

HEIGHTS AND WEIGHTS OF EUROPEAN AND COLOURED† SCHOOLCHILDREN IN CAPE TOWN*

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The most generally accepted standards for comparison of one child or group of children with another are those of height and weight. Birth weights are regarded as important in the assessment of neonates and the progress of infants is largely estimated by the mothers and their professional advisers on the basis of a satisfactory weight gain. Height, being much more difficult to measure with reasonable accuracy in early life, is given rather less attention until a few years have passed, when the child becomes more interested than anyone else in his or her elevation from ground level. Since, then, these simple physical measurements are of widespread interest and importance it is surprising to discover that little attempt has been made to establish the normal pattern of height and weight in a community which has been for several centuries the Mother City of Southern Africa.

In the past 25 years various local and racial studies have been made. Some of these have dealt with infants, others with older children, but the majority of the figures have been collected from boys and girls under school age. Sometimes there has been no attempt to differentiate between the sexes or between the ethnic groups involved. Other reports have been primarily concerned with the social-medicine aspect or have been based on a particular section of a community. Consequently, a number of current beliefs are unsupported by any satisfactory evidence and it seems at least possible that local partisan impressions may be erroneous. For purposes of comparison with the height and weight standards of other areas and other countries it is obvious that a tolerably accurate set of figures for the local children should be

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† Coloured children are of mixed European and African descent.

acquired. At present the standard of comparison is taken from the tables in British and American text-books on the assumption that these are normal also for Cape Town children, though some people add 3-4 lb. to these standards to arrive at the hypothetical local norm. These comments apply particularly to children of school age and the present report has been compiled to determine the facts of the situation.

The present investigation was designed to establish normal standards of height and weight for both European and Coloured children between 6 and 15 years of age attending schools under the control of the Cape Town Education Authority. The original intention was to obtain figures also for African children, but unexpected difficulties prevented this and their omission is probably not too great a misfortune, since the results would not have been representative of the local African child population.

The numbers involved were considerable—a total of approximately 84,000 European and Coloured. The information on which this paper is based was obtained from the schools' medical cards which were made available by the helpful cooperation of the Superintendent General of Education, the Chief Medical Inspector of Schools, and the Heads of the schools selected by our sampling technique. All the Government schools, irrespective of class or creed, in the Cape Town Municipal Area were included in two lists, European and Coloured, and these were drawn up by the office staff of the Chief Medical Inspector for reasons entirely unconnected with this enquiry. Our statistical adviser laid down the procedure for selection of the particular schools to be visited and for the choice of children in those schools (see Appendix). The relevant details were taken from the medical cards found by this procedure. The children themselves were not seen. The question of any personal influence in the choice

was totally eliminated and any difficulties which might have arisen from having to seek parental authority for physical examination were avoided.

This random sample provided information concerning 534 European boys and girls in 14 schools, and 449 Coloured

TABLE I. NUMBER OF CHILDREN STUDIED IN EACH AGE-GROUP

Age (yrs.)	European		Coloured	
	Girls	Boys	Girls	Boys
6-7	15	31	30	19
7-8	20	33	24	27
8-9	21	31	23	27
9-10	17	20	24	24
10-11	42	25	24	26
11-12	46	19	20	28
12-13	44	22	23	22
13-14	31	19	23	23
14-15	43	55	32	30
Total	279	255	223	226

boys and girls in 12 schools (Table I) and from that material the tables and charts were made. Boys and girls were dealt with separately in each ethnic group, and each year of age from 6 to 15 years inclusive was scrutinized. It was then possible to construct tables and charts showing the status of Cape Town children, the relationship of the sexes and races, and their international placing.

In the text of this report when a general statement is made it is based on the median figure for the observations. This, of course, refers to the middle observation of that group and is not necessarily the same as the average for the group. Similarly, the 10th percentile line excludes the lowest tenth of the observations for that group and the 90th excludes the highest tenth.

HEIGHT

European Children (Table II)

The figures in Table II were taken from the graphs where the 10th and 90th percentile and the median lines crossed the year-of-age line. The figures for the actual observations plotted on the 8 graphs (Figs. 5-12) in the Appendix are given in Tables XIII-XVI (Appendix), together with the corresponding figures for the smoothed curve, to show that such discrepancies as there are make no material difference to the general picture. It appears that the growth pattern of the two sexes is different. Between 6 and 10 years the boys grow approximately 1 3/4 inches per year while the girls gain 2 1/4 to 2 1/2 inches. From 11 years onwards the boys grow at least 2 1/4 inches annually while for the girls this is the maximum figure and it decreases thereafter so that between 14 and 15 years the girls' yearly increment is half that of the boys. At 14 years of age the heights of the two sexes are very similar. Before that age the girls tend to be the taller but by 15 years the boys have not only wiped out the deficit but have established a definite lead of an inch.

Coloured Children (Table III)

The identical pattern is shown here but the boys show an even greater sluggishness in growth so that by 14 years of age the girls are still ahead though in another year they have been outgrown.

When the heights of the two racial groups (Tables IX and X) are compared it is obvious that the children of direct European descent are considerably taller than the Coloured children. The deficit in the latter is generally between 2 and 3 inches and is smaller in the females than it is in the males. This will be discussed later.

TABLE II. HEIGHT OF CAPE TOWN EUROPEAN CHILDREN (INCHES)

Age	Boys				Girls			
	P ¹⁰	Median	P ⁹⁰	Range	P ¹⁰	Median	P ⁹⁰	Range
6	43 1/2	46	48 1/2	4 1/2	42 1/2	45	48 1/2	6
7	45 1/2	47 1/2	50	4 1/2	44 1/2	47 1/2	51	6 1/2
8	47	49	52	5	46 1/2	50	53 1/2	7
9	48 1/2	51	54 1/2	5 1/2	49	52 1/2	56	7
10	50 1/2	53	56 1/2	5 1/2	51	54 1/2	58 1/2	7 1/2
11	52 1/2	55	58 1/2	6	53 1/2	56 1/2	60 1/2	7 1/2
12	54 1/2	57	60 1/2	6 1/2	55 1/2	59	62 1/2	7 1/2
13	56 1/2	60	63 1/2	6 1/2	57	60 1/2	65	8
14	58 1/2	62	66 1/2	7 1/2	58 1/2	62 1/2	66 1/2	8 1/2
15	61 1/2	65 1/2	69 1/2	8	60	64	68 1/2	8 1/2

TABLE III. HEIGHT OF COLOURED CHILDREN (INCHES)

Age	Boys				Girls			
	P ¹⁰	Median	P ⁹⁰	Range	P ¹⁰	Median	P ⁹⁰	Range
6	40 1/2	44 1/2	46 1/2	6	40	42 1/2	45	5
7	42	45	48	6	42 1/2	45 1/2	47 1/2	5 1/2
8	43 1/2	47	49 1/2	6 1/2	44 1/2	47 1/2	50	5 1/2
9	44 1/2	48 1/2	51 1/2	6 1/2	46 1/2	49 1/2	52 1/2	6
10	46 1/2	50 1/2	53	6 1/2	48 1/2	52	54 1/2	6 1/2
11	48 1/2	52	55 1/2	7	50 1/2	54	57	6 1/2
12	50 1/2	54 1/2	57 1/2	7	52 1/2	56	59	6 1/2
13	52 1/2	56 1/2	59 1/2	7 1/2	54 1/2	58	61	6 1/2
14	54 1/2	59 1/2	62 1/2	7 1/2	56 1/2	60	62 1/2	6 1/2
15	57 1/2	62 1/2	66	8 1/2	58	61 1/2	64 1/2	6 1/2

TABLE IV. WEIGHT OF EUROPEAN CHILDREN (LB.)

Age	Boys				Girls			
	P ¹⁰	Median	P ⁹⁰	Range	P ¹⁰	Median	P ⁹⁰	Range
6	39 1/2	46 1/2	53	13 1/2	38 1/2	45	52 1/2	14
7	43	51	58 1/2	15 1/2	42	49 1/2	59	17
8	48	56 1/2	65	17	46 1/2	55	66	19 1/2
9	53 1/2	62	72	18 1/2	51	61	74	23
10	57	68	79 1/2	22 1/2	56	67	82	26
11	62	74 1/2	88	26	62	75	91	29
12	68	82	98	30	69 1/2	83	101	31 1/2
13	75	90	109	34	77 1/2	93	113	35 1/2
14	83 1/2	102	123	39 1/2	87	104	127	40
15	94	117	138	44	98	117	141	43

TABLE V. WEIGHT OF COLOURED CHILDREN (LB.)

Age	Boys				Girls			
	P ¹⁰	Median	P ⁹⁰	Range	P ¹⁰	Median	P ⁹⁰	Range
6	34	42	49	15	33	41	50	17
7	36	44	51 1/2	15 1/2	36	43 1/2	54	18
8	38	47	55	17	39 1/2	48	58	18 1/2
9	41	50	59	18	43 1/2	53 1/2	64	20 1/2
10	44	54	64	20	48 1/2	59 1/2	70 1/2	22
11	48 1/2	59 1/2	71	22 1/2	53 1/2	66	78	24 1/2
12	54	66	79	25	59 1/2	74	87	27 1/2
13	60 1/2	74	88	27 1/2	67	83	98	31
14	69	84	100	31	75	94	112	37
15	79	96	114	35	85	106	130	45

WEIGHT

European Children (Table IV)

At 6 years the boys are 1 1/2 lb. heavier than the girls and they continue to weigh slightly more than the girls until the age of 11 years, when the girls increase in weight at a slightly faster rate for a few years. The boys then gain weight a little more rapidly so that at 15 years the median weight for both sexes is 117 lb.

Coloured Children (Table V)

At 6 and 7 years the boys are heavier than the girls, but from 8 years onwards there is an increasing disparity between them, the girls steadily increasing their advantage until at 15 years they are 10 lb. heavier. That this is not due to any general difference in pattern of the weight increase is shown in the charts. It is a matter of degree and will be referred to again.

At no stage do the Coloured match their European counterparts so far as weight is concerned (Tables XI, XII). The boys at 6 years of age weigh 4 1/2 lb. less than the Europeans and, as their annual weight gain is less, there is a difference of 21 lb. weight at the age of 15. The Coloured girls at 6 weigh 4 lb. less than the European girls and at the age of 15 years

they are 11 lb. lighter. The general trend in both sexes and both races is similar.

DISCUSSION

The literature on physical measurements in South Africa is not large. Such as it is, it must be examined to discover what other investigators have found. The Bantu has been extensively studied by Kark,¹ Le Riche² and Botha *et al.*³ but little is known of the Coloured and European school children.

The nursery-school period has been studied by Philips⁴ and Woodrow and Robertson⁵ for the European group, and by Woodrow and Robertson⁵ in Coloured children but little is known of physical development once they reach school-going age. Le Riche² investigated the status of European school children in Pretoria and in the Cape the only available data refer exclusively to Europeans. In 1935 Maughan Brown⁷ weighed and measured 18,000 European school children in various parts of the Cape Province but, presumably, these figures are now out of date. In any case there is no means of knowing what districts of the Province were involved nor which figures refer to urban and which to rural populations. Freed⁸ assessed 300 children (236 European and 64 Coloured) from the Veldrift area of the Cape Province but for purposes of comparison these figures have to be discarded since they refer to a closed community and do not differentiate between Europeans and Coloureds.

When Woodrow and Robertson did their work on European and Coloured nursery-school children, they found a negligible variation in height and weight between boys and girls and for that reason they did not quote separate figures for the two sexes. Philips studied only European nursery-school children and divided them into upper and lower income groups but, unfortunately, did not give any measurements for the higher income category at 6 years of age.

Comparison of the figures for the three recent estimates (Table VI) of height and weight in Cape European children at 6 years of age shows a scatter of 0.9—1.6 inches in the height assessments, and of 2—2.4 lb. in the weights. These

TABLE VI. COMPARATIVE FIGURES (CAPE TOWN)

Age (years)	European Boys		European Girls		Coloured Boys		Coloured Girls		
	Height (inches)	Weight (lb.)	Height (inches)	Weight (lb.)	Height (inches)	Weight (lb.)	Height (inches)	Weight (lb.)	
Philips lower income	6	44-34	47-71	44-42	43-33				
Woodrow and Robertson	6	45-3	45-6	45-3	45-6	43-2	37-5	43-2	37-5
Present series	6	46	46½	45	45	44½	42	42½	41

figures are less than the annual height and weight gains at this age and are possibly attributable to variations in the estimation of age in the three series. The present figures refer to the median status at the child's birthday anniversary. The three series are sufficiently in accord to dispel any doubt about the representative validity of our report. There are no comparable figures for other age-groups. It is also apparent that, apart from differences of 3½ and 4½ lb. in the respective weights of Coloured girls and boys, the figures for 6-year-olds in the present series show no inexplicable discrepancy when compared with those of Woodrow and Robertson. The Coloured children of the two series compare fairly closely in height, and the weight gain may well be a reflection of improved social conditions in the interval between the two assessments.

Growth in height and weight is dependent on so many factors, heredity, social status, endocrine influence, muscular activity, etc.—that a considerable variation at any particular age is to be expected. This has been emphasized frequently in recent years and it is now generally accepted that any measurement falling between the 10th and 90th percentiles of those for that age is within the normal range. The modern custom of depicting the normal range by a three-line graph instead of the old method of drawing one average line is soundly based on this scatter. There is nothing unusual about the extent of the scatter in the charts of the present series. There is, however, subject for comment on the variations in progress of the two sexes and the two ethnic groups studied.

Figs. 1 and 2 and Table VII show that in the boys of both groups the impetus of growth increases gradually with the passage of time. Between 6 and 7 years the annual increase in height is between 1¼—1¾ inches whilst at 14—15 years it has increased to almost 3 inches. The rate seems to rise most quickly after the age of 12 years. In girls the trend is in the opposite direction. They appear to grow more quickly between 6 and 8 years than at any other time in the school-going period, and they maintain an annual increment superior to that of the boys until about 13 years, when their yearly increase in height decreases very distinctly. The boys

TABLE VII. ANNUAL GAIN IN HEIGHT (inches)

Age (years)	7	8	9	10	11	12	13	14	15
American Boys	2½	2½	2	2	1½	2½	2	3	2
American Girls	2½	2½	1½	2½	2½	2½	2	1	2
British Boys	2	2	2	2½	1½	2	2	1½	2
British Girls	2½	2	2½	2	2½	2	2	1½	1½
Cape Town:									
European Boys	1½	1½	1½	2	2½	2½	2½	2½	3
European Girls	2½	2½	2½	2	2½	2½	2½	1½	1½
Coloured Boys	1½	1½	1½	1½	1½	1½	2½	2½	3
Coloured Girls	2½	2½	2½	2½	2	2	2	2	1½

TABLE VIII. ANNUAL GAIN IN WEIGHT (lb.)

Age (years)	7	8	9	10	11	12	13	14	15
American Boys	6½	6	6	5	6½	7	9	14½	12½
American Girls	5½	6	6	6½	8½	8½	11½	9½	3
British Boys	4½	4½	5½	6½	4½	9	7	11	
British Girls	4½	6½	6½	6½	7	8½	11	11	
Cape Town:									
European Boys	4½	5½	5½	6	6½	7½	8	12	15
European Girls	4½	5½	6	6	8	8	10	11	13
Coloured Boys	2	3	3	4	5½	6½	8	10	12
Coloured Girls	2½	4½	5½	6	6½	8	9	11	12

show a spurt of growth about the commonly accepted age of puberty. The girls do exactly the opposite. These characteristics are shown by both ethnic groups but, while the two lots of girls proceed on very closely approximated tracks, the progress of the boys is much less alike. The Coloured boys lag behind their European counterparts until about 13 years of age; thereafter the two rates of growth are identical. There is no obvious reason for these sex and race differences but the net result is that at 15 years the median height of a Coloured boy is 3½ inches and of a girl 2½ inches less than that of their Cape Town European contemporaries.

It is generally assumed that growth in childhood is an ever-slowing process but these charts of the rate of increase in height are not in accord with this dictum. Johnston⁹ has already charted a difference between the sexes. His graph shows a sex difference comparable to ours, though not quite identical, and his explanation is that growth in

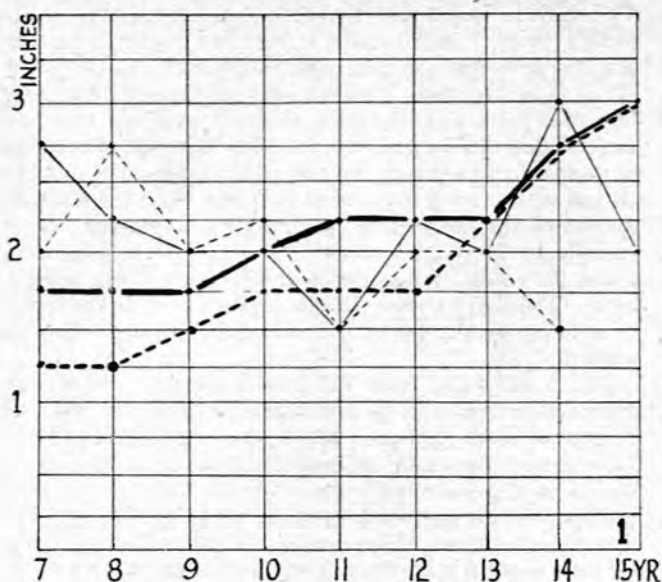


Fig. 1. Boys' annual increase in height (inches)*.

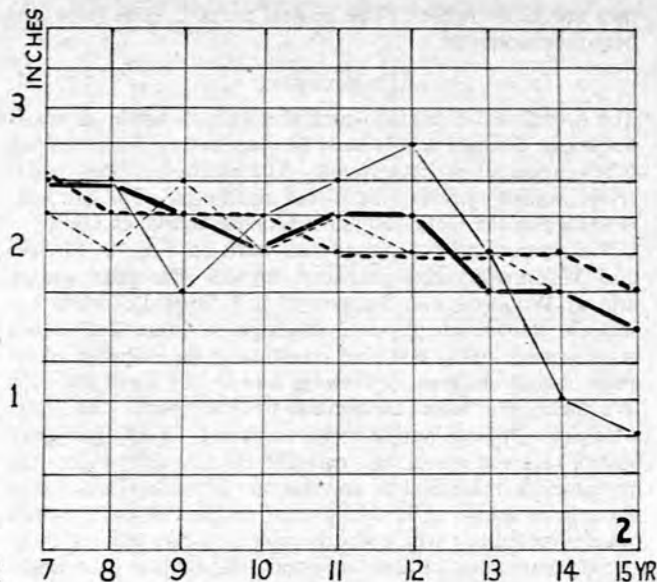


Fig. 2. Girls' annual increase in height (inches)*.

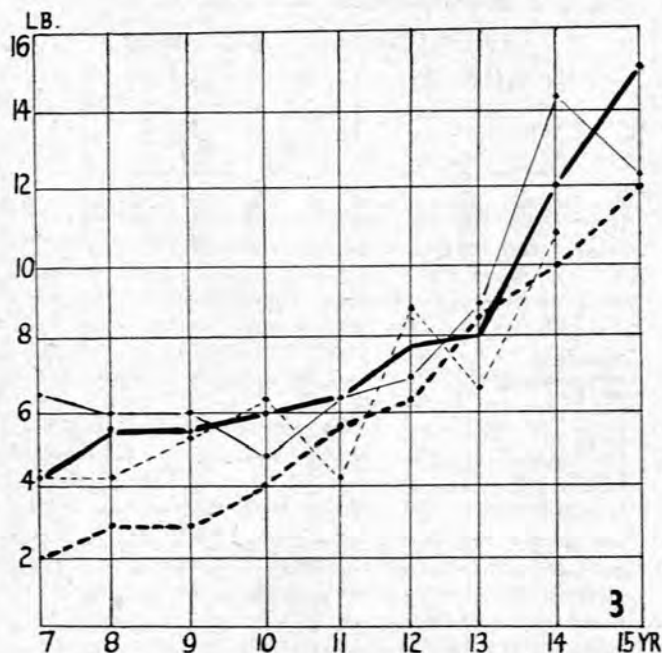


Fig. 3. Boys' annual increase in weight (lb.)*

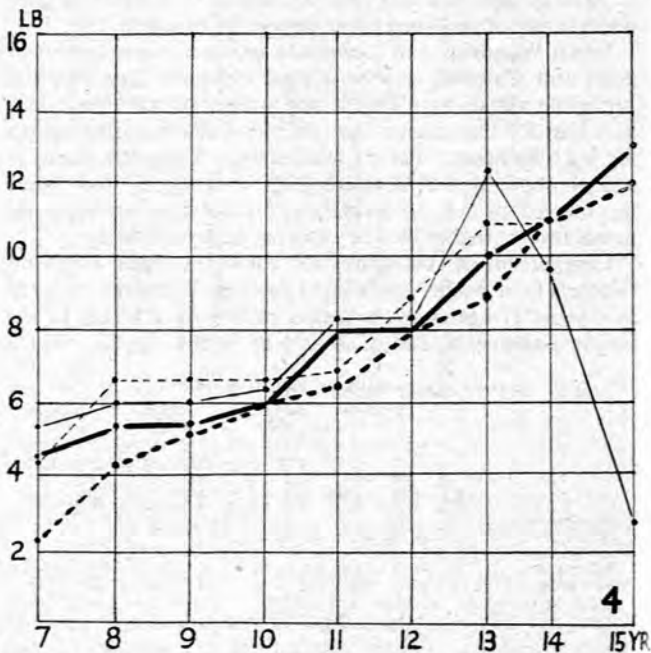


Fig. 4. Girls' annual increase in weight (lb.)*

length decreases rapidly in rate after puberty which, he avers, is 2 years earlier in the female than in the male.

Our graphs for the girls conform to the accepted pattern, though the American line is somewhat erratic. The similar contrast of Cape Town boys with those overseas is striking in the discrepancies shown. British and American boys follow the female pattern till about 11 years, when the Americans at least change to that of the Capetonian males, i.e. show a growth spurt. In both Cape Town and America

* American=continuous thin line, British=interrupted thin line. Cape Town European=continuous heavy line. Cape Town Coloured=interrupted heavy line.

the ethnic derivation is from comparable mixed European stock and it is unlikely that the differences are hereditary in origin. The fact that the girls all conform to one pattern supports this assumption and also makes it improbable that climate plays any direct part. Hormonal influence would likewise appear to be comparable in the four groups of each sex. The diet of the average female in the three groups of European descent is vastly different from that of the Cape Coloured girls, yet the rate of growth in height of all four is very similar. The diet of the average Cape European boy is certainly not materially inferior, if it is not indeed superior.

to that of the British boy, yet the former appears to grow more slowly than his northern brother. Usually, and for reasons best known to their mothers, when food is in short supply the male of all ages is given priority over the female so that in the less well-endowed Coloured community it might be expected that the boys would have an advantage over the girls. The charts show no such trend. Between 6 and 12 years the Coloured girls grow faster than the boys. The reason cannot lie in the sampling methods since, presumably, the males and females of the three series were in each case alike for the two sexes. The most reasonable explanation may lie in the energy expenditure of the various groups. Girls, generally, pay lip service to muscular activity. Capetonian boys of both races are, on the other hand, probably far more active than either British or American boys from a much earlier age and the climatic conditions encourage this. They may use more of their energy in exercise and therefore grow more slowly in height than do the British and American groups and the females of the same age in the same town.

If this is true the effect should be still more obvious in the matter of weight. Table VIII and Figs. 3 and 4 would appear to confirm the theory. The annual weight increment of all Cape Town children increases steadily throughout the age period of this investigation. The girls of other lands do so too, except Americans of over 13 years, and the reason for their exception may not be unassociated with the dictates of fashion. The graphs for British and American boys' weights might reflect certain scholastic and social turning-points in their lives. The relatively poor place taken on every comparative graph by the Coloured children could reflect their mediocre feeding since, to a much more obvious extent, increase in weight is more intimately associated with the food supply than is increase in height. Further support is given by the greater disparity in weight between Coloured boys and all the other boys than is shown by the Coloured girls, though these show a similar, less marked, lag behind their sisters of European descent. But it is doubtful if this is the whole story since, even at 8 years of age, the Coloured girls have established a lead over the boys in both height and weight.

The median heights and weights of Cape Town European, Cape Town Coloured, British and American children are shown in Tables IX-XII and Figs. 13-16. The British and American figures have been converted from centimetres and kilograms to the nearest $\frac{1}{2}$ inch and $\frac{1}{2}$ lb. The source of the British figures is Illingworth¹⁰ and the subjects were London County Council school children. The USA figures come via Stuart and Stevenson¹¹ from studies of the Iowa Child

TABLE IX. COMPARATIVE: BOYS' HEIGHT (inches)

Age (years)	6	7	8	9	10	11	12	13	14	15
American	46½	49	51½	53½	55½	56½	59	61	64	66
British	44½	46½	49½	51½	53½	55	57	59	60½	
Cape Town:										
European	46	47½	49½	51½	53½	55½	57½	60	62½	65½
Coloured	44½	45½	47	48½	50½	52	54½	56½	59½	62½

TABLE X. COMPARATIVE: GIRLS' HEIGHT (inches)

Age (years)	6	7	8	9	10	11	12	13	14	15
American	45½	48	50½	52½	54½	57	59½	61½	62½	63½
British	44½	46½	48½	51½	53½	55½	57½	59½	61½	
Cape Town:										
European	45	47½	50	52½	54½	56½	59	60½	62½	64
Coloured	42½	45½	47½	49½	52	54	56	58	60	61½

TABLE XI. COMPARATIVE: BOYS' WEIGHT (lb.)

Age (years)	6	7	8	9	10	11	12	13	14	15
American	48½	54	60	66	71	77½	84½	93	107½	120
British	46	50½	55	61½	68	72½	81½	88	99	
Cape Town:										
European	46½	51	56½	62	68	74½	82	90	102	117
Coloured	42	44	47	50	54	59½	66	74	84	96

TABLE XII. COMPARATIVE: GIRLS' WEIGHT (lb.)

Age (years)	6	7	8	9	10	11	12	13	14	15
American	46½	52	58	64	70½	79	87½	99	108½	113½
British	44	48½	55	61½	68	75	83½	94½	105½	
Cape Town:										
European	45	49½	55	61	67	75	83	93	104	117
Coloured	41	43½	48	53½	59½	66	74	83	94	106

Welfare Research Station. The comparative status is shown in Figs. 13-16.

It can be seen from the median heights and weights that the American boys are heavier and taller than the other 3 groups. The Cape Town European boys are slightly shorter and lighter and they are closely followed by the British school-boys. The Cape Coloured boys are very much shorter and lighter than the other groups.

So far as the girls are concerned, the American girls are again the tallest and heaviest except at approximately 15 years of age, when the Cape Town European girls overtake them. After them come the British and finally the Cape Coloured girls. The latter are, once again, far below the others, although the difference is less marked than in the males.

Similar comparisons have been made in the past. Cluver *et al.*¹² found that South African European children were taller and heavier than the Americans, especially the boys. Freer found the reverse of that picture but his subjects were not really suitable for any comparison tests. Maughan Brown noted favourable comparison between his widely scattered Cape Province European children and those of similar racial stock in England, Australia and America. In both sexes the heights of Cape European, English and American children were the same but the Cape boys were heavier than the others at all ages and the Cape girls at the older ages. Le Riche found that American children from the higher income category were taller and heavier than his Pretoria school-children of European descent.

The international comparison graphs and figures presented here do not show any very notable differences among the children of European stock in the three continents. The most striking feature is the poor position of the Coloured children and the actual figures are more revealing than the graph. We have already shown that the growth pattern in the two sexes, in the Cape, is very similar and the conclusion seems inevitable that the poor showing of the Coloured children is economic in origin. The really surprising thing is that their standards, especially for height, come so near to those of children who enjoy so many of the advantages which they lack. It should be noted too that the feeding habits in the three continents, though they vary widely, do not seem to have much bearing on the rate, pattern or endpoint of the growth of children of comparable lineage.

Finally, the established belief that growth occurs in spurts and that increase in height takes precedence over increase in weight at certain periods of childhood seems to lack any foundation in fact. It is, of course, true that the bodily proportions change from time to time and that some children give the impression of being 'leggy' but though there is a clear difference between the growth pattern of boys and

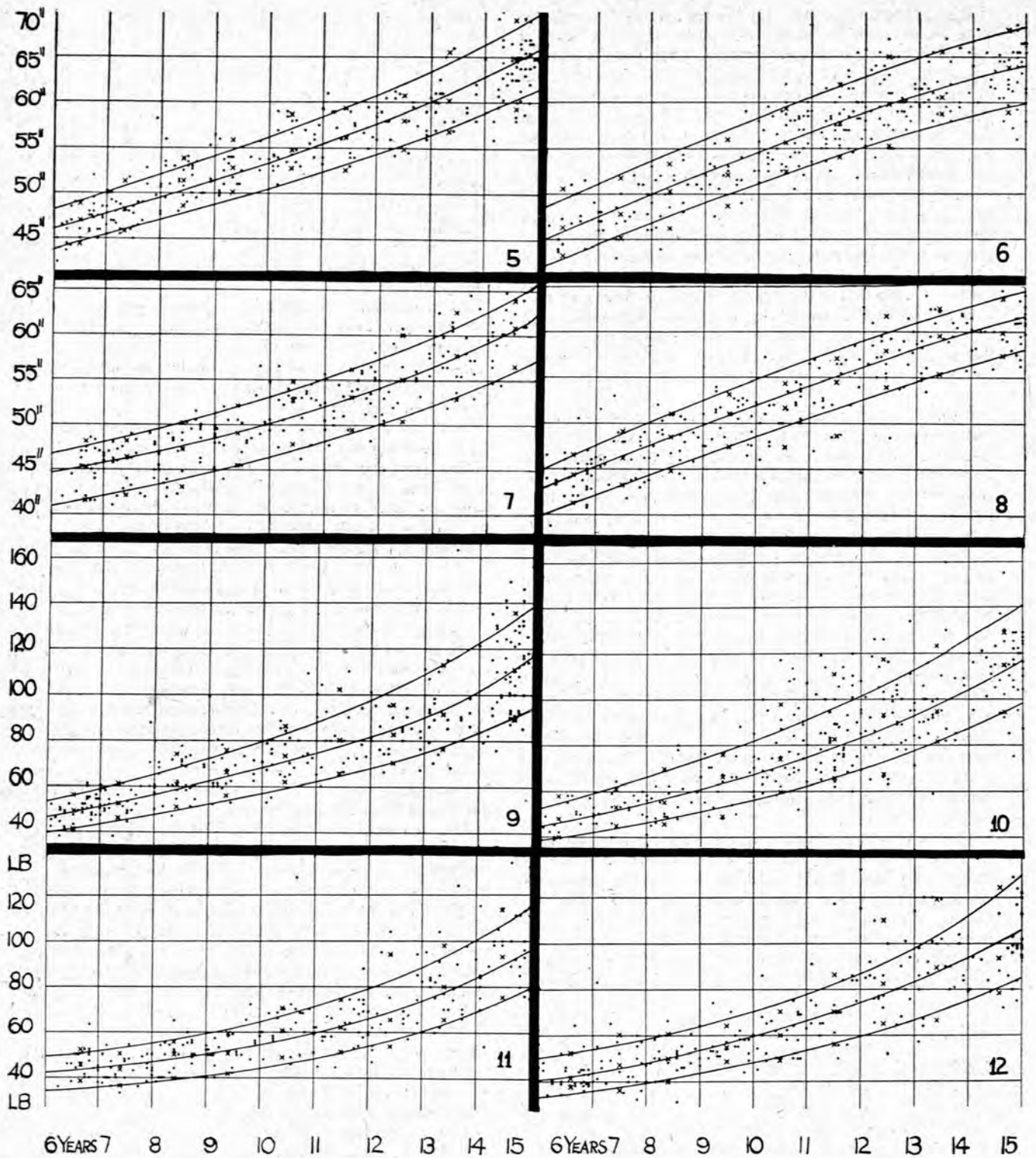


Fig. 5. Height, European boys, Cape Town, 1956.
 Fig. 6. Ditto, European girls.
 Fig. 7. Height, Coloured boys, Cape Town, 1956.
 Fig. 8. Ditto, Coloured girls.

Fig. 9. Weight, European boys, Cape Town, 1956.
 Fig. 10. Ditto, European girls.
 Fig. 11. Weight, Coloured boys, Cape Town, 1956.
 Fig. 12. Ditto, Coloured girls.

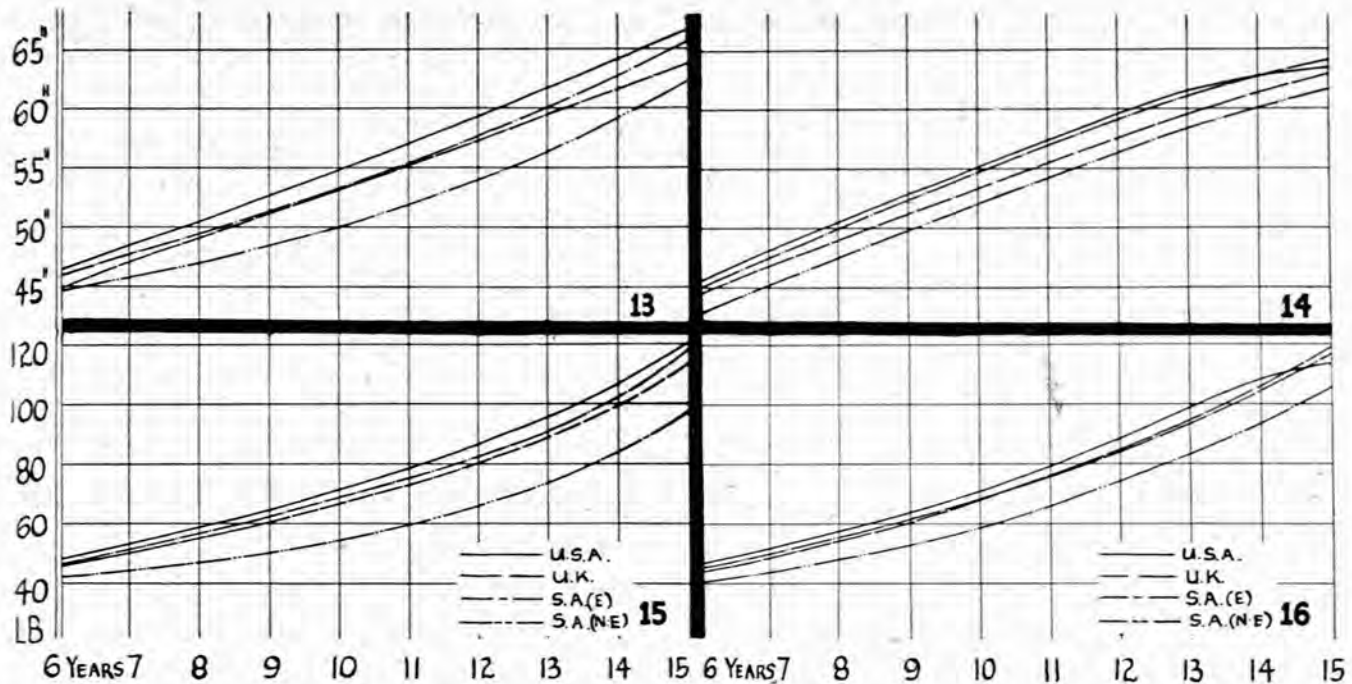


Fig. 13. Comparative chart of boys' heights.

Fig. 14. Comparative chart of girls' heights.

Fig. 15. Comparative chart of boys' weights.

Fig. 16. Comparative chart of girls' weights.

of girls there is never at any time any material cessation or even slowing of the rate of gain in weight. The temporary effect of illness is another matter.

SUMMARY

1. The aim of this survey was to establish the normal range of heights and weights for Cape Town school children of European and Coloured race.

2. The material utilized for this purpose was a random sample of approximately 84,000 European and Coloured school children.

3. The results of the survey are given in graphic as well as tabular form. They show that (a) the European boys and girls are both heavier and taller than the Coloured boys and girls at all the ages studied, and that (b) the difference is most striking amongst the boys.

4. The Cape Town children have been compared with British and American children of the same ages. The comparison shows that (a) there is little difference in the weights and heights of the European children in Britain, USA and Cape Town, and (b) the Cape Coloured child lags far behind the European in both height and weight.

5. An incidental finding was that of a fundamental difference in the growth pattern of the sexes, the boys showing an ever-increasing annual gain in height, the girls growing a gradually diminishing amount each year.

APPENDIX

All the material employed in this investigation was extracted from the school medical inspection cards. Only 'normal' children were included and, as some schools had facilities for 'backward' children, their cards were excluded from the sample before the selection of cases was made. All children had been measured and weighed by the school medical officers.

Height. The children were measured in their stockinged feet against a tape measure applied to a wall. All readings were taken to the nearest $\frac{1}{4}$ inch.

Weight. The boys were weighed in trousers and vests whilst the girls wore pants and vests. They were weighed on a portable spring scale and the recordings were made to the nearest $\frac{1}{2}$ lb.

Choice of Schools

At the outset it was decided to analyse the medical inspection cards of 500 European school children. On the advice of a statistician, after the pilot survey more data was necessary and the sample of schools was enlarged. Eventually 983 cards were used.

The list of schools (as supplied by the Chief Medical Inspector of Schools) was placed in alphabetical order, first the high and secondary schools and then the primary schools. The number of pupils in each school was ascertained from the educational statistics for 1954 and the total gave the number of Cape Town European school children as 27,695. As it was decided to visit 15 schools, the school which educated every 1,846th child (27,695 divided by 15) was selected. One of the selected schools is a 'Home of Recovery' and as the aim of the survey was to establish the norm, this school was excluded.

Choice of Medical Inspection Cards

The original intention was to select 3 cards from each age-group in each school to obtain a sample of 50 children in each age-group. Apart from one school, all the cards were arranged in alphabetical order and these cards were sorted into age-groups. The first card from each age group was selected by using a table of random figures whilst the remaining 2 were selected by dividing the remainder of the pile into 3 equal parts and taking the leading card from the rear sections. Where there were insufficient numbers to enable this type of selection, all the cards in the particular age-group were included. This accounts for the inequality of numbers in the various age groups.

At one school the cards were arranged according to school classes. As it would not have been practicable to sort these into age-groups before the selection of cards (difficulty would have been encountered in restoring the original order) it was decided to include 6 cards from each class. The first card was likewise selected from a table of random figures and the remaining 5 by

dividing the remaining pile into 6 equal portions. This latter school contained only boys and accounted for the disproportion in number of boys and girls.

Some schools had recent past-pupils' records included amongst the present pupils' cards, and some of them may have been included in the cards finally selected for the survey.

The sampling for the Coloured children was carried out in the same way, but in the light of experience gained from the European survey, it was decided to select 5 cards from each age-group; 15 schools were again selected but of these 2 had never had a medical inspection and it was not possible to visit a third.

Amongst other information the medical inspection cards include a record of heights and weights of the children at various ages. Each child is examined at least once, and sometimes as many as 5 or 6 times during his school career. From each inspection card only one height and weight recording was extracted and where more than one medical inspection has been carried out, only the most recent recordings were utilized. The child's exact age at the time of the examination is stated on the card, e.g. 10 years and 2 months, etc.

Once all the data had been gathered the information was plotted on 8 graphs (heights of European boys, European girls, Coloured boys and Coloured girls; and weights of the same 4 groups): Figs. 5-12. The median height and weight for each age-group was ascertained, as well as the average age of the children in each age-group. This figure was shown on the graphs by means

of a cross. The medians were then joined together and the curve 'smoothed' to give the middle curve on the 8 charts. The 10th and 90th percentiles were calculated and these were likewise shown by a cross on the various graphs. In view of the small number of cases in the survey these percentiles were not so accurate as the median and slightly more 'smoothing' had to be performed when various curves were drawn. The lower and upper curves on the graphs represented the 10th and 90th percentiles and the area between these 2 curves showed the heights and weights of 80% of the children studied.

Tables XIII-XVI show the observed and 'smoothed' readings for the median, 10th and 90th percentiles as read directly from the above-mentioned 8 charts. Tables II-V in the text (those illustrating the median, 10th and 90th percentile of heights and weight of the children) were read directly from the same charts, the height and weight being read off at the point where the curves crossed each year of age.

We wish to acknowledge our indebtedness to Dr. J. G. Meiring, Superintendent General of Education for the Cape Province, and to Dr. L. van D. Cilliers, Chief Medical Inspector for Schools, for permission to make use of the school medical cards; to the principals of the schools selected for sampling for their helpful cooperation in our scheme; to Professor Edward Batson for his generous help in guiding our sampling technique and for the use of his tables; and to the Department's late secretary, Miss J. D. Montgomery, for a vast amount of preparatory work. Mr.

TABLE XIII. ACTUAL OBSERVATIONS AND 'SMOOTHED CURVE' READINGS OF HEIGHT OF CAPE TOWN EUROPEAN CHILDREN (inches)

Age	Boys						Girls					
	P ¹⁰		Median		P ⁹⁰		P ¹⁰		Median		P ⁹⁰	
	Obs.	Smth.	Obs.	Smth.	Obs.	Smth.	Obs.	Smth.	Obs.	Smth.	Obs.	Smth.
6-7	44½	44½	47	46½	48½	49	43½	42	46½	45½	50½	49½
7-8	45½	46	48½	48½	51½	50½	45½	45	47½	48½	51½	52½
8-9	48½	47½	51½	50½	53½	53	46½	47½	50½	50½	53½	54½
9-10	50½	49½	52½	52	56	55½	48½	50	52	53½	56	57
10-11	52½	51½	54½	54½	58½	57	52½	52½	55½	55½	59½	59½
11-12	52½	53½	56½	56½	59½	59½	54	54½	57½	58	62	61½
12-13	54½	55½	58	58½	60½	62	55½	56	59½	59½	65	63½
13-14	56½	57½	60½	61	65½	64½	58½	57½	60½	61½	65½	65½
14-15	59½	60½	64½	64½	69	68½	59	59½	63½	63½	68	67½

Obs. = Observed.

Smth. = Smoothed.

TABLE XIV. ACTUAL OBSERVATIONS AND 'SMOOTHED CURVE' READINGS OF HEIGHT OF COLOURED CHILDREN (inches)

Age	Boys						Girls					
	P ¹⁰		Median		P ⁹⁰		P ¹⁰		Median		P ⁹⁰	
	Obs.	Smth.	Obs.	Smth.	Obs.	Smth.	Obs.	Smth.	Obs.	Smth.	Obs.	Smth.
6-7	41½	41½	45½	45½	48	47½	41½	41½	44½	44½	46½	46½
7-8	42	42½	46½	46½	48½	48½	43½	43½	46½	46½	49½	49
8-9	43	44	47½	47½	50½	50½	44½	45½	48½	48½	51	51
9-10	45½	45½	49	49	52	52	47½	47½	51	50½	53½	53½
10-11	48	47½	52½	51	54½	54	47½	49½	51½	53	54½	56
11-12	49½	49½	53	53	56½	56½	48½	51½	54½	55	57	58
12-13	50½	51	55	55	60	58½	54	53½	58	57	61½	59½
13-14	53½	53½	57½	57½	62½	61	55½	55½	59½	59	62½	61½
14-15	56½	56	61	60½	64	64½	57½	57½	60	61	63½	64

TABLE XV. ACTUAL OBSERVATIONS AND 'SMOOTHED CURVE' READINGS OF WEIGHT OF EUROPEAN CHILDREN (lb.)

Age	Boys						Girls					
	P ¹⁰		Median		P ⁹⁰		P ¹⁰		Median		P ⁹⁰	
	Obs.	Smth.	Obs.	Smth.	Obs.	Smth.	Obs.	Smth.	Obs.	Smth.	Obs.	Smth.
6-7	41½	41½	49	48½	56	56	40	39½	47	45½	58	55
7-8	46	45	53	53	61	61	45	44	53	52	61	62
8-9	51	49½	61	59	74	68	46	48	55	57	69½	68½
9-10	56	54	66	64	76	74½	49	53	66	64½	76	77
10-11	62	59	73½	71	86	83	60	59	73½	71	98	86½
11-12	65½	64½	80	77½	102	92	66	66	82½	79	110½	96½
12-13	70½	70½	82½	85	95½	102	67	72½	93	87	117½	106
13-14	76½	77½	92	94	113	113	82	82	95	97½	123	118
14-15	89½	90½	111	111	136	133	94½	94½	115	112½	129	136

TABLE XVI. ACTUAL OBSERVATIONS AND 'SMOOTHED CURVE' READINGS OF WEIGHT OF COLOURED CHILDREN (lb.)

Age	Boys						Girls					
	P ¹⁰		Median		P ⁹⁰		P ¹⁰		Median		P ⁹⁰	
	Obs.	Smth.	Obs.	Smth.	Obs.	Smth.	Obs.	Smth.	Obs.	Smth.	Obs.	Smth.
6-7	38½	35	46	43½	52	50½	38	34½	41½	42	52	52
7-8	36½	36½	43½	45½	50½	53	36	37½	47	46	60	56
8-9	40	39	50	48	56	57	40	41	50	50	61	61
9-10	42	42	51	52	60	61	48½	46	55	57½	64	66
10-11	49	46	61	56½	70	67	49½	51	50	63	70	74
11-12	51	51	62½	63	74	75	56	56½	70	70	86½	82½
12-13	54	56	65½	69	94	83	65	62½	82½	78	110	91
13-14	66	64	80	77½	98	93	66½	70	90	88	119	103½
14-15	75½	74	93	90	113½	107	78½	81	94½	101	124	122

Nolte was responsible for the final preparation of our graphs and 'smoothed' curves.

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