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CANADA



A  
HEIGHT AND WEIGHT SURVEY  
OF  
TORONTO ELEMENTARY SCHOOL CHILDREN  
1939

Published by Authority of the Hon. James A. MacKinnon, M.P.  
Minister of Trade and Commerce  
Ottawa  
1942

*Price, 25 cents*



## P R E F A C E

This report sets forth the statistical results of a survey of children in the elementary schools of the City of Toronto, taken in November, 1939. The field survey was conceived and planned by Dr. F. F. Tisdall and Dr. J. H. Ebbs of the Hospital for Sick Children in Toronto, under the direction of Dr. Alan Brown, in consultation with Dr. F.S. Burke of the Department of Pensions and National Health, Ottawa, who was responsible for a similar survey made in 1923. Thanks are also due to Dr. J. E. Robbins, chief of the Education Statistics Branch of the Dominion Bureau of Statistics and his staff, who together with the Toronto Board of Education rendered valuable assistance.

Dr. Gordon F. Jackson, Medical Officer of Health of the City of Toronto, Dr. L. A. Pequegnat, Deputy Medical Officer of Health, and Miss Elsie Hickey, director of Public Health nurses in Toronto organized and supervised the actual measurements of the heights and weights of the children, while the remaining information was entered on the schedules by the teachers in each classroom.

The Dominion Bureau of Statistics received the schedules and undertook the tabulation, compilation and statistical interpretation of the results. Their medical interpretation is to be the work of Dr. Tisdall and his associates.

The present report is the work of Mr. H. Keyfits, assisted by Miss B. J. Stewart and Mr. H. G. Page, of the Social Analysis Branch of the Dominion Bureau of Statistics. The charts were prepared by Mr. J. W. Delisle, Chief of the Draughting Branch.

*S. A. Gudmore.*

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HEIGHT AND WEIGHT SURVEY OF TORONTO ELEMENTARY SCHOOL CHILDREN, 1939.

INTRODUCTION

A survey of the heights and weights of some 59,000 boys and girls attending elementary schools in the city of Toronto was completed in 1923 by the Department of Public Health of that city. The records of measurement were punched on cards in Toronto and these were delivered to the Bureau of Statistics in Ottawa for tabulation and interpretation. A table of average heights and weights by age was calculated from these results which has since served as the standard for Canadian school children.

Some time previous to the taking of this survey a reorganization of the Department of Public Health in Toronto was made, medical and nursing staff was increased and definite policies adopted. It was decided that medical investigation would be as thorough as possible and the correction, in so far as possible, of physical defects would be a major part of the plan.

At the time the first height and weight measurements were taken in 1922, various public health measures initiated by the Hospital for Sick Children were being energetically applied throughout Greater Toronto by the Board of Health. Following the passage of a by-law providing for the pasteurisation of all milk, a "Drink-More-Milk" campaign was launched. Woll-baby clinics had been established since 1914 throughout the city, and with safe milk and water it was found possible to control certain infectious diseases and bring them to a minimum. These and other public health measures which were gradually introduced (and since adopted throughout most of the Dominion) have remained an matters of first consideration, and we believe that the results of such a far-sighted and long-range policy have resulted in important changes in the stature of children.

This is borne out by the fact that during the past few years both clinicians and the Department of Health of Toronto have noted that children brought before them for medical inspection or treatment no longer fitted into the height and weight tables of 1923. It was, therefore, decided to carry out a new survey and this was completed in November, 1939. New measurements were required for comparison with the 1923 figures to determine the long-term change in average stature as well as to analyse the influence of such factors as economic status, birthplace of parents, etc. on height and weight. Also wartime concern for making the most of food resources has raised great interest in the subject of nutrition. This report gives an indication of the range within which nutrition, supposed to be one of the main factors of the environment, affects the build of children. In addition, the tables also serve such immediate practical ends as the setting of age-sized of children's garments.

The original schedules, unlike those of the 1923 survey, were sent direct to the Bureau of Statistics, where they were coded, punched, sorted and tabulated. Due to the many other demands on its facilities, the Bureau was not able to complete its portion of the project until January, 1942.

SCOPE OF THE SURVEY

The present survey covers measurements of about 78,000 children, as against about 59,000 measured in 1923. As in the earlier study they are about equally divided on the basis of sex. The punch card as drawn up for the present study represents a considerable elaboration on the 1923 card and contains, in addition to data on height, weight, age, birthplace of parent or guardian and the means of identifying the card in case of error, information for each child on the occupation class or status of the parent, whether the family was or was not on relief at any time during the year, as well as the child's defects at the time of the enumeration and the diseases from which he or she has suffered. In addition, the schools were so identified by code numbers as to differentiate those in prosperous districts from those in poor sections of the city.

The plan of tabulation was correspondingly more elaborate for the 1939 study. Machinery has enabled classifications to be made of all the factors on the card at a single run. A system of ratings on height and weight for each age were used for this purpose, and the resultant tables enable one to judge which factors are relevant to stature. An exact statement of the influence of each factor in inches and pounds requires the construction of separate age-height-weight tables and it was planned to avoid as far as possible the making of such tables for separate items on the card, since the small numbers in individual ages would hardly give results accurate enough to justify the expense.

The schedules as received from Toronto included about 88,000 cases in all, but some 10,000 pupils for whom information on either height, weight or age was missing were not included in the tabulation. Thus the figures here presented cover 39,550 boys and 38,503 girls. While there is no "not stated" category for height, weight or age, provision was made for a "not stated" item in all the other columns of the card.

The pupils surveyed are not equally representative of all age groups included, about half of them appearing in ages 9 to 12 (see Table 1). It was decided that the number of cases at age 16 (300) was too small even for average height and weight tables. It must be remembered in using ages beyond 13 or 14 that a certain type of selection has occurred in that pupils remaining in primary school beyond those ages tend to be backward. This point is underlined by the close relationship between height and weight on the one hand and academic standing on the other; thus the most representative results are in the ages 7 to 12 or 13.

The following table shows the age distribution of the 78,053 boys and girls studied as well as the distribution of Toronto children in 1931.

(x)  
Table 1. - Age Distribution of Children in the Survey, by Sex.

Age	Boys	Girls	Total	1931 (Census)
5	1,459	1,501	2,960	9,510
6	3,269	3,204	6,473	9,924
7	4,080	3,794	7,874	10,071
8	4,239	4,118	8,357	10,681
9	4,451	4,510	8,961	10,450
10	4,437	4,468	8,905	11,147
11	4,470	4,343	8,813	10,054
12	4,542	4,339	8,881	9,539
13	3,869	3,790	7,659	9,203
14	2,905	2,707	5,612	10,039
15	1,829	1,729	3,558	9,989
<b>TOTAL</b>	<b>39,550</b>	<b>38,503</b>	<b>78,053</b>	<b>110,607</b>

(x) This distribution is somewhat different from that of the 1923 sample (shown below), especially at the lower ages .

Age	Boys	Girls	Age	Boys	Girls	Age	Boys	Girls
5	30	20	9	3,922	3,960	12	3,298	3,132
6	1,107	1,128	10	3,791	3,704	14	2,255	2,286
7	3,541	3,469	11	3,556	3,636	15	868	839
8	4,008	3,881	12	3,602	3,383	<b>Total</b>	<b>29,978</b>	<b>29,438</b>

THE FORM OF THE DATA

Economic Factors.

The differences in stature and weight between different economic classes are shown in the survey in three ways: -

(1) Occupation Class or Status of the Parent.

For purposes of this survey the principal occupations are classified as manual and non-manual, within each of which three groups corresponding to economic levels are considered. Ten groups were constructed in all, as follows:-

Gainfully Occupied -

<u>MANUAL</u>	(LABOURERS AND SERVICE WORKERS (unskilled)-day labourers, personal and domestic attendants, etc.
	(FACTORY OPERATIVES AND SEMI-SKILLED WORKERS- various machine operators, lower grade tradesmen (such as butchers, furriers, etc.)
	(CRAFTSMEN (highly skilled trades)- building trade craftsmen- carpenters, masons, etc. - metal tradesmen - tool and die makers, jewellers, etc., - etc.
<u>NON-MANUAL</u>	(CLERICAL- office clerks, and lower grade occupations of a "white collar" nature in general.
	(COMMERCIAL- sales clerks, real estate, insurance, etc., agents and brokers, etc.
	(OWNERS AND MANAGERS.
	PROFESSIONAL

Non-Gainfully Occupied -

PENSIONED OR RETIRED  
UNEMPLOYED  
HOUSEWIVES

Results for children whose parents fall into each of these categories are shown in Table 9.

(2) Relief Status of the Family.

The question of relief was a delicate one and was answered for considerably less than half of the pupils. The large number appearing in the "not stated" category represents cases where no definite answer as to relief status was given on the schedule or where the space was left blank. (See Table 10).

(3) District in which School is Located.

The Bureau of Statistics was provided with a list of ten schools located in districts where the financial or economic status of the district as a whole was considered relatively very good, and ten schools in districts where the status was represented as very poor. The results for these two groups are shown in Table 11. The names of the schools in each group are as follows:-

<u>Poor Districts</u>		<u>Prosperous Districts</u>	
Brant	Niagara	Allenby,	John Ross Robertson
Carlton	Ogden	Blythwood	Oricle Park.
Dufferin	Park	Brown	Rosedale
Duke of York	Pauline	Fern	Runnymede
Norse	St. Paul's	Hillcrest	Whitney

### School Grade.

Grade was punched on the card in a range from kindergarten to ninth year. Unfortunately, many of the schools in Toronto include combinations of grades (2 and 3, and 3 and 4 occur especially often), and for all pupils in such schools (numbering almost one-half of the total in the survey) "not given" was punched in this field. (See Table 12).

### Birthplace of Parents.

Country of birth of parent or guardian was punched in 11 geographical groupings; (see Table 16), and a "not stated" category.

1. Canada
2. England, Wales, Isle of Man, Channel Islands, etc.
3. Scotland
4. Ireland
5. Other British possessions
6. Northern Europe (Scandinavia, Finland, Germany, Holland, Belgium)
7. Western and Southern Europe (France, Italy, Spain, Greece, Austria, etc.)
8. Eastern or Slavic Europe (Hungary, Poland, Russia, Roumania, Bulgaria, etc.)
9. Asia and Africa
10. United States
11. Other American countries (Mexico, South America, etc.)

### Defects and Diseases.

The 21 defects and 12 diseases which were classified on the student's academic card were punched in groups which have enabled tabulations to be made conveniently for the ratings of height and weight for each class separately and for certain frequently recurring groups of classes. (See Tables 13 and 14).

-----

Heights were punched to the nearest inch, weights to the nearest pound, and age to the nearest whole year. Measurements were with indoor clothing, but without shoes.

A sample of the schedule used in the classroom for recording the information, as well as the punch card drawn up by the Bureau for tabulation, is shown in Figure 1.

-----

### TABULATING PROCEDURE

The tabulating procedure may be divided into three main sections: -

- (1) A sort of the cards by age, height and weight. This resulted in a single set of age-height-weight tables for all pupils divided only by sex from which could be taken as summarizations; -

Average weights for each height at each age,  
Average heights at each age,  
Average weights at each age,  
Average weights at each height,  
Average increase in height between successive ages, and  
Average increase in weight between successive ages.

These formed the bases for comparison with results of the earlier Canadian survey and of surveys in other countries.



Figure 1

# SPECIMEN SCHEDULE

(SPECIMEN ONLY)  
(coded)

HEIGHT AND WEIGHT SURVEY OF PRIMARY SCHOOL CHILDREN  
DEPARTMENT OF PUBLIC HEALTH, TORONTO, NOVEMBER, 1939

0-104-7-21

SCHOOL	ROOM No.	Grade VII		GIRLS	DATE OF WEIGHING				8-11-39			
NAME (SURNAME FIRST)	ADDRESS	PUPIL				PARENT OR GUARDIAN				PUPIL		FAMILY ON RELIEF?
		HEIGHT	WEIGHT	D. OF B.	COUNTRY OF BIRTH	P. M. D.	COUNTRY OF BIRTH	OCCUPATION	RELIGION	DEFECTS	DISEASES	
Boomer, Mary	630 Kingville Ave.	61 1/2	103	17-8-26	Canada	P.	Canada	Plumber	Presbyt.	(X)	(X)	
Praser, Shirley	26 Bingham St.	59 1/2	88 1/2	21-9-27	Canada	P.	England	Unemployed	United	5, 6, 10 (X)	A, F (X)	Yes
Swan, Joan	372 Scarfield Ave.	62 1/2	87 1/2	28-10-28	Canada	P.	Holland	Salesman	United	5, 6 (X)	A, H (X)	No
Wilson, Jean	159 Pickerton St.	56 1/2	70	2-7-27	Canada	M.	United States	Housewife	Anglican	8, 16 (20X)	E, F, H (6X)	
Entered by teacher prior to survey		Entered by nurse recording at the time of the survey		Entered by teacher prior to survey				Entered by teacher from child's A. D. P. card on which the entries have originally been made by nurse or doctor		Entered by school or district nurse		

# SPECIMEN PUNCH CARD

**Key To Columns 35-44**

DEFECTS	1	2	3	4	5	6
RELIEF	1	2	3	4	5	6

DEFECTS	DISEASES	RELIEF
1 1 1 1 1 1	1 1 1 1 1 1	1 1 1 1 1 1
2 2 2 2 2 2	2 2 2 2 2 2	2 2 2 2 2 2
3 3 3 3 3 3	3 3 3 3 3 3	3 3 3 3 3 3
4 4 4 4 4 4	4 4 4 4 4 4	4 4 4 4 4 4
5 5 5 5 5 5	5 5 5 5 5 5	5 5 5 5 5 5
6 6 6 6 6 6	6 6 6 6 6 6	6 6 6 6 6 6
7 7 7 7 7 7	7 7 7 7 7 7	7 7 7 7 7 7
8 8 8 8 8 8	8 8 8 8 8 8	8 8 8 8 8 8
9 9 9 9 9 9	9 9 9 9 9 9	9 9 9 9 9 9

D.B.S. SURVEY OF TORONTO SCHOOL CHILDREN 1939

(2) In order to avoid the construction of age-height-weight tables for the relating of each factor on the card to stature and age, a system of ratings on height and weight for each age was devised. Each child was described as over, average, or under in respect of height and in respect of weight for his height, making nine classes. The classes were numbered from one to nine, according to the scheme below. Thus, pupils average in height for their age and average in weight for their height and age fall into class 5. Short pupils of average build (weight in relation to height) fall into class 2, short pupils who are underweight even for their height fall into class 1, tall pupils who are overweight even for their height fall into class 9, etc. It was felt that it was more desirable for the summary description in ratings to take weight in relation to height (which may be described as build), rather than weight in an absolute measure. In most of the tables, groups 1, 2 and 3; 4, 5 and 6; and 7, 8 and 9 are used to give, respectively, under-average height, average height and over-average height. In the same way 1, 4 and 7; 2, 5 and 8; and 3, 6 and 9, give respectively, thin, normal and stout children (weight in relation to height).

It was felt that if comparable ratings for each age could be established and an aggregate covering all ages made of each rating then each aggregate would constitute a single sample, thus avoiding attempts to compare the small numbers at each age. In this way the distribution of the pupils by rating groups could be compared for any item on the card with the distribution for all children and the result would indicate in what way the particular item was related to stature.

For example, the procedure would involve adding the rating distributions of the several ages for all children with parents born in Ireland, and then comparing the total distribution of the children of Irishmen among the nine ratings groups with the distribution for all children. Thus Irish children of all ages would be the sample for comparison, a sample over 5 times as large as the largest single age.

The method as used consisted in dividing the distribution at each age into three groups of height, with 25 p.c. of the distribution in each of the upper and lower ranges and 50 p.c. in the average group. Within each of these, weights were similarly divided, making in all nine groups in respect of height and weight. The distribution of a representative set of 16 pupils would be as follows: -

HEIGHT	WEIGHT			Short for age
	Group 1	Group 2	Group 3	
	1 pupil	2 pupils	1 pupil	
	Group 4	Group 5	Group 6	Average height for age
	2 pupils	4 pupils	2 pupils	
	Group 7	Group 8	Group 9	Tall for age
	1 pupil	2 pupils	1 pupil	
	Under-weight for height and age	Average weight for height and age	Over-weight for height and age	

In each case the division points were taken at the nearest whole number of inches and pounds; a sample of the ranges is shown below for boys age 9. The complete set for each age and sex is given in the Appendix, Table A.

Height (inches)	Weight for rating group (pounds)								
	1	2	3	4	5	6	7	8	9
46	under 47	47-50	over 50						
47	under 48	48-52	over 52						
48	under 50	50-54	over 54						
49	under 53	53-57	over 57						
50	under 55	55-60	over 60						
51				under 58	58-63	over 63			
52				under 60	60-66	over 66			
53				under 63	63-69	over 69			
54							under 65	65-72	over 72
55							under 68	68-75	over 75
56							under 71	71-81	over 81
57							under 72	72-85	over 85
58							under 74	74-90	over 90

The justification of the process of adding together ratings for the different ages depends partly on the distribution being similar from age to age. When plotted on arithmetic scale the scatter becomes greater with increasing age, both in height and in weight, but when plotted on a logarithmic scale the scatter is remarkably constant, increasing only very slightly at the higher ages.

For reference the percentage distribution into under-average, average and over-average height and weight for the aggregate of all children at individual ages is shown below.

Table 2. - Percentages of Children, Age 5 to 15, Classified by Age, who are in Upper, Middle and Lower Groups of Height for their Age and of Weight for their Height and Age.

Age	Height			Weight for Height		
	P.C. Under Average	P.C. Average	P.C. Over Average	P.C. Under Average	P.C. Average	P.C. Over Average
<b>B O Y S</b>						
5	19.1	57.2	23.6	26.2	48.5	25.3
6	22.4	53.3	24.3	22.7	49.9	27.4
7	20.8	50.2	29.0	22.5	54.6	22.9
8	18.1	61.8	20.1	23.5	50.9	25.5
9	30.4	47.9	21.7	24.9	50.1	24.9
10	19.4	59.0	21.6	24.6	50.0	25.4
11	23.3	55.7	21.0	24.7	48.1	27.1
12	25.1	53.4	21.5	25.6	49.5	24.9
13	28.1	48.7	23.1	24.5	50.9	24.6
14	28.2	49.5	22.3	25.4	51.4	23.2
15	24.6	53.4	22.0	25.1	51.0	23.9
Total	23.7	53.6	22.7	24.4	50.5	25.1
<b>G I R L S</b>						
5	22.2	55.8	22.0	23.5	51.2	25.3
6	27.0	52.7	20.3	24.4	49.0	26.6
7	23.0	51.4	25.5	26.1	48.1	25.8
8	22.7	48.6	28.7	25.7	49.7	24.6
9	22.1	46.6	31.3	24.2	51.1	24.7
10	21.9	45.0	33.1	26.3	47.8	25.9
11	21.7	52.7	25.6	24.4	50.9	24.7
12	27.7	50.4	21.9	24.8	48.5	26.7
13	26.4	53.2	20.4	25.0	50.0	25.0
14	33.4	44.9	21.7	23.5	47.6	28.9
15	20.9	50.6	28.5	24.7	51.6	23.7
Total	24.4	49.8	25.8	24.9	49.5	25.6

Ideally, numbers in each group should show exactly 25 p.c., 50 p.c. and 25 p.c. but the practical necessity of drawing the lines at integral numbers of inches and pounds results in considerable deviation. It is submitted that as long as the comparison is between percentage underweight for a particular group of children and percentage underweight for all children the essential arbitrariness of what constitutes over- and under-height and weight does not affect the conclusions. This is so even when the numbers in the several ratings groups for each age are added together provided (which is the case) no special age-distribution pertains to the group of children being investigated.

(3) The third section of the tabulating procedure consists in cross-classifying the items of the card in an effort to determine the relative influence of each of these factors on the heights and weights of children. In this way some important questions may be answered. For example, does the economic status of the family influence the prevalence of disease and defects? Does it retard the child in his academic standing as indicated by his school grade? Do certain combinations of diseases or defects have more effect on height and weight than the same diseases and defects disconnected? To what extent do differences between public and separate schools relate to race and economic conditions? To what extent might heredity, as indicated by the birthplace of the parent, influence build? The last question is partially answered in the present report but the others await further cross-tabulation. Further questions not related to height and weight may also be answered from the survey with further tabulation. Do diseases lead to permanent defects? Are defects related to grade at school? etc.

### TABULATIONS

#### Distributions and Averages of Heights and Weights (I)

The first and most important tabulation is the distributions by height and weight of pupils of given sex and age. Unfortunately, these tables are rather bulky and hence are not here reproduced for each age. A specimen is shown in Table 3.

Charts are given (Figure 2) showing the percentage distributions of boys and girls of the survey by height at ages 6, 9 and 13. It will be noted that for the ages other than 6 there is the clearest distinction between the 1923 survey and that of 1939, the pupils of 1939 being on the whole taller. It is interesting that age 6 is an exception. Possibly at the earlier period some selection entered into the starting of the children at school, in physically undeveloped children being kept at home. At the present time, however, nearly all children are in school by the age of 6 so that there is less possibility of selection affecting the figures.

In order to make comparisons from a distribution such as Table 3 it is necessary to use summarizations of various types. The first summary is a series of average weights for each height at each age. These are shown in Tables 4 A and 4 B together with average weights for each height independently of age. It would be misleading to publish average weights for heights and ages at which in the survey there are too few pupils. Entries where three times the standard deviation of error would be greater than one pound - (on the simple formula for standard error this requires 50 pupils) - have been excluded. The tables will be most used in comparing the individual child with the group of the same age.

(II) In connection with average heights and weights, mention may here be made of abnormalities in height and weight. In the records as given by the nurses there were some dozens of such cases. Thus, a boy of 8 years of age was included whose height was 54½ inches and who weighed 138 pounds. At the opposite extreme was a boy of 9 years of age weighing 50 pounds and measuring 53 inches. Also included was a boy of 10 years of age weighing 175 pounds. While such figures as these are a strain on credulity, there seemed no basis on which the Bureau of Statistics could exclude them from the survey.

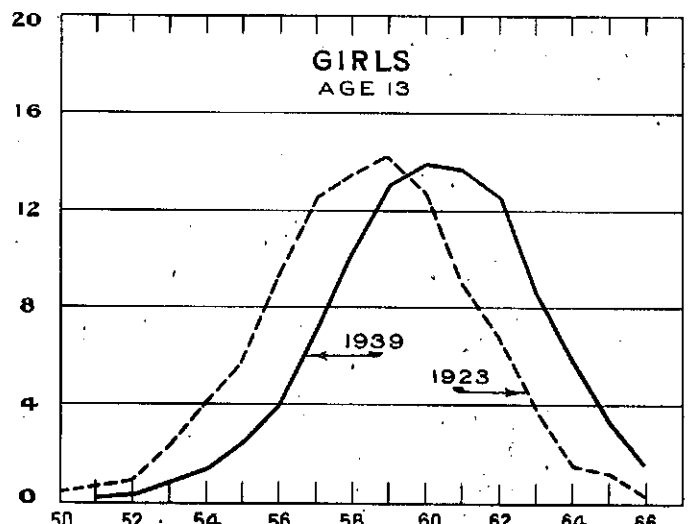
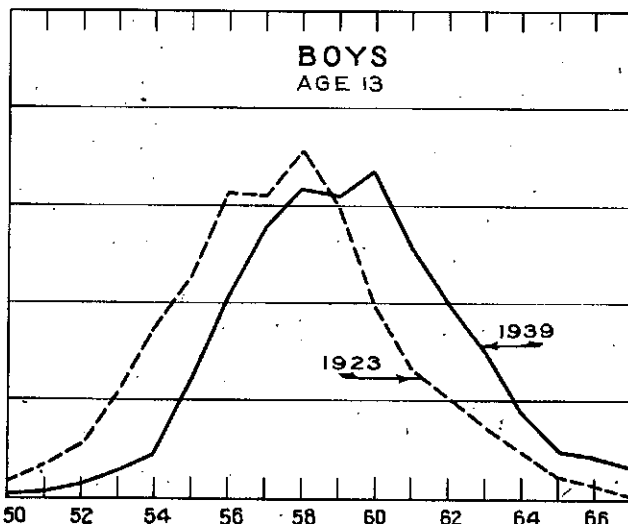
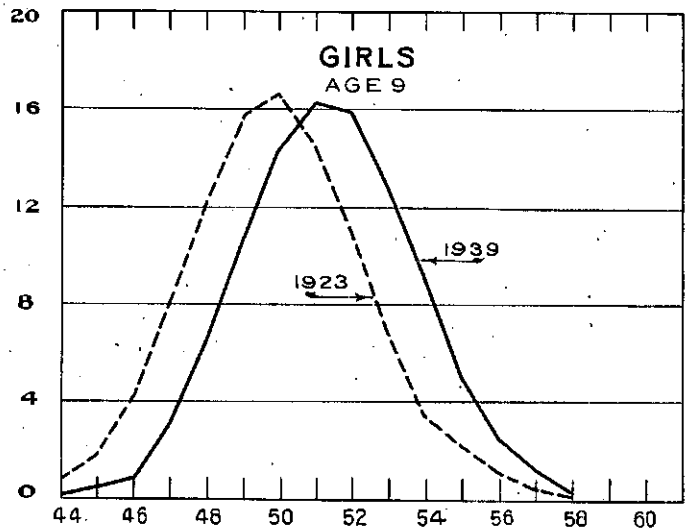
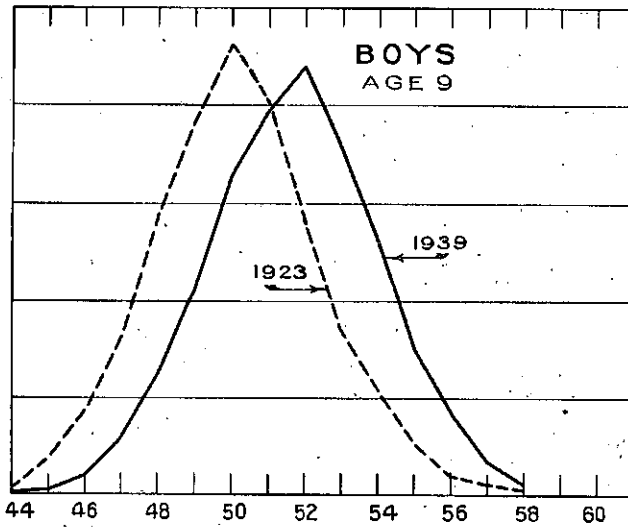
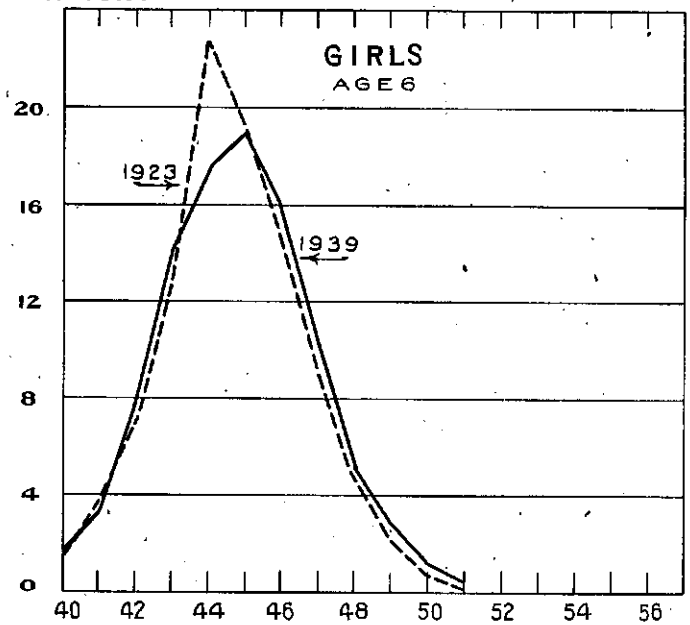
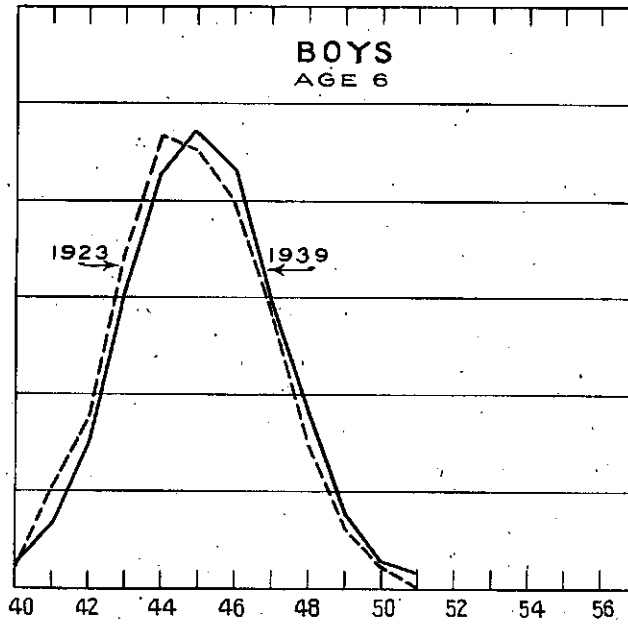
Table 3. - Specimen Distribution of Boys, Age 5, by Height and Weight.

Height (inches)	Total	Pounds																																					
		20 or less	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	65	67			
Under 36	3									1	1																												
36	-																																						
37	1								1																														
38	2						1	1																															
39	25	1			3	2	5	1	4	6		2	1																										
40	83			2	5	3	11	14	11	13	12	4	4	1	1						1																1		
41	165			2	2		10	10	20	35	26	22	13	6	12		5	1		1																			
42	261	1			1	4	6	15	19	31	39	47	32	32	16	6	7	4		1																			
43	297				1	1	3	8	7	18	27	37	56	50	34	21	14	10	4	3	2					1													
44	277					2	4	4	10	15	18	23	31	35	37	22	19	20	12	14	3	3	3			1	1												
45	193								1	2	3	8	9	11	15	31	27	13	24	17	17	2	1	3	3			1	2	2							1		
46	109										1	1	1	6	10	10	4	11	12	10	13	7	4	4	3	4	4	2	1								1		
47	32								1		1					1		1	3	2	5	1	3	5	1	1	1									2	2	1	1
48	9																1		1																	1	1		
Over 48	2																																				1		
Total	1,459	1	1	5	10	8	32	36	62	87	100	114	129	128	143	112	110	77	58	65	46	51	14	13	16	7	8	6	3	4	4	4	1	2	1	1			

# PERCENTAGE DISTRIBUTION OF CHILDREN AT EACH INCH OF HEIGHT

1923 AND 1939

P.C.  
AT EACH HEIGHT



HEIGHT IN INCHES



Table 4 B. - Average Weight of Girls at Each Height and Age.

Height (inches)	Weight for Age (pounds)														
	5	6	7	8	9	10	11	12	13	14	15	All Ages			
40	36.1	36.2										36.2			
41	37.8	37.0										37.7			
42	39.6	39.2										39.5			
43	42.0	40.9	40.8									41.3			
44	43.9	42.8	43.0									43.2			
45	46.1	45.0	44.6	44.3								45.0			
46	48.2	47.4	46.8	47.1								47.2			
47		50.0	49.2	48.9	49.5							49.4			
48		52.3	51.6	51.4	51.2	52.6						51.7			
49		54.7	54.1	54.3	53.8	54.2						54.2			
50			57.8	55.4	56.7	57.2	56.3					56.5			
51			60.6	59.6	59.4	59.8	60.2					59.7			
52			64.1	63.1	63.0	62.8	62.6	61.8				62.9			
53				66.6	66.2	65.8	65.7	66.5				66.1			
54				68.8	69.0	69.5	69.4	69.3	69.9			69.3			
55					73.1	72.3	72.4	73.5	74.3			72.8			
56					77.6	76.2	75.9	75.8	76.7			76.2			
57					77.3	79.0	80.7	80.6	82.0	83.1		80.8			
58						84.7	84.1	83.7	85.5	89.0		84.9			
59						88.8	88.0	89.7	90.3	93.9	99.9	90.6			
60							93.0	93.2	94.2	98.0	102.4	95.1			
61							96.0	98.0	98.9	101.9	104.5	100.1			
62								102.9	104.1	106.7	107.8	105.2			
63								104.3	108.9	108.3	112.5	109.0			
64								110.6	111.4	113.0	114.8	112.7			
65									114.9	117.8	118.8	116.8			
66									113.8	120.9	124.5	118.7			
67										122.4		119.6			



Average heights and average weights for children of each age are shown in Table 5 together with the corresponding averages of the 1923 survey and Figure 3 gives the data plotted on both arithmetic and logarithmic scales. The excess of the 1939 heights over those of 1923 amounts to from one to two inches between ages 7 and 13. In weight, the excess of 1939 increases almost steadily with age from age 7 when it is slightly over 2 pounds to age 13 when it is about 6 pounds. Average annual rates of growth in childhood have been obtained by the crude method of subtraction of averages for successive years. The exceptional result for age 6 is due to the small numbers at the very young ages in the early survey.

Table 5. - Comparison of Average Heights and Average Weights for all Heights at Each Age, 1923 and 1939.

Age	Height (in inches)					Weight (in pounds)				
	Average		Excess of 1939 over 1923			Average		Excess of 1939 over 1923		
	1923	1939	Inches	P.C.	Equivalent Years	1923	1939	Pounds	P.C.	Equivalent Years
<b>BOYS</b>										
5	42.3	43.1	.8	1.9	.32	41.6	43.0	1.4	3.4	.32
6	44.8	45.1	.3	.7	.21	45.0	46.4	.4	.9	.14
7	46.2	47.4	1.2	2.6	.60	48.8	51.3	2.5	5.1	.53
8	48.2	49.6	1.4	2.9	.70	53.5	56.8	3.3	6.2	.65
9	50.2	51.7	1.5	3.0	.79	58.6	62.9	4.3	7.3	.72
10	52.1	53.6	1.5	2.9	.88	64.6	68.8	4.2	6.5	.71
11	53.8	55.4	1.6	3.0	.94	70.5	75.2	4.7	6.7	.75
12	55.5	57.4	1.9	3.4	.95	76.8	82.5	5.7	7.4	.70
13	57.5	59.4	1.9	3.3	.90	85.0	90.8	5.8	6.8	.69
14	59.6	61.6	2.0	3.4	1.00	93.4	100.9	7.5	8.0	.77
15	61.6	63.9	2.3	3.7	...	103.2	111.6	8.4	8.1	...
<b>GIRLS</b>										
5	42.5	43.0	.5	1.2	.23	40.5	42.0	1.5	3.7	.34
6	44.7	44.8	.1	.2	.08	44.9	44.9	.0	.0	.00
7	46.0	47.1	1.1	2.4	.55	47.6	49.9	2.3	4.8	.53
8	48.0	49.3	1.3	2.7	.68	51.9	55.0	3.1	6.0	.56
9	49.9	51.4	1.5	3.0	.75	57.4	61.2	3.8	6.6	.64
10	51.9	53.4	1.5	2.9	.71	63.3	67.8	4.5	7.1	.61
11	54.0	55.7	1.7	3.1	.77	70.7	75.8	5.1	7.2	.63
12	56.2	58.2	2.0	3.6	.91	78.8	86.1	7.3	9.3	.72
13	58.4	60.2	1.8	3.1	1.06	88.9	95.4	6.5	7.3	.71
14	60.1	61.5	1.4	2.3	1.75	98.0	103.4	5.4	5.5	.87
15	60.9	62.3	1.4	2.3	...	104.2	109.3	5.1	4.9	...

It is interesting to compare the above with the result of following a single group of children through the ten years of school life. The year-to-year differences between heights of the children measured in Toronto in 1939 show a peak between ages 6 and 8, a dip to a minimum between ages 9 and 11, and a second peak near the end of the table. This corresponds very closely with a study published by the University of Iowa in 1935<sup>(1)</sup> tracing the continuous growth of a single set of Iowa City school children throughout their school life. There, also, in respect of height, peaks were found at ages 7 and 13 for boys and at ages 7 and 11 for girls, and between these peaks a significant dip. Figure 4 shows the striking agreement between the Canadian figures for 1939 and the Iowa results. Less correspondence is shown with the Toronto measurements of 1923, because fewer pupils were involved, particularly at the lower ages. The earlier maturity of girls is indicated very plainly in the curves both for weight and for height.

(1) "The Rhythm of Physical Growth" (males) and "The Physical Growth of Girls", University of Iowa Studies, 1935 and 1936.

Figure 3A

# AVERAGE HEIGHT AND AVERAGE WEIGHT OF BOYS AND GIRLS AGE 5 TO 15

1923 AND 1939

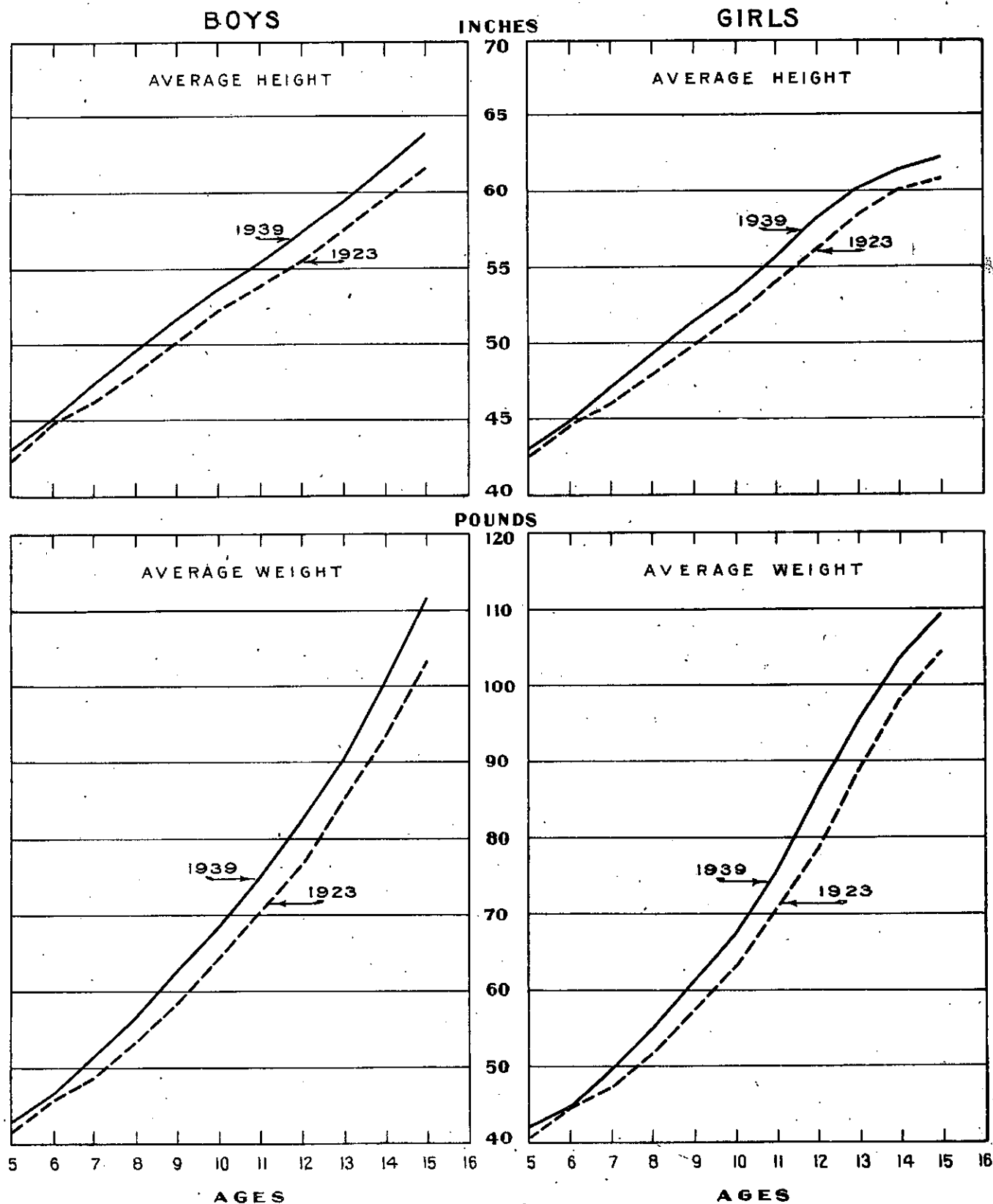


Figure 3B

# AVERAGE HEIGHT AND AVERAGE WEIGHT OF BOYS AND GIRLS AGE 5 TO 15 1923 AND 1939

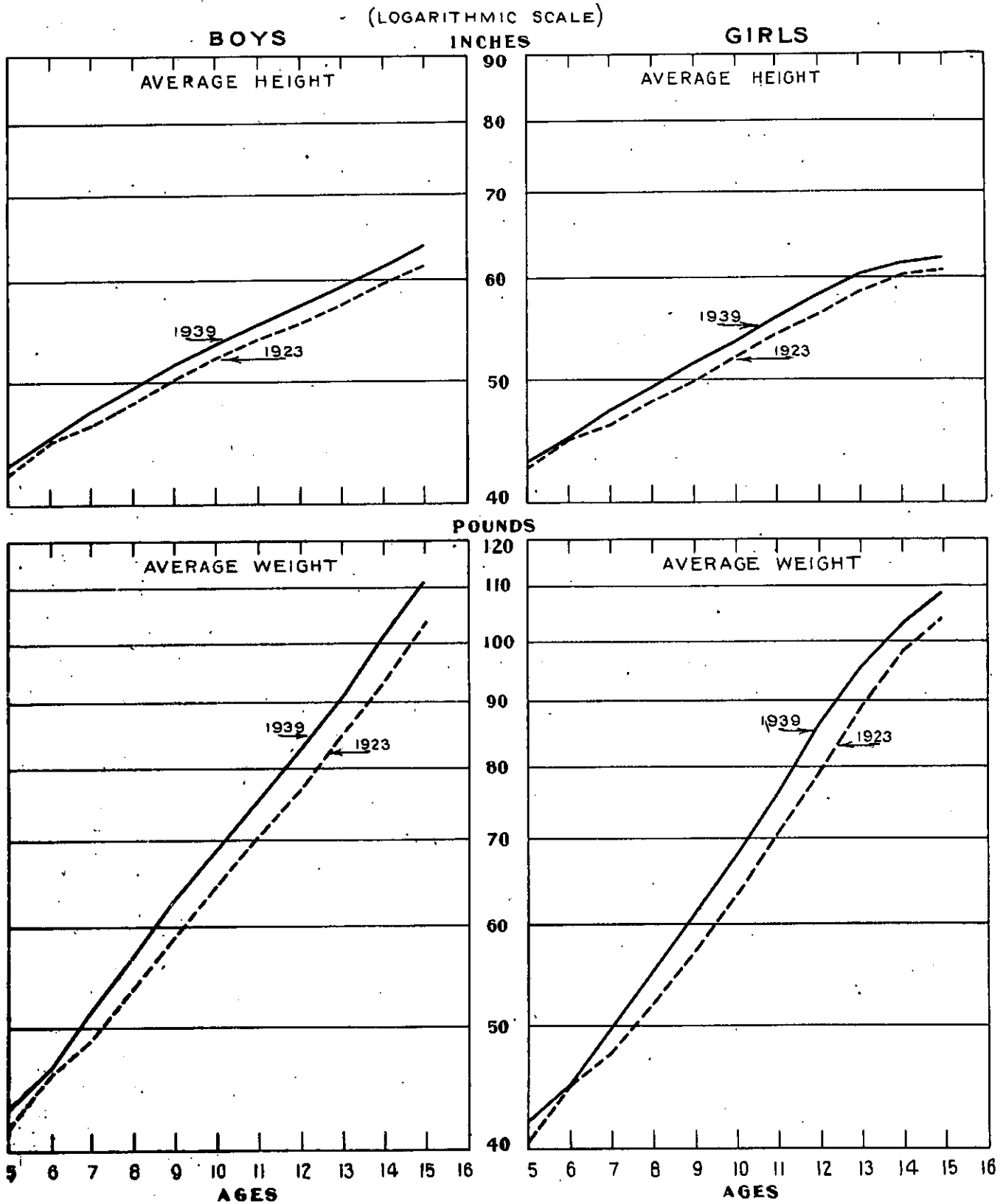


Table 6. - Annual Increments in Average Height and Average Weight for 1923 and 1939 Toronto Surveys as Compared with the Iowa Survey, 1935.

Age	Height (inches)			Weight (pounds)		
	Toronto		Iowa	Toronto		Iowa
	1923	1939	1935	1923	1939	1935
<u>BOYS</u>						
5 - 6	2.5	2.0	2.37	4.4	3.4	4.45
6 - 7	1.4	2.3	2.35	2.8	4.9	5.60
7 - 8	2.0	2.2	2.44	4.7	5.5	6.22
8 - 9	2.0	2.1	2.20	5.1	6.1	5.82
9 - 10	1.9	1.9	2.06	6.0	5.9	7.83
10 - 11	1.7	1.8	1.68	5.9	6.4	6.08
11 - 12	1.7	2.0	1.81	6.3	7.3	7.43
12 - 13	2.0	2.0	2.17	8.2	8.3	10.98
13 - 14	2.1	2.2	2.39	8.4	10.1	10.98
14 - 15	2.0	2.3	2.27	9.8	10.7	13.93
<u>GIRLS</u>						
5 - 6	2.2	1.8	2.39	4.4	2.9	5.23
6 - 7	1.3	2.3	2.33	2.7	5.0	5.16
7 - 8	2.0	2.2	2.29	4.3	5.1	6.06
8 - 9	1.9	2.1	2.28	5.5	6.2	6.21
9 - 10	2.0	2.0	2.01	5.9	6.6	6.97
10 - 11	2.1	2.3	2.35	7.4	8.0	9.26
11 - 12	2.2	2.5	2.63	8.1	10.3	10.74
12 - 13	2.2	2.0	2.23	10.1	9.3	10.62
13 - 14	1.7	1.3	1.38	9.1	8.0	10.59
14 - 15	.8	.8	.50	6.2	5.9	7.27

Standard deviation measures of the variation in height of the children of each age were calculated. Table 7 shows, for example, that at age 9 in 1939 about 67 p.c. of the boys were within 2.39 inches of the average. This was a decline from 2.51 inches in 1923, but as there is a similar amount of decrease between 1923 and 1939 at some of the other ages, the change is probably not significant. It will be seen that there is a steady increase in the standard deviation of height with age, both for boys and girls, except at the very last ages for girls, when there is a considerable decline. It is interesting that the co-efficients of variation both for boys and for girls show a steady increase with age, but the fact that the co-efficients are greater at the ages when some of the pupils are approaching maturity suggests strongly that the different ages of maturing of individuals are to a considerable extent responsible for the wider spread of heights. This is borne out by the fact that for boys at age 13 (see Figure 2) a definitely bi-modal distribution is shown, and a roughly constructed three-dimensional diagram of heights and weights for boys at this age showed two distinct peaks, representing maxima in height and weight combined. If this is not mere chance it is most likely due to the division of the group into boys maturing early and those maturing late.

Figure 4

ANNUAL INCREMENTS IN HEIGHT AND WEIGHT FOR 1923 AND 1939  
TORONTO SURVEYS AS COMPARED WITH THE IOWA SURVEY 1935

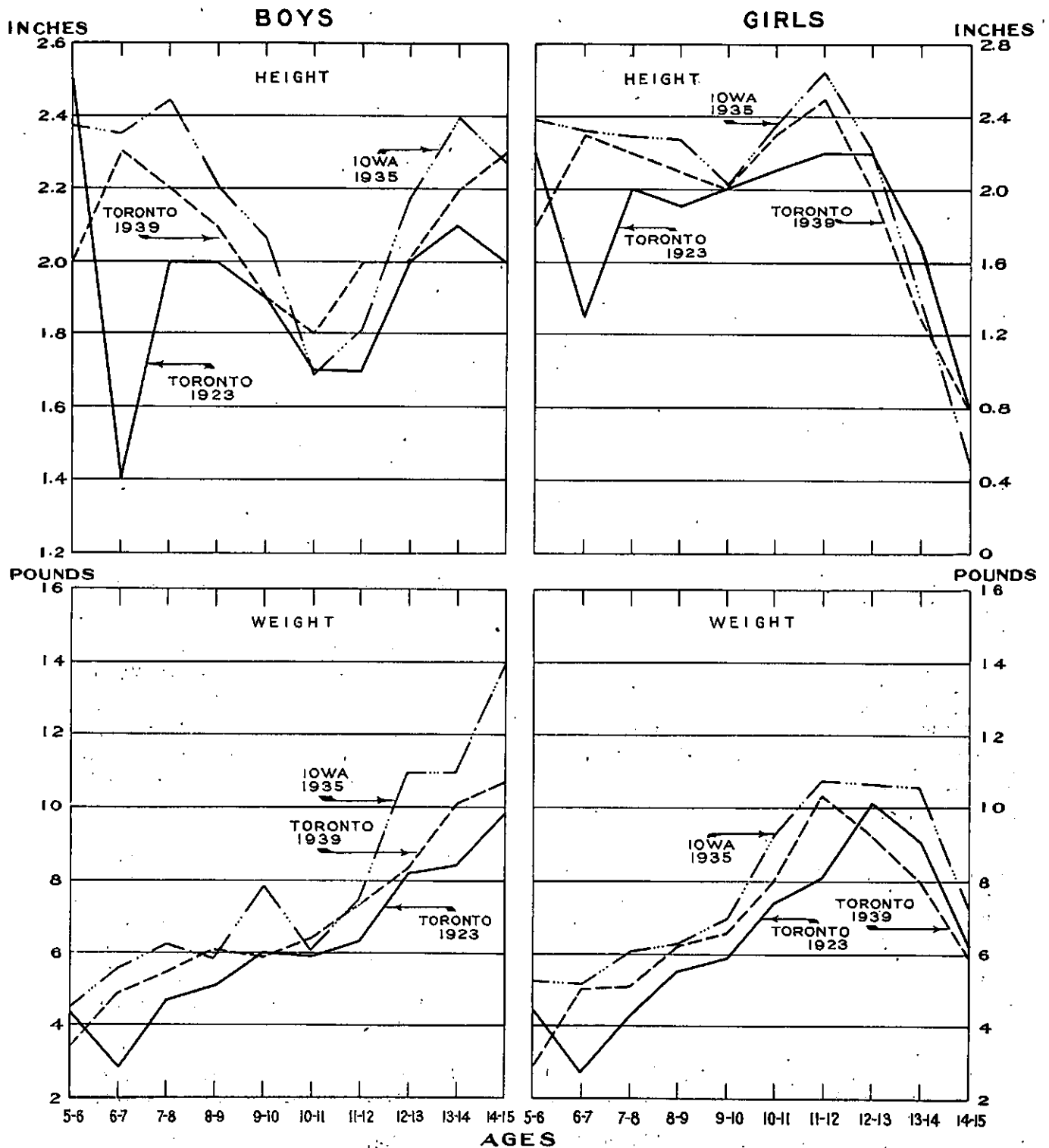


Table 8. - Comparison of Average Heights and Average Weights at Each Age for the Canadian Surveys, 1923 and 1939, with those of Other Surveys. - (concluded)

Survey	Age										
	5	6	7	8	9	10	11	12	13	14	15
WEIGHT (pounds)											
<u>Boys</u>											
Toronto, 1923 .....	41.6	46.0	48.8	53.5	58.6	64.6	70.5	76.8	85.0	93.4	103.2
Toronto, 1939 .....	43.0	46.4	51.3	56.8	62.9	68.8	75.2	82.5	90.8	100.9	111.6
London, England, 1938 ....	40.5	44.9	49.7	54.8	60.3	66.2	72.6	79.4	86.7	94.5	...
Glasgow, Scotland, 1905-06 -											
Group A .....	40.9	44.2	48.0	52.3	56.7	61.6	66.4	71.7	75.6	...	...
Group B .....	42.0	45.6	49.6	53.9	58.4	62.7	67.8	72.9	77.3	...	...
Group C .....	42.5	45.9	50.1	54.4	59.5	63.9	69.1	75.6	82.2	...	...
Group D .....	43.3	46.6	51.2	56.3	61.2	66.3	70.8	76.9	83.2	...	...
U.S. Dept. of Agr. - W.P.A., 1937-39 .....	40.9	45.5	50.2	55.5	61.3	67.3	73.6	80.9	90.0	101.0	115.2
<u>Girls</u>											
Toronto, 1923 .....	40.5	44.9	47.6	51.9	57.4	63.3	70.7	78.8	88.9	98.0	104.2
Toronto, 1939 .....	42.0	44.9	49.9	55.0	61.2	67.8	75.8	86.1	95.4	103.4	109.3
London, England, 1938 ....	39.7	43.6	48.1	53.2	59.0	65.6	73.0	81.5	91.2	102.2	...
Glasgow, Scotland, 1905-06 -											
Group A .....	39.9	43.0	46.4	50.5	54.7	59.5	65.3	72.4	76.8	...	...
Group B .....	40.6	43.9	47.7	51.8	56.8	60.8	66.8	74.3	81.3	...	...
Group C .....	41.3	44.7	48.1	52.7	56.9	61.9	68.4	76.1	83.0	...	...
Group D .....	41.8	45.6	49.3	54.3	58.8	64.4	70.5	78.8	89.0	...	...
U.S. Dept. of Agr. - W.P.A., 1937-39 .....	39.7	44.1	49.0	54.3	60.1	66.6	74.5	83.9	94.0	102.5	110.2

It is of interest to set the figures of growth for Toronto school children between 1923 and 1939 against the results obtained by investigations in other countries. Thus G. T. Bowles in "New Types of Old Americans at Harvard", says:-

Throughout the country as a whole, and more especially in New England, there has been marked increase in the stature of old Americans over a statistically observed period of 150 years ... The increase has gone on at the rate of about .06 centimeter a year in the population at large and .08 centimeter for students. <sup>(1)</sup>

(1) "Physique of School Children", Office of Education, U.S. Dept. of Interior, Leaflet No. 37.

Footnote (2) of page 19.

(2) According to the Baldwin-Wood tables, 3.5 p.c. of net weight can be added for clothing for boys under 63 pounds, and 4 p.c. for those 64 pounds and over, while for girls up to 65 pounds 3 p.c. of net weight can be added, from 66 to 82 pounds, 2.5 p.c. and over 82 pounds, 2 p.c. (Shoes, coats and sweaters are not included.)

The change in stature of about one centimeter in 12 to 15 years is decidedly less than that shown by the Toronto school children. The study of Professor Bowditch in 1875 involving about 8,000 children from 5 to 18 years of age is comparable with a study by Collins for the U.S. Public Health Service in the school year 1923-24. Over the 48-year period, increases in height were as follows:-

Study	Average Height for Age (inches)								
	6	7	8	9	10	11	12	13	14
<b>Boys -</b>									
Bowditch ....	44.10	46.21	48.16	50.09	52.21	54.01	55.78	58.17	61.08
Collins(x) ....	45.35	47.13	49.42	51.29	53.19	55.12	56.84	59.00	61.20
Increment ..	1.25	.92	1.26	1.20	.98	1.11	1.06	.83	.12
<b>Girls -</b>									
Bowditch ....	43.66	45.94	48.07	49.61	51.78	53.79	57.16	58.75	60.32
Collins(x) ....	44.84	46.56	49.23	51.11	53.16	55.20	57.43	59.97	61.32
Increment ..	1.18	.62	1.16	1.50	1.38	1.41	.27	1.22	1.00

(x) Associate Statistician, U.S. Public Health Service.

It will be noted that the long-term rate of increase was lower, and more irregular from age to age than the rates for the (much larger group of) Toronto school children.

The above and other comparisons are referred to in a publication of the Office of Education of the United States Department of the Interior, "Physique of School Children". We quote this leaflet on the results of measurements in England and in Oslo:-

Periodic records have been kept over a number of years in certain large areas, and from these it is gathered that the 5-year-old English schoolboy and schoolgirl are nearly 2 inches taller than their predecessors of 40 years ago. The boy has gained more than a pound in weight and the girl, about 5 ounces.

In Oslo 9-year-old school girls in 1920 weighed, on the average, 54 pounds. In 1930 they weighed 59.4 pounds. Girls of 13 weighed 82.3 pounds in 1920, and in 1930, 89.8 pounds. In 1920 boys of 14 measured 61.4 inches and in 1930, 63 inches.

Summarizing for the United States, Bowles says:-

For at least the past 80 years, and probably longer, there has been marked annual increase in stature. It reached its peak between 1860 and 1870 when the mean annual increase was .15 inch.

#### HEIGHT AND WEIGHT IN RELATION TO PERSONAL FACTORS

##### (1) Occupation

Distinctions between the various occupation classes and between each status group of the non-gainfully occupied parents are obtained by a comparison of the numbers having various ratings in respect of height and weight (Table 9). Let us consider the "under-average height" group; 29.9 p.c. of the (male) children of labourers fall into it, 24.5 p.c. of those of factory operatives, 19.8 p.c. of clerical workers and 18.9 p.c. of commercial. There seems to be a distinction between unskilled labour on the one hand and the more skilled manual workers on the other, while clerical and commercial workers have smaller percentages of children under-height than the best of the manual group. Owners and managers with 17.2 p.c. under-average height and professional workers with 13.2 p.c. under-average are the tallest groups. Of the non-gainfully occupied groups, the unemployed (31.4 p.c. under-height) and pensioned and retired classes (35.1 p.c.) are the shortest. Further, the unemployed have greater proportions of children under average height than labourers.

Table 9. - Percentages of Children, Age 5 to 15, Classified According to the Occupation or Status of Parent or Guardian, who are in Lower, Middle or Upper Groups of Height for their Age, and of Weight for their Age and Height.

Occupational Class	No. of Children	P.C. in each Occupational Class	Height		Weight for Height		
			P.C. Under Average	P.C. Over Average	P.C. Under Average	P.C. Over Average	
B O Y S							
Gainfully Occupied -							
Labourers, unskilled, and service workers	6,017	15.2	29.9	52.7	23.4	50.7	25.8
Operatives (semi-skilled workers)	5,618	14.2	24.5	53.1	24.1	50.6	25.3
Craftsmen (skilled workers)	8,699	22.0	24.6	54.9	24.4	51.4	24.1
Clerical and related occupations	3,146	8.0	19.8	54.3	27.4	50.5	22.1
Commercial and related occupations	3,354	8.5	18.9	54.9	23.6	50.6	25.8
Owners and managers	2,778	7.0	17.2	53.3	19.7	47.2	33.1
Professional workers	1,679	4.2	13.2	52.3	26.3	48.1	25.5
Non-gainfully Occupied -							
Pensioned and retired	151	.4	35.1	45.0	29.1	49.0	21.8
Unemployed	678	1.7	31.4	53.8	24.0	53.1	22.8
Housewives	1,297	3.3	24.4	54.1	28.0	47.6	24.4
Not stated	6,133	15.5	24.9	52.7	25.2	51.2	23.7
Total	39,550	100.0	23.7	53.6	24.4	50.5	25.1
G I R L S							
Gainfully Occupied -							
Labourers, unskilled, and service workers	5,956	15.5	30.3	49.2	25.1	49.8	25.2
Operatives (semi-skilled workers)	5,596	14.5	25.1	49.8	25.3	48.6	26.2
Craftsmen (skilled workers)	8,459	22.0	25.0	50.5	26.0	49.7	24.4
Clerical and related occupations	3,024	7.9	20.8	50.6	25.6	51.0	23.4
Commercial and related occupations	3,161	8.2	19.5	49.7	23.9	48.7	27.4
Owners and managers	2,759	7.2	20.2	48.4	20.9	47.0	32.1
Professional workers	1,576	4.1	13.2	48.4	24.6	50.3	25.2
Non-gainfully Occupied -							
Pensioned and retired	160	.4	28.2	45.1	22.6	55.0	22.6
Unemployed	594	1.5	34.2	50.6	26.4	50.1	23.5
Housewives	1,345	3.5	25.9	47.8	25.1	48.2	26.7
Not stated	5,873	15.3	25.0	50.6	25.1	50.1	24.8
Total	39,503	100.0	24.4	49.8	24.9	49.6	25.6



Differences between occupation classes and status groups in weight for height (build) are not as great as in height, and such differences as are shown are somewhat difficult to interpret. Both in height and weight, girls show similar tendencies to boys in respect of the parent's occupation or status class.

For a fuller interpretation of the occupational data, further cross-classifications and breakdowns would be necessary which it was not possible to complete at the time of publication. Such cross-classification would be required to say whether characteristics of children of labourers on relief, let us say, or of certain races, differ from other labourers, or whether the large percentage of underweights is due directly to the greater representation of labourers among them.

## (2) Relief

In families on relief, over 33 p.c. of the boys are below average height, as against only 22 p.c. in those not on relief.

Table 10. - Percentages of Children, Age 5 to 15, whose Families were stated to have been on, or not on Relief, who are in Lower, Middle or Upper Groups of Height for their Age, and of Weight for their Age and Height.

Item	No. of Children	Height			Weight for Height		
		P.O. Under Average	P.O. Average	P.O. Over Average	P.O. Under Average	P.O. Average	P.O. Over Average
B O Y S							
Family not on relief	13,707	22.0	53.2	24.8	25.0	50.2	25.0
Family on relief	3,492	33.5	52.5	14.0	25.3	51.8	23.0
Not stated	22,351	23.2	54.0	22.8	23.9	50.4	25.7
Total	39,550	23.7	53.6	22.7	24.4	50.5	25.1
G I R L S							
Family not on relief	13,473	22.4	49.6	28.1	25.1	49.4	25.6
Family on relief	3,580	36.2	47.5	16.4	26.5	51.7	21.9
Not stated	21,450	23.7	50.3	25.9	24.5	49.2	26.2
Total	38,503	24.4	49.8	25.8	24.9	49.5	25.6

## (3) Location of School

As shown in the table following, only 12.2 p.c. of boys attending the ten schools located in prosperous districts are under average height, as compared with 31.3 p.c. of those attending the ten schools located in poor areas. Similar large differences occur among the girls. As before, there is striking absence of difference in build.

Table 11. - Percentages of Children, Age 5 to 15, Classified by Location of School, who are in Lower, Middle and Upper Groups of Height for their Age, and of Weight for their Age and Height.

Location of School(x)	No. of Children	Height			Weight for Height		
		P.C. Under Average	P.C. Average	P.C. Over Average	P.C. Under Average	P.C. Average	P.C. Over Average
<u>BOYS</u>							
Prosperous District	3,167	12.2	51.6	36.2	24.6	51.4	24.0
Poor District	4,186	31.3	51.8	17.0	24.3	51.6	24.2
All schools	39,550	23.7	53.6	22.7	24.4	50.5	25.1
<u>GIRLS</u>							
Prosperous District	3,124	13.7	46.0	40.5	24.5	49.9	25.8
Poor District	3,910	31.5	48.7	19.7	25.2	51.8	22.9
All schools	38,503	24.4	49.8	25.8	24.9	49.5	25.6

(x) For list of schools, see page 3.

#### (4) School Grade

In respect of grade at school, the data were arranged in slightly different manner. In order to add the various ages, children of each age were taken in relation to a standard grade level for that age. Thus children of -

Age 5 were taken in relation to kindergarten,	Age 10 were taken in relation to grade 5,
" 6 " " " " " " grade 1,	" 11 " " " " " " grade 6,
" 7 " " " " " " " grade 2,	" 12 " " " " " " " grade 7,
" 8 " " " " " " " grade 3,	" 13 " " " " " " " grade 8,
" 9 " " " " " " " grade 4,	" 14 " " " " " " " grade 9.

Calling these the "base grades", the various ages were added together according to whether the children were at the base grade or one, two or three years below it, or one or two years above, etc. The excerpt below of the most significant figures of Table 12 indicates the tremendous variations in the percentage of boys and girls under and over average height when taken according to a rough measure of academic standing.

Item	B o y s		G i r l s	
	P.C. under Average Height	P.C. over Average Height	P.C. under Average Height	P.C. over Average Height
One grade below base grade for age	34.9	11.3	38.9	13.6
At base grade for age .....	26.9	17.9	29.3	19.9
One grade above base grade for age	16.0	30.2	18.1	29.9

The same calculation may be made in a slightly different way using a "base age" for grade. From this can be determined the percentages under and over the average height of children one year younger or older than the base age for their grade, as follows:-

Item	B o y s		G i r l s	
	P.C. under Average Height	P.C. over Average Height	P.C. under Average Height	P.C. over Average Height
One year older than base age of grade .....	32.0	14.4	35.3	15.9
At base age of grade .....	26.5	18.8	29.1	20.7
One year younger than base age of grade .....	16.0	30.2	18.1	29.9

The results in respect of heights by grade at school are confirmed by several studies in recent years. To quote a publication previously referred to<sup>(x)</sup>-

Dr. Diehl of the University of Minnesota finds that ... College men (16 to 21 years of age) attain a maximum growth in height several years earlier than men in the general population, and at each age studied are distinctly taller than the men in the groups with which it was possible to compare them.

The results of many studies in recent years ... show clearly enough that on the average (with heavy emphasis on the word average) the brighter or more intelligent student, as measured by school progress and other tests, is larger and more nearly perfect physically than is his less brilliant fellow.

(x) "Physique of School Children", Office of Education of U.S. Dept. of Interior, Leaflet No. 37.

Table 12. - Percentages of Children, Age 5 to 15, According to Grade and Age in Relation to Basic Age and Grade, who are in Lower, Middle and Upper Groups of Height for their Age, and of Weight for their Age and Height.

Item	No. of Children	Height		Weight for Height			
		P.C. under Average	P.C. over Average	P.C. under Average	P.C. over Average	P.C. over Average	
<u>BOYS</u>							
<u>According to Grade</u>							
Two years younger than base age of grade ..	1,339	9.3	52.5	38.2	22.3	47.7	30.0
One year younger than base age of grade ...	6,723	16.0	53.8	30.2	23.5	50.4	26.1
At base age of grade .....	7,069	26.5	54.8	18.8	24.8	50.8	24.5
One year older than base age of grade ....	2,906	32.0	53.6	14.4	27.4	50.1	22.5
Two years older than base age of grade ...	820	39.0	49.0	12.0	26.0	51.6	22.4
Three years older than base age of grade ..	172	42.5	46.0	11.6	27.9	52.4	19.8
<u>According to Age</u>							
Two grades higher than base grade of age ..	1,339	9.3	52.5	38.2	22.3	47.7	30.0
One grade higher than base grade of age ...	6,723	16.0	53.8	30.2	23.5	50.4	26.1
At base grade of age .....	6,418	26.9	55.4	17.9	24.8	50.8	24.6
One grade lower than base grade of age ...	2,007	34.9	53.8	11.3	27.3	50.5	22.2
Two grades lower than base grade of age ..	467	44.9	47.5	7.4	28.4	49.6	21.8
<u>GIRLS</u>							
<u>According to Grade</u>							
Two years younger than base age of grade ..	1,719	10.4	45.2	44.5	23.0	49.8	27.3
One year younger than base age of grade ...	7,280	18.1	52.0	29.9	24.6	50.7	24.7
At base age of grade .....	6,420	29.1	50.2	20.7	28.3	46.8	24.9
One year older than base age of grade ....	2,217	35.3	48.9	15.9	26.5	51.2	22.4
Two years older than base age of grade ...	554	37.9	46.4	15.7	26.0	49.8	25.2
Three years older than base age of grade ..	108	57.4	31.6	11.1	29.7	37.0	33.4
<u>According to Age</u>							
Two grades higher than base grade of age ..	1,719	10.4	45.2	44.5	23.0	49.8	27.3
One grade higher than base grade of age ...	7,280	18.1	52.0	29.9	24.6	50.7	24.7
At base grade of age .....	5,744	29.3	50.8	19.9	28.5	46.6	24.9
One grade lower than base grade of age ...	1,527	38.9	47.5	13.6	27.3	51.1	21.6
Two grades lower than base grade of age ..	298	43.0	46.0	11.1	27.3	48.3	24.5

(5) Diseases

For most diseases it is found that the distribution of heights and weights of the children who have contracted them is almost the same as that of the children who have not. Thus, no significant differences are noticeable in the ratings under measles, whooping cough, chicken pox, German measles, scarlet fever and mumps. The only diseases which seem to have affected stature (and these only slightly) are diphtheria and smallpox. Peculiarly enough, there seemed some tendency for children who had rheumatism and cerebral spinal meningitis to be slightly taller and heavier than other children, but the number of cases is small.

Table 13. - Percentages of Children, Age 5 to 15, who have had Specified Diseases, who are in Lower, Middle and Upper Groups of Height for their Age, and of Weight for their Age and Height.

Disease (in order of prevalence)	No. of Cases	Height			Weight for Height		
		P.C. Under Average	P.C. Average	P.C. Over Average	P.C. Under Average	P.C. Average	P.C. Over Average
B O Y S							
Measles .....	21,989	23.0	53.4	23.4	24.7	50.4	24.7
Chicken pox .....	15,461	22.4	54.1	23.6	24.4	50.3	25.4
Whooping cough .....	12,658	21.7	55.0	23.4	24.6	51.2	24.3
Mumps .....	7,762	22.6	54.3	23.1	24.4	50.7	24.9
Scarlet fever .....	3,245	22.9	54.1	23.0	24.3	49.9	25.8
German measles .....	2,407	21.1	54.3	24.6	23.7	50.0	26.3
Pneumonia .....	1,506	24.8	52.0	23.1	25.3	49.9	24.7
Diphtheria .....	416	28.1	53.6	18.3	26.2	49.3	24.5
Rheumatism .....	274	18.6	58.4	23.0	23.3	48.2	28.8
Infantile paralysis .....	239	20.1	52.7	27.2	22.2	57.3	20.5
Smallpox .....	128	23.4	57.8	18.8	28.1	50.8	21.1
Cerebral spinal meningitis ..	29	24.1	46.3	27.6	24.2	41.4	34.4
Total .....	66,114						
Boys who have had at least one disease .....	27,902	22.6	54.0	23.4	24.6	50.5	24.9
Total Boys .....	39,550	23.7	53.6	22.7	24.4	50.5	25.1
G I R L S							
Measles .....	22,102	23.3	49.3	27.3	24.9	49.4	25.6
Chicken pox .....	15,163	23.1	50.0	27.0	25.3	48.8	26.0
Whooping cough .....	13,784	23.2	49.5	27.3	24.7	49.3	26.0
Mumps .....	7,354	23.1	50.5	26.4	24.8	50.0	25.2
Scarlet fever .....	3,358	22.8	49.5	27.7	26.0	48.9	25.1
German measles .....	2,711	22.5	48.8	28.8	24.1	49.8	26.2
Pneumonia .....	1,359	25.5	51.6	22.8	25.0	47.4	27.5
Diphtheria .....	452	28.2	47.6	24.1	22.3	50.0	27.6
Rheumatism .....	254	18.8	52.4	28.7	22.8	52.3	24.8
Infantile paralysis .....	184	26.1	49.0	25.0	28.8	46.8	24.5
Smallpox .....	133	24.0	43.6	32.3	29.3	45.8	24.8
Cerebral spinal meningitis ..	40	25.0	42.5	32.5	32.5	40.0	27.5
Total .....	66,894						
Girls who have had at least one disease .....	27,671	23.2	49.6	27.1	24.9	49.3	25.7
Total Girls .....	38,503	24.4	49.8	25.8	24.9	49.5	25.6

# (6) Defects

Defects were more closely related to stature than were diseases. Children with any defect were shorter and lighter for their height, i.e., thinner, than the children of the survey as a whole. The various defects seem to fall into three main classes in respect of their effect on height and weight. Children with enlarged glands; eye and ear defects and cardiac disease are, on the average, shorter but of approximately the same build as other children; those with nervous disorders, postural and speech defects and enlarged thyroid are taller than the average but somewhat underweight; while those with pulmonary disease and defective mentality are both shorter and thinner than others with defects. Numbers in most of these groups, however, are too small for significant conclusions to be drawn. Naturally those stated by the doctor to be anæmic or suffering from mal-nutrition are very much under normal height and underweight for their height and age.

Table 14. - Percentages of Children, Age 5 to 15, with Specified Defects (at date of survey) who are in Lower, Middle and Upper Groups of Height for their Age and of Weight for their Age and Height.

Defect (in order of prevalence)	No. of Children	Height			Weight for Height		
		P.C. Under Average	P.C. Average	P.C. Over Average	P.C. Under Average	P.C. Average	P.C. Over Average
B O Y S							
Abnormal tonsils .....	6,141	27.5	53.5	18.9	26.7	50.6	22.6
Defective nasal breathing .....	2,900	27.6	53.8	19.1	28.4	50.0	21.6
Enlarged glands .....	1,730	30.7	50.7	18.7	28.4	50.4	21.3
Dental defect .....	678	26.2	54.0	20.0	24.3	49.8	26.1
Speech defect .....	659	26.7	49.6	23.7	29.9	49.9	20.2
Anæmic appearance .....	622	30.8	52.6	16.7	42.0	43.7	14.4
Malnutrition .....	507	33.5	51.0	15.6	76.7	20.2	3.2
Nervous disorders .....	500	18.4	53.4	28.2	34.0	46.4	19.6
Postural defect .....	343	19.2	50.4	30.3	32.0	47.5	20.4
Eye defect .....	301	34.9	46.5	18.6	23.3	50.8	25.9
Cardiac disease .....	297	33.0	48.5	18.5	24.6	49.1	26.3
Orthopedic defect .....	197	25.4	47.7	26.9	24.4	42.1	33.5
Ear defect .....	196	34.2	51.1	14.8	23.0	54.6	22.5
Pulmonary disease .....	158	31.0	51.3	17.7	31.6	50.0	18.4
Skin disease .....	115	27.7	51.3	20.8	20.8	46.9	32.1
Mentality .....	102	34.4	47.0	18.6	32.4	53.9	13.7
Enlarged thyroid .....	48	27.1	41.7	31.2	33.3	41.7	25.0
Miscellaneous .....	292	25.6	44.2	30.1	33.5	35.9	30.5
Total .....	15,786						
Boys having at least one defect .	9,619	28.0	52.3	19.7	29.9	48.5	21.6
Total Boys .....	39,550	23.7	53.6	22.7	24.4	50.5	25.1
G I R L S							
Abnormal tonsils .....	5,824	28.3	49.5	22.3	27.1	49.8	23.2
Defective nasal breathing .....	2,318	29.8	49.9	20.3	27.8	50.8	21.5
Enlarged glands .....	1,440	30.9	48.1	20.9	30.5	49.4	20.0
Malnutrition .....	926	35.3	46.2	18.4	76.9	21.8	1.2
Anæmic appearance .....	701	29.5	47.2	23.4	47.2	43.3	9.6
Dental defect .....	625	28.2	51.5	20.4	23.2	52.2	24.7
Nervous disorders .....	314	23.6	48.8	27.7	32.5	46.8	20.8
Postural defect .....	292	21.3	44.5	34.2	24.7	49.6	25.7
Cardiac disease .....	271	33.3	44.6	22.2	32.9	47.6	19.6
Speech defect .....	268	28.4	47.4	24.2	34.7	48.5	16.8
Eye defect .....	242	28.1	45.9	26.1	22.4	50.0	27.7
Orthopedic defect .....	170	20.7	56.4	22.9	26.5	44.7	28.8
Ear defect .....	169	34.4	42.5	23.1	26.0	46.8	27.2
Skin disease .....	137	25.5	47.5	26.9	26.2	43.8	29.9
Enlarged thyroid .....	126	27.7	44.4	27.8	19.0	51.6	29.3
Pulmonary disease .....	99	21.2	56.6	22.2	38.4	46.5	15.1
Mentality .....	39	28.2	46.2	25.7	33.4	38.5	28.2
Miscellaneous .....	303	25.8	43.9	30.4	39.7	25.1	35.3
Total .....	14,264						
Girls having at least one defect .	8,909	29.1	48.7	22.3	32.2	47.0	20.9
Total Girls .....	38,503	24.4	49.8	25.8	24.9	49.5	25.6

(7) Public and Separate Schools

Distribution of pupils between ratings groups for public and Roman Catholic separate schools are shown in the table below.

Table 15. - Percentages of Children, Age 5 to 15, Classified According to Types of School, who are in Lower, Middle and Upper Groups of Height for their Age, and of Weight for their Age and Height.

Type of School	No. of Children	Height		Weight for Height			
		P.C. Under Average	P.C. Average	P.C. Over Average	P.O. Under Average	P.C. Average	P.O. Over Average
B O Y S							
Public .....	34,059	22.8	53.6	23.6	24.6	50.5	24.9
Separate .....	5,491	29.5	53.5	17.0	23.2	50.6	26.2
Total .....	39,550	23.7	53.6	22.7	24.4	50.5	25.1
G I R L S							
Public .....	33,234	23.3	49.8	26.9	25.4	49.1	25.5
Separate .....	5,269	31.2	50.1	18.8	22.5	51.8	25.8
Total .....	38,503	24.4	49.8	25.8	24.9	49.5	25.6

(8) Birthplace of Parent

Of the children with Canadian-born parents, 22.7 p.c. are below average height, and of the children of English, Scottish and Irish parents, 25.1, 23.9 and 25.0 p.c., respectively, are under average height. The United States-born, on the other hand, are slightly taller than the Canadian-born; the distinction is probably related to a correspondingly higher economic condition. Inter-racial marriage has a tendency to increase height of offspring as exemplified in Canadian-born children.

The greatest differences are to be seen among the European groups. Children of northern European parents show only 17.0 p.c. in the lower group of heights, while those of western and southern European stock show 33.9 p.c.

With respect to weight, children of British parents tend, on the average, to be somewhat lighter than the average of the whole. Those of eastern European parentage are taller than the average, and also heavier for their height and age, while children of western and southern European parentage, although showing a greater proportion shorter than average, also show a greater proportion heavier.

Table 16. - Percentages of Children, Age 5 to 15, Classified According to Birthplace of Parent or Guardian, who are in Lower, Middle and Upper Groups of Height for their Age, and Weight for their Age and Height.

Birthplace of Parent or Guardian	No. of Children	Height			Weight for Height		
		P.C. Under Average	P.C. Average	P.C. Over Average	P.C. Under Average	P.C. Average	P.C. Over Average
B O Y S							
Canada .....	17,938	22.7	53.7	23.6	25.5	51.3	23.2
England .....	7,209	25.1	53.3	21.6	27.3	51.8	20.9
Scotland .....	3,134	23.9	54.3	21.7	25.1	53.1	21.7
Ireland .....	2,041	25.0	52.8	22.3	27.4	52.1	20.6
Other British possessions ....	555	24.5	51.5	24.0	25.0	47.6	27.4
Northern Europe .....	369	17.0	59.4	23.5	26.5	52.0	21.4
Western and Southern Europe ...	1,732	33.9	50.4	15.8	18.2	45.8	36.1
Eastern or Slavic Europe .....	4,478	20.4	55.0	24.6	15.7	45.0	39.3
Asia and Africa .....	95	35.8	44.2	20.0	27.3	45.3	27.4
United States .....	715	17.9	57.0	25.1	24.8	49.2	26.0
Not stated and other .....	1,284	30.0	52.8	17.2	24.5	49.3	26.2
Total .....	39,550	23.7	53.6	22.7	24.4	50.5	25.1

Table 16. - Percentages of Children, Age 5 to 15, Classified According to Birthplace of Parent or Guardian, who are in Lower, Middle and Upper Groups of Height for their Age, and Weight for their Age and Height. (Concluded)

Birthplace of Parent or Guardian	No. of Children	Height			Weight for Height		
		P.C. Under Average	P.C. Average	P.C. Over Average	P.C. Under Average	P.C. Average	P.C. Over Average
G I R L S							
Canada .....	17,485	23.4	49.4	27.0	25.9	50.5	23.4
England .....	7,011	24.9	49.6	25.5	27.9	49.7	22.4
Scotland .....	3,063	26.8	48.8	24.4	27.7	51.9	20.4
Ireland .....	1,976	22.9	50.8	26.3	28.8	50.0	21.2
Other British possessions .....	552	26.3	49.6	24.1	27.0	48.5	24.5
Northern Europe .....	365	18.1	47.1	34.7	22.4	50.9	26.6
Western and Southern Europe ...	1,689	34.8	48.7	16.5	15.5	48.7	35.8
Eastern or Slavic Europe .....	4,497	21.1	52.5	26.4	15.9	43.0	41.1
Asia and Africa .....	95	42.1	39.0	19.0	27.4	46.3	26.4
United States .....	713	20.6	50.9	28.5	22.8	51.0	26.2
Not stated and other .....	1,057	31.7	49.8	18.4	26.6	49.3	23.6
Total .....	38,503	24.4	49.8	25.8	24.9	49.5	25.6

Intercorrelations between races and economic groups make for considerable difficulty of interpretation, a difficulty which will be resolved by the obtaining of ratings for the various occupations, etc., within each birthplace group. This is treated under the heading of "Cross-Classifications" below.

#### (9) Age Differences

The method as used in this survey in discussing differences between wealthy and poor districts, between children on and not on relief, etc., aggregates all ages and so conceals differences between individual ages. This has been rendered necessary for the establishment of definite results because of the fewness of cases at each age. To investigate, for groups which were well represented, whether significant age variations existed, the percentages of children of each age in the under-average-height rating were compared between the children of the given group and all children. For example, 23.7 p.c. of boys, age 5, of Scotland-born parents were under average height, against 19.1 p.c. of all boys age 5, a ratio of 5 : 4. The corresponding ratio at age 9 is about 20 : 19, at age 13, 13 : 14.

#### CROSS-CLASSIFICATIONS

##### Birthplace of Parents and Economic Factors

In the foregoing are included detailed tables showing how heights and weights vary with the several economic factors and with birthplace of parents. It is known, however, from Census studies, that a considerable degree of correlation exists between birthplace and occupations, the foreign-born tending to be in less skilled occupations; the main exception to this is the slight tendency for the United States-born to be in a slightly higher economic level than the Canadian-born. It was felt that this correlation might be partially responsible for the children whose fathers were in more skilled occupations and higher income levels being taller than other children.

Table 17 gives a cross-classification by birthplace of parents and the economic factors on the card. It will be seen that essentially similar results are shown for children of Canadian-born parents as for all children. Thus, among boys 11 p.c. of the children of Canadian-born parents, living in good districts, and 31.6 p.c. of children of Canadian-born parents living in poor districts, are underheight; among girls the figures are 13.1 p.c. and 29.4 p.c., respectively. Rather less differential, though in the same direction, is shown for the European groups. Among Canadian-born families on relief 34.2 p.c. of the boys are underheight and 36.9 p.c. of the girls, against 20.2 p.c. and 20.8 p.c. for boys and girls, respectively, among those not on relief. This difference between families on and not on relief is likewise seen for each one of the birthplaces separately, though not to the same extent in all cases as among children of Canadian parentage.

The breakdown by occupation reveals a declining percentage of children of Canadian parentage below average height from labourers, (31.7 p.c. for boys and 31.9 p.c. for girls) to professionals (11.7 p.c. for boys, and 10.4 p.c. for girls). The decline with increasing occupational level is also to be found among English, Scottish and Irish families. In the European groups, the issue is rather obscure perhaps because of the smaller numbers involved. Children of Canadian-born unemployed parents are 34.4 p.c. in the under-average-height classification for boys, and 38.6 p.c. for girls.

The general conclusion from the cross-classification of Table 17 is that the correlation of birthplace with economic position is involved in the relation demonstrated between height and weight and the other factors on the card, but the economic factor appears to be the more important.

Table 17. - Percentages of Children, Age 5 to 15, who are under Average Height, Classified by Birthplace and Occupation of Parent; Birthplace of Parent and Location of School; Birthplace of Parent and Relief Status.

Occupational Class	All Origins	Canada	Eng-land	Scot-land	Ire-land	United States	Eastern Europe	Western and Southern Europe
<b>B O Y S</b>								
Labourer .....	29.9	31.7	32.2	24.8	29.3	34.0	23.0	35.8
Operative .....	24.5	25.4	25.2	25.1	21.3	28.0	18.1	34.4
Craftsman .....	24.6	25.4	24.4	24.0	26.5	11.4	21.3	28.7
Clerical .....	19.8	19.2	21.9	22.4	19.9	20.0	(a)	(a)
Commercial .....	18.9	18.6	17.5	20.8	17.1	22.4	18.2	25.4
Owner and manager .....	17.2	14.8	19.8	17.5	11.4	8.6	15.5	34.9
Professional .....	13.2	11.7	18.9	11.5	(a)	8.5	16.3	(a)
Pensioned and retired ..	35.1	40.3	44.0	(a)	(a)	(a)	(a)	(a)
Unemployed .....	31.4	34.4	22.4	32.6	(a)	(a)	20.1	40.3
Housewife .....	24.4	24.1	25.6	23.3	(a)	(a)	29.7	(a)
Total Stated ...	23.5	22.8	24.9	23.4	23.9	18.0	20.1	33.7
<b>G I R L S</b>								
Labourer .....	30.3	31.9	31.0	31.0	25.8	15.5	22.6	42.9
Operative .....	25.1	27.3	24.0	27.4	18.3	32.3	18.1	26.1
Craftsman .....	25.0	25.3	25.5	26.4	27.1	32.3	18.1	26.1
Clerical .....	20.8	25.3	25.5	26.4	27.1	25.2	(a)	(a)
Commercial .....	19.5	17.3	19.5	22.3	18.8	19.5	25.4	32.9
Owner and manager .....	20.2	18.0	18.4	22.6	20.3	18.9	17.1	32.3
Professional .....	13.2	10.4	17.3	19.7	(a)	11.5	27.6	(a)
Pensioned and retired ..	28.2	28.6	33.4	(a)	(a)	(a)	(a)	(a)
Unemployed .....	34.2	38.6	36.1	36.6	(a)	(a)	26.0	(a)
Housewife .....	25.9	24.9	28.0	26.0	19.7	(a)	23.9	(a)
Total Stated ...	24.3	23.4	25.0	26.4	23.0	21.8	20.9	35.4
<b>Location of School</b>								
<b>B O Y S</b>								
Prosperous District ....	12.2	11.0	18.5	11.2	22.7	7.5	(a)	(a)
Poor District .....	31.3	31.6	35.1	27.3	30.7	36.4	26.6	36.2
Average District .....	23.9	23.4	24.4	24.6	24.3	18.3	19.4	33.6
<b>G I R L S</b>								
Prosperous District ....	13.7	13.1	14.8	14.5	17.8	7.8	(a)	(a)
Poor District .....	31.5	29.4	35.1	31.4	25.1	28.1	26.0	30.6
Average District .....	24.6	24.4	24.6	27.2	23.0	22.3	20.2	36.3
<b>Relief Status</b>								
<b>B O Y S</b>								
Family not on Relief ...	22.1	20.2	23.0	23.1	22.1	15.6	20.5	34.0
Family on Relief .....	33.5	34.2	33.2	28.5	37.5	(a)	27.3	40.3
<b>G I R L S</b>								
Family not on Relief ...	22.4	20.8	23.2	23.8	19.0	20.6	19.5	33.0
Family on Relief .....	36.2	36.9	36.7	39.7	31.5	(a)	26.3	46.2

(a) Less than a total of 50 cases.



### CONCLUSION

As indicated previously, the study divides itself into three parts through the requirements of tabulation: (1) simple averages of height and weight for all pupils, the only separation being by sex; (2) the effect of the various factors of the punch card taken singly; (3) the cross-classifications of the factors of the card in their effect on height and weight. This third part has been carried only to the classification of birthplace against the economic factors and awaits the opportunity to make further tabulations, suggestions upon the form of which will be welcomed.

The results of this study agree with results obtained in similar analyses of heights and weights of school children. The tendency found in British and American surveys toward an increase in average height and weight of from 2 to 5 p.c. in a generation is also demonstrated here.

It will be desirable to tie in the results of this survey with work done on nutrition; it is of importance to establish fairly precisely the range within which good or poor nutrition can affect heights and weights. This matter, always vital, is of especial importance in wartime, with the need, even in Canada, to make the most of our food resources, and to maintain a healthy population. Its long-term importance is stressed by the surprising correlation between backwardness at school and poor stature.

It is not suggested here that stature is the sole measure of bodily well-being. In individual cases serious malnutrition may accompany normal height and weight, as was found in some of the defects (Table 14), but for broadly selected groups the present study confirms results obtained many times previously of the effect of environment on height and weight. This is revealed in the individual occupations, district in which the school is situated, relief status, etc.

At the same time the complete disentangling of hereditary and environmental factors cannot be claimed for this survey. It contains nothing which disproves the possibility that children of relatively prosperous parents are taller because their parents, on the average, are taller (if, for example, tallness is a factor in economic success) as well as through superior environment. Such a separation of factors would ideally require a study of heights and weights of parents in relation to their children. However, the separation of heredity from environment was partially made in the present data by a sorting of each of the economic factors by birthplace; the economic differentials seemed to run through each birthplace. Another unresolved difficulty is the possibility that the effect of nutrition is, in part, a speeding up of growth that would have taken place later in any case, though the uniformity of the differentials with age is an argument against this.

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## RANGES IN WEIGHT FOR EACH RATING GROUP, AT EACH HEIGHT AND AGE.

- AGES -

HEIGHT (ins)	5			6			7			8			9			10			HEIGHT (ins)
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
BOYS																			BOYS
39	-34	35-37	38+																39
40	-35	36-38	39+	1	2	3													40
41	-37	38-40	41+	-35	36-38	39+													41
42	4	5	6	-36	37-40	41+	1	2	3										42
43	-39	40-42	43+	-38	39-42	43+	-38	39-44	45+										43
44	-40	41-44	45+	-39	40-43	44+	-39	40-44	45+	1	2	3							44
45	-42	43-46	47+	4	5	6	-41	42-45	46+	-41	42-46	47+							45
46	7	8	9	-43	44-47	48+	-43	44-47	48+	4	5	6	1	2	3				46
47	-46	47-50	51+	-45	46-50	51+	-45	46-50	51+	-45	46-49	50+	-46	47-50	51+				47
48	-48	49-52	53+	-47	48-52	53+	-47	48-52	53+	-47	48-51	52+	-47	48-52	53+	1	2	3	48
49	-49	50-54	55+	-49	50-54	55+	-49	50-54	55+	4	5	6	-49	50-54	55+	-49	50-54	55+	49
50				-50	51-56	57+	-51	52-57	58+	-52	53-57	58+	-52	53-57	58+	-52	53-58	59+	50
51				-52	53-58	59+	-54	55-60	61+	-54	55-60	61+	-54	55-60	61+	-54	55-61	62+	51
52							-56	57-63	64+	-56	57-63	64+	-57	58-63	64+	-56	57-63	64+	52
53							-59	60-66	67+	-59	60-66	67+	-59	60-66	67+	-59	60-66	67+	53
54							-62	63-69	70+	-61	62-69	70+	-62	63-69	70+	-62	63-69	70+	54
										-64	65-73	74+	-64	65-72	73+	-64	65-72	73+	55
										-68	69-78	79+	-67	68-75	76+	-68	69-75	76+	56
										-71	72-81	82+	-70	71-81	82+	-70	71-79	80+	57
													-71	72-85	86+	-73	74-83	84+	58
													-73	74-90	91+	-77	78-89	90+	59
																-79	80-94	95+	60
																-80	81-99	100+	
GIRLS	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	GIRLS
37	-30	31-33	34+																45
38	-31	32-34	35+																46
39	-32	33-36	37+	-33	34-36	37+													47
40	-33	34-37	38+	-34	35-37	38+													48
41	-35	36-39	40+	-35	36-38	39+	1	2	3										49
42	4	5	6	-36	37-40	41+	-36	37-42	43+										50
43	-39	40-43	44+	-38	39-42	43+	-38	39-43	44+	1	2	3							51
44	-41	42-46	47+	4	5	6	-40	41-44	45+	-40	41-44	45+	-41	42-45	46+	1	2	3	52
45	7	8	9	-42	43-47	48+	-42	43-46	47+	-42	43-47	48+	-40	41-45	46+	-49	50-51	52+	53
46	-44	45-51	52+	-44	45-49	50+	-44	45-48	49+	-44	45-49	50+	-42	43-47	48+	-48	50-52	53+	54
47	-46	47-53	54+	-46	47-52	53+	-46	47-51	52+	-46	47-51	52+	-44	45-49	50+	-49	50-54	55+	55
48	-48	49-55	56+	-48	49-54	55+	-48	49-54	55+	4	5	6	-48	49-54	55+	-48	50-55	56+	56
49	-50	51-57	58+	-50	51-57	58+	-50	51-57	58+	7	8	9	-50	51-56	57+	-48	49-53	54+	57
50				-52	53-60	61+	-53	54-60	61+	-53	54-59	60+	-50	51-56	57+	-53	54-59	60+	58
51				-53	54-63	64+	-55	56-64	65+	-55	56-62	63+	-53	54-59	60+	-56	57-62	63+	59
52							-57	58-67	68+	-57	58-66	67+	-55	56-62	63+	-58	59-65	66+	60
53							-59	60-69	70+	-60	61-70	71+	-57	58-66	67+	-60	61-69	70+	61
54										-62	63-73	74+	-60	61-69	70+	-63	64-73	74+	
55										-64	65-76	77+	-63	64-73	74+	-66	67-76	77+	
56													-66	67-77	78+	-69	70-81	82+	
57													-69	70-81	82+	-72	73-85	86+	
58													-70	71-85	86+	-75	76-89	90+	
59																-78	79-93	94+	
60																-80	81-97	98+	
61																-85	84-100	101+	

RANGES IN WEIGHT FOR EACH RATING GROUP, AT EACH HEIGHT AND AGE, con.

-AGES-

HEIGHT (ins)	11			12			13			14			15			HEIGHT (ins)
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
<b>BOYS</b>																<b>BOYS</b>
49	-52	53-59	50+													49
50	-55	56-61	52+													50
51	-57	58-63	54+	-56	57-63	54+										51
52	-60	61-66	57+	-60	61-67	58+	-53	64-70	71+							52
53	-62	63-68	59+	-63	64-70	71+	-65	66-72	73+							53
54	-65	66-72	73+	-66	67-74	75+	-67	68-75	76+	-67	68-73	74+				54
55	-68	69-76	77+	-69	70-77	78+	-70	71-78	79+	-69	70-77	78+	-69	70-81	82+	55
56	-71	72-79	80+	-72	73-80	81+	-72	73-81	82+	-72	73-82	83+	-71	72-83	84+	56
57	-74	75-83	84+	-74	75-84	85+	-75	76-84	85+	-76	77-86	87+	-74	75-86	87+	57
58	-77	78-87	88+	-77	78-88	89+	-78	79-88	89+	-79	80-89	90+	-78	79-89	90+	58
59	-80	81-92	93+	-81	82-92	93+	-82	83-93	94+	-82	83-93	94+	-83	84-93	94+	59
60	-84	85-97	98+	-84	85-97	98+	-85	86-96	97+	-85	86-98	99+	-88	89-99	100+	60
61	-89	90-102	103+	-89	90-102	103+	-89	90-101	102+	-90	91-103	104+	-92	93-104	105+	61
62	-90	91-105	106+	-91	92-108	109+	-92	93-107	108+	-95	96-108	109+	-95	96-108	109+	62
63				-94	95-110	111+	-97	98-113	114+	-100	101-113	114+	-99	100-112	113+	63
64				-95	96-113	114+	-101	102-117	118+	-104	105-119	120+	-104	105-117	118+	64
<b>GIRLS</b>																<b>GIRLS</b>
47	-49	50-53	54+				-104	105-120	121+	-107	108-123	124+	-108	109-123	124+	47
48	-49	50-53	56+				-106	107-125	126+	-111	112-126	127+	-112	113-129	130+	48
49	-51	52-57	58+				-108	109-131	132+	-114	115-132	133+	-115	117-135	136+	49
50	-52	53-59	60+	-55	56-59	60+				-118	119-137	138+	-120	121-140	141+	50
51	-56	57-63	64+	-56	57-62	63+	-61	62-65	66+	-120	121-142	143+	-124	125-144	145+	51
52	-58	59-66	67+	-57	58-66	67+	-63	64-69	70+	-61	62-73	74+	-129	130-147	148+	52
53	-60	61-69	70+	-61	62-70	71+	-63	64-69	70+	-63	64-77	78+	-132	133-150	151+	53
54	-63	64-73	74+	-64	65-73	74+	-65	66-73	74+	-63	64-77	78+				54
55	-66	67-76	77+	-67	68-77	78+	-67	68-77	78+	-68	69-80	81+	-79	80-90	91+	55
56	-69	70-80	81+	-70	71-80	81+	-70	71-80	81+	-72	73-84	85+	-80	81-93	94+	56
57	-73	74-85	86+	-73	74-84	85+	-74	75-85	86+	-76	77-89	90+	-81	82-96	97+	57
58	-75	76-90	91+	-76	77-88	89+	-77	78-91	92+	-80	81-95	96+	-83	84-100	101+	58
59	-78	79-94	95+	-80	81-93	94+	-81	82-96	97+	-84	85-100	101+	-89	90-104	105+	59
60	-82	83-99	100+	-83	84-98	99+	-85	86-100	101+	-88	89-104	105+	-91	92-109	110+	60
61	-86	87-103	104+	-87	88-102	103+	-89	90-105	106+	-92	93-104	105+	-95	96-113	114+	61
62	-90	91-107	108+	-91	92-107	108+	-94	95-111	112+	-95	96-108	109+	-98	99-116	117+	62
63	-94	95-111	112+	-94	95-112	113+	-98	99-116	117+	-98	99-112	113+	-100	101-120	121+	63
64	-98	99-116	117+	-98	99-117	118+	-101	102-120	121+	-103	104-119	120+	-104	105-123	124+	64
65				-103	104-121	122+	-104	105-123	124+	-107	108-123	124+	-108	109-126	127+	65
66				-107	108-126	127+	-106	107-125	126+	-110	111-127	128+	-114	115-131	132+	66
67							-108	109-127	128+	-112	113-131	132+	-118	119-134	135+	67
68										-114	115-135	136+	-121	122-137	138+	68
69													-123	124-142	143+	69

### DISTRIBUTION OF BOYS, BY AGE AND WEIGHT

A G E S															A G E S															A G E S																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
Weight (lbs.)	Total	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
Total	39,350	1,459	3,369	4,080	4,289	4,451	4,487	4,470	4,542	4,669	4,805	1,929																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	</

### DISTRIBUTION OF GIRLS, BY AGE AND WEIGHT

[illegible]

Table D.

## DISTRIBUTION OF BOYS BY AGE AND HEIGHT

## DISTRIBUTION OF GIRLS BY AGE AND HEIGHT

AGE															AGE														
Height Total (in.)	5	6	7	8	9	10	11	12	13	14	15	Height Total (in.)	5	6	7	8	9	10	11	12	13	14	15						
Total 39,550	1,459	3,269	4,080	4,239	4,451	4,437	4,470	4,542	3,869	2,905	1,829	Total 38,502	1,501	3,204	3,794	4,118	4,510	4,468	4,542	4,339	3,790	2,707	1,729						
35	3	3										35	2	2															
36	1	1										36	5	5															
37	2	2										37	8	8															
38	37	25	12									38	55	42	13														
39	115	83	32									39	155	101	53														
40	267	165	87									40	509	175	107														
41	505	261	199	15								41	584	297	241	24													
42	810	297	403	90	15							42	887	296	451	121	17												
43	1132	277	558	255	38	4						43	1107	245	564	249	42												
44	1394	193	618	452	108	8						44	1386	182	610	441	119	24											
45	1527	109	565	593	218	36						45	1558	81	516	630	281	40											
46	1699	32	390	772	378	102						46	1718	46	336	703	463	142											
47	1851	9	241	684	615	229	39	14				47	1775	14	165	619	606	295											
48	1851	2	101	509	688	385	108	31	6			48	1932	7	92	443	742	488											
49	2013		36	340	725	585	248	146	64			49	1987	7	34	296	653	647	286										
50	2147		20	196	592	705	436	305	146			50	2023	7	12	136	501	737	435	166									
51	2352			35	428	785	586	505	305			51	2098		10	57	560	716	436	166									
52	2347				242	641	723	478	183			52	1949			24	175	576	736	436	166								
53	2347				113	462	725	606	329			53	1928			4	89	411	631	509	235								
54	2809				39	265	583	678	494			54	1745			3	35	228	597	624	416								
55	2317				17	146	454	682	577			55	1739			3	11	114	373	624	416								
56	2129				2	58	266	525	433			56	1727			2	3	53	526	526	529								
57	1979				6	20	133	417	653			57	1756			2	3	15	134	423	583								
58	1678				7	1	63	253	532			58	1805			2	3	4	61	314	559								
59	1514						23	143	407			59	1709			2	3	4	33	164	515								
60	1200						6	69	250			60	1538			1	4	11	10	114	423								
61	984						8	27	139			61	1165			1	4	11	6	48	279								
62	785						6	12	84			62	822			1	4	11	2	28	165								
63	633						6	47	134			63	484			1	4	11	2	81	128								
64	535						7	27	75			64	239			1	4	11	2	35	55								
65	442						5	11	65			65	109			1	4	11	2	27	50								
66	307								174			66	68			1	4	11	2	8	18								
67	190								103			67	16			1	4	11	2	4	4								
68	126								80			68	1			1	4	11	2	1	1								
69	70								18			69	71			1	4	11	2	8	15								
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