84	2·50	3·15	3·88	4·60	5·45
16·00		1·27	1·98	2·60	3·24	3·78	4·50
16·25		0·82	1·45	2·15	2·75	3·11	3·70
16·50			1·05	1·70	2·30	2·65	3·12
16·75			0·75	1·35	1·90	2·25	2·65

For source of data and method of construction, see text.

TABLE XB

Whole-year Velocity Standard for Weight of Girls (peak weight velocity-centred)

Age (yr.)	Centiles (kg./yr.)						
	3rd	10th	25th	50th	75th	90th	97th
7·25	0·98	1·35	1·84	2·38	3·12	3·93	4·94
7·75	1·02	1·39	1·91	2·48	3·25	4·09	5·13
8·25	1·08	1·45	2·00	2·60	3·41	4·27	5·32
8·75	1·15	1·55	2·10	2·73	3·58	4·44	5·52
9·25	1·25	1·70	2·22	2·88	3·76	4·62	5·73
9·75	1·40	1·87	2·38	3·05	3·95	4·81	5·98
10·25	1·67	2·15	2·62	3·26	4·20	5·07	6·30
10·50	1·83	2·32	2·80	3·40	4·40	5·28	6·48
10·75	2·07	2·55	3·05	3·68	4·63	5·60	6·78
11·00	2·32	2·80	3·37	4·05	5·05	6·00	7·18
11·25	2·63	3·15	3·82	4·70	5·73	6·70	7·75
11·50	2·98	3·65	4·50	5·44	6·54	7·50	8·54
11·75	3·50	4·30	5·38	6·32	7·50	8·45	9·35
12·00	4·25	5·20	6·39	7·43	8·50	9·30	10·05
12·25	5·10	5·95	7·05	8·08	9·15	9·80	10·48
12·40	5·48	6·26	7·22	8·25	9·31	9·90	10·57
12·50	5·55	6·30	7·27	8·30	9·36	9·93	10·60
12·60	5·52	6·28	7·23	8·25	9·32	9·91	10·57
12·75	5·35	6·06	7·08	8·08	9·08	9·77	10·46
13·00	4·25	5·13	6·28	7·25	8·20	9·10	9·80
13·25	2·80	4·05	5·28	6·19	7·00	8·00	8·75
13·50	1·80	3·00	4·20	5·20	6·00	6·83	7·83
13·75	1·15	2·23	3·40	4·36	5·10	5·85	6·77
14·00	0·65	1·57	2·60	3·55	4·44	5·20	6·10
14·25		1·07	1·95	2·82	3·85	4·55	5·50
14·50		0·70	1·43	2·27	3·38	4·08	5·00
14·75			1·05	1·83	2·94	3·67	4·55
15·00			0·70	1·48	2·55	3·30	4·15
15·25				1·17	2·22	2·99	3·82
15·50				0·92	1·92	2·70	3·48

For source of data and method of construction, see text.

Appendix II

Use of Table of Decimals of Year

(1) Record the date of examination as a five-figure number, the first two figures being the year (i.e. '66) and the next three the decimal of the year corresponding to the date (i.e. Jan. 1 is 000, Feb. 1 is 085 etc.). These three figures are obtained from the Table. Thus an examination carried out on Jan. 7, 1952, is recorded as 52.016.

(2) Immediately underneath write the date of birth of the subject, using the same system. Thus a boy born on June 23, 1939, has the birth date 39.474.

(3) Subtract date (2) from date (1) in a normal arithmetic manner. The answer is the age at examination in years in the decimal system, i.e. in the example given, 12.542.

(4) Round off this figure to two decimal points for recording, i.e. 12·54.

TABLE OF DECIMALS OF YEAR

	1 Jan.	2 Feb.	3 Mar.	4 Apr.	5 May	6 June	7 July	8 Aug.	9 Sept.	10 Oct.	11 Nov.	12 Dec.
1	000	085	162	247	329	414	496	581	666	748	833	915
2	003	088	164	249	332	416	499	584	668	751	836	918
3	005	090	167	252	334	419	501	586	671	753	838	921
4	008	093	170	255	337	422	504	589	674	756	841	923
5	011	096	173	258	340	425	507	592	677	759	844	926
6	014	099	175	260	342	427	510	595	679	762	847	929
7	016	101	178	263	345	430	512	597	682	764	849	932
8	019	104	181	266	348	433	515	600	685	767	852	934
9	022	107	184	268	351	436	518	603	688	770	855	937
10	025	110	186	271	353	438	521	605	690	773	858	940
11	027	112	189	274	356	441	523	608	693	775	860	942
12	030	115	192	277	359	444	526	611	696	778	863	945
13	033	118	195	279	362	447	529	614	699	781	866	948
14	036	121	197	282	364	449	532	616	701	784	868	951
15	038	123	200	285	367	452	534	619	704	786	871	953
16	041	126	203	288	370	455	537	622	707	789	874	956
17	044	129	205	290	373	458	540	625	710	792	877	959
18	047	132	208	293	375	460	542	627	712	795	879	962
19	049	134	211	296	378	463	545	630	715	797	882	964
20	052	137	214	299	381	466	548	633	718	800	885	967
21	055	140	216	301	384	468	551	636	721	803	888	970
22	058	142	219	304	386	471	553	638	723	805	890	973
23	060	145	222	307	389	474	556	641	726	808	893	975
24	063	148	225	310	392	477	559	644	729	811	896	978
25	066	151	227	312	395	479	562	647	731	814	899	981
26	068	153	230	315	397	482	564	649	734	816	901	984
27	071	156	233	318	400	485	567	652	737	819	904	986
28	074	159	236	321	403	488	570	655	740	822	907	989
29	077		238	323	405	490	573	658	742	825	910	992
30	079		241	326	408	493	575	660	745	827	912	995
31	082		244		411		578	663		830		997
	Jan. 1	Feb. 2	Mar. 3	Apr. 4	May 5	June 6	July 7	Aug. 8	Sept. 9	Oct. 10	Nov. 11	Dec. 12