SOME OBSERVATIONS ON THE HEIGHTS AND WEIGHTS OF UNDERGRADUATES

WITH SPECIAL REFERENCE TO THE UNIVERSITY OF WALES

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INTRODUCTION

It is standard practice, no matter what other anthropometric measurements may be taken, to record height and weight at routine medical examinations. There are a number of reasons for so doing. Height related to weight, or to some function of weight, at a given age may be used as an index of body build and physical constitution; gross deviation from standard norms may raise the suspicion of disease or nutritional deficiency; and periodic observations on the same individual afford a standard for assessing physical fitness and in some instances may be an aid to diagnosis. Considerations of individual health apart, however, perhaps the most interesting information is to be found in measurements derived from groups. Such measurements have, for example, been widely used as an index of health and development among children, and in a number of studies group differences in stature have been related to socio-economic background (Friend and Bransby, 1947; Bransby and others, 1946; Yudkin, 1944). Relationships between the stature of parents and their children have been studied by Pearson and Lee (1903), by Bowles (1932), and more recently by Durnin and Weir (1952). Still other investigations have demonstrated differences in stature between ethnic groups. Finally, a matter of some interest in the present context, a small but definite correlation has been established between stature and intelligence, and Parnell (1952) has drawn attention to relationships between various somatotypes and the academic performances of undergraduates at Oxford University.

Students form a convenient and relatively accessible group for anthropometric surveys and are often used as standards of comparison. The last survey carried out among students generally was that of Cathcart, Hughes, and Chalmers (1935). More recently, published information has been

derived chiefly from Oxford and Cambridge, and is by no means necessarily representative of the student population of this country as a whole. Indeed, differences in group measurements between one university and another would not be unexpected. The distribution of students by socio-economic status is unlikely to be the same at the older universities as it is at provincial universities, and there may be differences among the provincial universities themselves in this regard. Moreover, Martin (1949) demonstrated differences in stature between young men from different regions of the country and these differences may be reflected in university groups, since provincial universities tend to draw their students predominantly from the local population.

Considerable changes in the size and composition of the undergraduate population of Great Britain have taken place in recent years. It would be of interest to establish information which could confidently be regarded as representative of the undergraduate population of the United Kingdom, and the observations which follow are presented as a contribution from the University of Wales. There are, in addition, points of particular interest in a study of a predominantly Welsh population. There is, for example, the possibility that ethnic factors might determine differences between Welsh students and others. Differences in physique between groups distinguished on socio-economic criteria, might, moreover, be accentuated in Wales as a result of adverse environmental experiences during the trade depression of the 1930s—a time when present-day students were passing through infancy or early childhood. On the other hand, during the recent war and in the post-war years, improved nutritional opportunities may have modified the consequences of earlier environmental stresses. Factors such as these have to be borne in mind and give added point to anthropometric studies at the present time.

SOURCE OF DATA

The measurements were obtained at routine medical examinations conducted by the Student Health Service on new entrants to the University of Wales during the academic sessions 1949-50 and 1950-51, the figures for the 2 years having been combined. Attendance at these examinations is voluntary and the findings relate to approximately 77 per cent. of the intake during the 2 years. The fact that nothing is known about the measurements of some 23 per cent. of the entrants constitutes an admitted shortcoming in the data. It cannot be sufficiently emphasized therefore, that the conclusions must be regarded as tentative. Nevertheless, in the absence of more complete information, the results may not be entirely valueless, if only because they draw attention to matters worthy of further study and enquiry.

The measurements were taken as follows. For both men and women, height was measured in stockinged feet. Women were weighed semi-clothed, men were weighed with their trousers on. The stated weights are likely, therefore, to be some $1\frac{1}{2}$ -2 lb. heavier than the nude weights. In this respect the present information is similar to that obtained in other surveys.

Finally, it is necessary to point out that minor discrepancies between the totals for similar groups in the different analyses are due to the incompleteness of certain individual record cards.

RESULTS

(1) *Students at the University of Wales, and the University of Cambridge, compared with the General Population.*—In Table I the mean heights and weights of male entrants to the University of Wales are compared with recent figures for freshmen at Cambridge (Bailey, 1951). The analysis made by Martin (1949) of the measurements of candidates for national service are also given. Two facts are noteworthy. The first is that Cambridge undergraduates were, on the average, 1.4 in. taller and some 8 lb. heavier than undergraduates at the University of Wales. The second is the marked superiority

of both undergraduate groups when compared with the national servicemen. Cambridge freshmen were, on the average, 2 in. taller and some 17 lb. heavier than the recruits. The superiority of freshmen at the University of Wales, though of smaller degree, is, nevertheless, striking.

Martin's figures are the best available for young adults from the general population, but the national servicemen differed from the student groups in a number of particulars. Martin's analysis refers to men called up for military service in 1939, that is to say, before a national food policy came into operation, and the undergraduate groups were examined during the period 1948-51. The potential servicemen were, moreover, between 20 and 21 years of age. The mean age of the Cambridge undergraduates was 21.0 years and that of the University of Wales undergraduates 20.5 years, but in both student groups the range was wider than in Martin's series.

It is unfortunate that figures representative of the contemporary young adult population are not readily available. Kemsley (1950), in a study of the heights and weights of industrial workers carried out by the Ministry of Food in 1943, gives mean values on a par with Martin's figures. The Ministry of Food survey, however, suffers from the drawback that it was conducted among civilians at a time when the fitter members of the population are likely to have been in the services. Consequently, physical selection may have influenced Kemsley's findings. It is, perhaps, less likely that physical selection of this kind would affect the findings among women, and in Table II (overleaf) women entrants to Cambridge University (Bailey, 1951) and to the University of Wales are compared with young women in two age groups taken from the Ministry of Food survey.

The findings among the women are similar to those among the men. Women at Cambridge were, on the average, an inch taller and some 6 lb. heavier than women at the University of Wales. Both undergraduate groups were markedly superior to the groups from the general population.

TABLE I
MALE UNIVERSITY ENTRANTS AND NATIONAL SERVICE RECRUITS: MEAN HEIGHTS AND WEIGHTS

Group	Date	Height (in.)			Weight (lb.)		
		No. of Observations	Mean $\pm$ S.E.	S.D.	No. of Observations	Mean $\pm$ S.E.	S.D.
Cambridge Freshmen	1948-50	3,100	69.91 $\pm$ 0.05	2.55	3,100	153.10 $\pm$ 0.29	16.29
University of Wales Freshmen ..	1949-51	1,532	68.5 $\pm$ 0.06	2.4	1,531	145.0 $\pm$ 0.45	17.2
National Service Recruits ..	1939	91,163	67.5 $\pm$ 0.009	2.6	91,084	135.7 $\pm$ 0.055	16.54

TABLE II
FEMALE UNIVERSITY ENTRANTS AND INDUSTRIAL WORKERS: MEAN HEIGHTS AND WEIGHTS

Group	Date	Mean Age (yrs)	Height (in.)			Weight (lb.)		
			No. of Observations	Mean $\pm$ S.E.	S.D.	No. of Observations	Mean $\pm$ S.E.	S.D.
University of Cambridge ..	1948-50	19.3	271	64.98 $\pm$ 0.15	2.50	271	133.21 $\pm$ 1.09	17.87
University of Wales ..	1949-51	19.6	835	63.9 $\pm$ 0.08	2.4	834	127.6 $\pm$ 0.59	17.0
Industrial Workers ..	1943	19.5	1,376	62.26 n.s.	2.34	1,376	115.7 n.s.	15.21
		20.5	1,284	62.42 n.s.	2.31	1,284	118.0 n.s.	16.80

It must be borne in mind that the measurements at the universities were carried out among volunteers (Cambridge—75 per cent. of intake; University of Wales—77 per cent. of intake). The difficulty of obtaining information about the physique of young adults from the general population with which students could confidently be compared has already been mentioned. The evidence strongly suggests, however, that, at least in so far as mean heights and weights are concerned, students are considerably superior to similar age groups drawn from the general population. It would, perhaps, be surprising were this not so.

(2) *Regional Differences within the University of Wales.*—The possibility that variations in physical measurements might occur among students coming from different regions of Great Britain was next investigated. Entrants to the University of Wales were divided into three groups as follows:

- those whose homes were in Wales,
- those whose homes were in other parts of the British Isles,
- those from the Dominions, Colonies, and foreign countries, including students of foreign extraction resident in the United Kingdom only since 1945.

The overseas group was small and because of its heterogeneous character was not treated separately

in the present analysis. A comparison between the two other residential groups is more legitimate and of greater interest (see Table III).

Among the men, students resident in Wales were, on the average, nearly an inch shorter and some 5 lb. lighter than students residing elsewhere in the British Isles. Among the women there was a similar difference in height and the residents outside Wales had an advantage of 8 lb. in weight when compared with women residing within the principality.

It might be argued that migration of families to and from Wales would affect the findings, but the effects of migration, if any, were small. Students whose homes were in Wales had generally lived there all their lives, and the same impression was gained from those whose homes were in England. It seemed likely, however, that differences in the age structure of the two residential groups might have contributed to the observed differences in mean heights and weights, and this possibility will now be examined.

(3) *Effects of Age.*—Bailey (1951) showed that, among Cambridge freshmen, weight varied appreciably according to age at entrance. Height, on the other hand, was not materially affected. The findings at the University of Wales were similar,

TABLE III
MEAN HEIGHTS AND WEIGHTS OF STUDENTS OF THE UNIVERSITY OF WALES BY PLACE OF RESIDENCE

Sex	Place of Residence	No. of Observations	Height (in.)		Weight (lb.)	
			Mean $\pm$ S.E.	S.D.	Mean $\pm$ S.E.	S.D.
Males	In Wales	1,236	68.4 $\pm$ 0.07	2.5	144.3 $\pm$ 0.51	17.3
	Elsewhere in British Isles	243	69.3 $\pm$ 0.14	2.2	149.1 $\pm$ 1.01	15.7
Females	In Wales	703	63.8 $\pm$ 0.10	2.3	126.7 $\pm$ 0.64	17.0
	Elsewhere in British Isles	111	64.6 $\pm$ 0.19	2.0	132.6 $\pm$ 1.67	17.8

TABLE IV
MEAN WEIGHTS BY AGE RELATED TO PLACE OF RESIDENCE

Sex	Age at Entry (yrs)	Resident in Wales				Resident elsewhere in the British Isles				All Students (including those from Overseas)			
		No. of Observations	Mean Weight (lb.)	Standard Error	Standard Deviations	No. of Observations	Mean Weight (lb.)	Standard Error	Standard Deviations	No. of Observations	Mean Weight (lb.)	Standard Error	Standard Deviations
Males	18 and under	470	141.9 ± 0.73	15.9	52	147.6 ± 1.89	13.6	528	142.4 ± 0.71	16.4	19-3	17.3	16.9
	19-	252	144.4 ± 1.14	17.6	45	149.4 ± 2.28	15.3	300	145.2 ± 1.00	17.3	16.9	17.1	16.4
	20-	187	144.6 ± 1.30	17.7	37	148.6 ± 2.02	12.3	227	145.2 ± 1.12	16.9	17.1	16.4	19.4
	21-	161	147.5 ± 1.35	17.1	36	150.9 ± 2.55	15.3	202	147.7 ± 1.20	17.1	16.4	19.4	17.6
	22-	47	145.6 ± 2.28	15.7	23	148.1 ± 3.96	19.0	70	147.7 ± 1.96	16.4	19.4	17.6	16.4
	23 and over	119	148.7 ± 1.75	19.1	50	153.0 ± 2.55	18.0	205	148.0 ± 1.35	19.4	17.6	16.4	17.5
Females	18 and under	423	127.1 ± 0.86	17.8	45	131.0 ± 2.40	16.1	473	127.6 ± 0.81	17.6	16.4	17.5	19.2
	19-	174	127.0 ± 1.13	14.9	28	132.2 ± 3.27	17.3	207	128.2 ± 1.14	16.4	17.5	19.2	17.4
	20-	54	123.3 ± 2.12	15.6	15	136.3 ± 5.32	20.6	72	127.5 ± 2.06	17.5	19.2	17.4	
	21-	16	128.1 ± 4.02	16.1	12	131.7 ± 6.38	22.1	29	128.8 ± 3.56	19.2			
	22 and over	36	119.7 ± 2.65	15.9	11	135.9 ± 4.85	16.1	53	125.6 ± 2.39	17.4			

and for this reason, the age-weight relationship only is considered in the present analysis.

The results are shown in Table IV, in which a comparison between age groups in the two areas of residence (Wales and "elsewhere in the British Isles") is also given. Two points emerge from consideration of Table IV. The first is the distinct advantage of students from outside Wales in each age group and in both sexes. This disposes of the possibility that differences in age distribution accounted for the disparities in physique between the two residential groups noted in Table III. The second point is that, in contrast with the experience for men, no consistent relationship between age and weight was demonstrated among the women.

A significant positive correlation between weight and age is demonstrated for males in Table IVA. There is no significant correlation between weight

and age for females. The difference between the correlation coefficients in the two male residential groups is not significant ($t = 1.5; 0.2 > p > 0.1$).

The difference between the sexes is noteworthy. Subsidiary information obtained at Student Health examinations demonstrated a similar trend in age-weight relationship (see Table V). A number of students initially examined during the session 1949-50 were re-examined during the session 1951-52, on the average some 2 years later. This group consisted of 474 men and 259 women who had survived examination hurdles and other hazards of university life and were available for and desirous of a second

TABLE V
WEIGHT LOSS OR GAIN 2 YEARS AFTER INITIAL EXAMINATION (ALL STUDENTS)

	Weight (lb.)	Males		Females	
		No.	Per cent.	No.	Per cent
Gain	15 and over ..	23	4.9	8	3.1
	11-14	44	9.3	9	3.5
	7-10	76	16.0	24	9.3
	3- 6	123	25.9	30	11.6
Stationary		148	31.2	106	40.9
Loss	3- 6	37	7.8	29	11.2
	7-10	20	4.2	35	13.5
	11-14	3	0.6	13	5.0
	15 and over ..	—	—	5	1.9
Total		474	99.9	259	100.0

TABLE IVA
CORRELATION COEFFICIENTS AND REGRESSION EQUATIONS OF WEIGHT ON AGE

Sex	Place of Residence	Correlation Coefficients Age/Weight	Regression Equations Weight/Age
Males	In Wales ..	+0.126 ± 0.03	Wt. = 0.902 Age + 126.1
	Elsewhere in British Isles..	+0.226 ± 0.06	Wt. = 1.202 Age + 123.6
Females	In Wales ..	-0.063 ± 0.04	
	Elsewhere in British Isles..	+0.088 ± 0.10	

medical examination. Results from a group of this nature must clearly be interpreted with caution. At all events they indicate that the difference between the sexes in age-weight relationship noted at initial examinations was paralleled at the second examination in those students upon whom it was possible to carry out a longitudinal study. During the 2 years between the examinations most of the men had gained weight. Relatively few women experienced a gain in weight and there was no clear group tendency for them to do so.

$$(\chi^2 = 77; n' = 6; p < 0.01)$$

It may be that this finding represents a biological difference between the sexes, maximum increase in weight among girls taking place around puberty and among men continuing to increase beyond late adolescence. The extent to which the findings in Table V are influenced by voluntary weight reduction among women students can only be surmised.

(4) *Effects of Socio-Economic Status.*—Entrants to the University of Wales were classified by reference to parental occupation according to the Registrar-General's five social classes (Table VI). Somewhat surprisingly there was almost no difference either in mean heights or in mean weights among males in the different social classes. A small social gradient is suggested for mean heights and weights among female students, and a separate analysis showed that differences between Social Classes I and II combined and IV and V combined were unlikely to have occurred through chance.

An examination of the ages of men and women in the different social classes showed little difference in age distribution.

The absence of a social gradient among the men was an unexpected finding, the more so, perhaps, in view of findings at Cambridge (Bailey, 1951). Using the type of school attended as a socio-economic criterion, Bailey demonstrated a gradient in both height and weight. The type of school attended by students at the University of Wales could not be used as an index of socio-economic status because of the small number of public school men entering the university during the two sessions. Although no straightforward comparison can be made between the two surveys, the contrast between the results at the two universities is noteworthy.

Here it should be stated, however, that although conventional social class analysis failed to show differences between group measurements at the University of Wales, it was possible to demonstrate differences between groups distinguished on other criteria. Thus the sons of miners were compared with the sons of farmers; both groups were well represented at the university, and the comparison was of local interest because both farming and mining communities figure largely in the life of Wales. Moreover, there is likely to have been a marked contrast in the nutrition of the two groups in early childhood, since many of the present-day students were born during the years of depression in the Welsh coal industry.

TABLE VI
MEAN HEIGHTS AND WEIGHTS BY SOCIAL CLASS OF PARENTS
(Dominions, Colonial, and Overseas Students Excluded)

Sex	Social Class	Height (in.)			Weight (lb.)		
		No. in Group	Mean $\pm$ S.E.	S.D.	No. in Group	Mean $\pm$ S.E.	S.D.
Males	I	159	68.8 $\pm$ 0.18	2.25	159	145.4 $\pm$ 1.32	16.61
	II	557	68.6 $\pm$ 0.10	2.35	556	145.9 $\pm$ 0.68	16.02
	III	557	68.6 $\pm$ 0.11	2.51	557	144.7 $\pm$ 0.78	18.45
	IV	144	68.2 $\pm$ 0.21	2.49	144	143.7 $\pm$ 1.39	16.70
	V	57	68.2 $\pm$ 0.31	2.36	57	146.2 $\pm$ 2.11	15.95
	Total	1,474			1,473		
Females	I	99	64.0 $\pm$ 0.22	2.24	99	128.1 $\pm$ 1.35	16.59
	II	358	63.7 $\pm$ 0.13	2.47	358	128.0 $\pm$ 0.90	17.10
	III	271	63.6 $\pm$ 0.15	2.15	271	126.5 $\pm$ 0.95	15.71
	IV	57	63.0 $\pm$ 0.32	2.42	57	123.4 $\pm$ 1.30	16.38
	V	24	63.1 $\pm$ 0.44	2.15	24	126.2 $\pm$ 2.96	14.48
	Total	809			809		

The results (Table VII) showed that farmers' sons were, on the average, just over an inch taller and some 5 lb. heavier than the sons of miners, both differences being significant at the conventional 5 per cent. level.

TABLE VII
MEAN HEIGHTS AND WEIGHTS OF FARMERS' AND MINERS' SONS

Father's Occupation	No. of Observations	Height (in.)		Weight (lb.)	
		Mean $\pm$ S.E.	S.D.	Mean $\pm$ S.E.	S.D.
Miner	156	68.2 $\pm$ 0.21	2.6	143.9 $\pm$ 1.42	18.0
Farmer	81	69.4 $\pm$ 0.30	2.7	149.0 $\pm$ 1.63	14.7

The general tendency of rural dwellers to have a physique superior to that of town dwellers is well known. However, when the measurements of all students were compared according to whether they lived in urban or in rural areas, no difference could be demonstrated. The explanation of the difference between miners' and farmers' sons is, in fact, not simple, and has been referred to here mainly to show that, despite the absence of an overall social gradient, at least one group difference existed.

A number of possible explanations for the absence of an overall social gradient for heights and weights come to mind. For example, the sample of students may be unrepresentative. Voluntary attendance for medical examinations may introduce a bias towards equalizing the average measurements in the social classes. It is conceivable, for instance, that two extreme groups—with superior or inferior physique—are least likely to be attracted to a medical examination, and that the former may come predominantly from wealthier families and the latter from the less well-to-do. Another explanation which must also be considered, is that in contrast with Cambridge undergraduates, the majority of students at the University of Wales were educated at secondary schools. Boys and girls from well-to-do families in Wales sometimes go to English public schools and proceed to English universities, and if the majority of such students are from Social Class I, those of that class who go to the University of Wales may be unrepresentative in respect of physique. If this were indeed an important factor, it is possible that there is more variability in physical measurements *within* Social Class I among students in Wales than there is *between* the social classes as demonstrated in Table VI.

A further point is the physique of the general population. Published surveys are based mainly on data obtained before or during the last war. Recent

social advances may have caused a levelling-off of physique among young people of different socio-economic backgrounds. If this is so, the findings at the University of Wales would be no more than a reflection of a process that has been generally operative.

It is impossible to reach any final conclusion when so many factors may have been concerned and when so much is unknown. Basing observation on available figures, the most outstanding impression is that variations between students of different socio-economic status are small in comparison with the marked superiority of all student groups over the general population. This suggests, as others have pointed out, that young adults who are destined for a university career, and whose intellectual endowment is presumably above average, are also, irrespective of socio-economic status, of superior physique. The relative contributions of nature and nurture to this physical advantage have been discussed by Parnell (1952). It is now proposed to examine certain aspects of this problem with particular reference to undergraduates at the University of Wales.

(5) *Influence of Nationality: "Natives" and "Migrants"*.—It has already been shown (Tables III and IV) that students at the University of Wales classed as living "Elsewhere in the British Isles" were, on the average, taller and heavier than residents in Wales, and that this advantage was independent of differences in age distribution. The mean measurements of the "migrant" group (i.e. those from outside Wales) closely resemble those of Cambridge students from "other" schools. It may be assumed that the majority of Cambridge students in this group were educated at English secondary schools and would be comparable—at least in so far as a common educational background is concerned. It is not surprising, therefore, that the mean heights and weights of these two groups are almost identical (Table VIII).

TABLE VIII
MEAN HEIGHTS AND WEIGHTS OF FRESHMEN AT THE UNIVERSITY OF WALES, RESIDENT OUTSIDE WALES, COMPARED WITH CAMBRIDGE FRESHMEN OF SIMILAR EDUCATIONAL BACKGROUND

University	No. of Observations	Height (in.) Mean $\pm$ S.E.	Weight (lb.) Mean $\pm$ S.E.
Wales	243	69.3 $\pm$ 0.14	149.1 $\pm$ 1.01
Cambridge	482	69.4 $\pm$ 0.1	150.9 $\pm$ 0.7

The superiority of the students with a background of secondary education in England over those who had had a similar education in Wales might be due

TABLE IX
DISTRIBUTION OF MEN STUDENTS BY SOCIAL CLASS*, SURNAME†, AND PLACE OF RESIDENCE

Social Class	Resident in Wales						Resident elsewhere in the British Isles						Grand Total	
	Surnames				Total		Surnames				Total			
	"Welsh"		"English"				"Welsh"		"English"					
	No.	Per cent.	No.	Per cent.			No.	Per cent.	No.	Per cent.				
I and II	396	47.8	167	41.4	563	45.7	44	62.9	109	63.0	153	63.0	716	48.6
III	300	36.2	184	45.7	484	39.3	21	30.0	52	30.0	73	30.0	557	37.8
IV and V	132	16.0	52	12.9	184	15.0	5	7.1	12	7.0	17	7.0	201	13.6
Totals	828	100.0	403	99.9	1,231	100.0	70	100.0	173	100.0	243	100.0	1,474	100.0

* Because of the small numbers Social Classes I and II and also IV and V have been combined.

† The use of the surname as an index of racial origin was suggested by the work of Fraser Roberts (1948) on the distribution of blood groups.

to regional differences in physique between English and Welsh people, though this would not be an altogether safe assumption. Possible explanations are:

- selection at university entrance,
- differences in social structure between the two groups,
- physical differences in the populations from which the students were drawn.

Under (a) such factors as the actual selection of candidates for entrance, circumstances which determine choice of university, and the availability of special courses (e.g. Forestry, Mining) might be operative and might favour certain physical types. The possible influence of factors of this kind has been referred to in connexion with the social class analysis above. An analysis by social class for the two residential groups is shown in Table IX. (For the sake of convenience certain "surname" subgroups are also distinguished in the Table and will be referred to later.)

The distribution of social classes between the two residential groups is significantly different (cols. 3 and 6—Table IX). Students from the lower social classes are less likely to reach the University of Wales if they live outside Wales than if they live within the principality. Dissimilarity of social background may therefore have contributed to the differences in heights and weights.

It is impossible to assess the extent to which (a) and (b) have influenced group measurements, but the fact that they may have done so should not be overlooked. The possibility that physical differences between the two populations might account for the observed differences in physique calls for more extended comment. It is often said that the Welsh tend to be of smaller physique than the English. It might consequently be argued that racial factors were responsible for the differences in physique between English and Welsh students. Upon this point it is possible to throw a little light.

Students from the two residential areas were subdivided according to nationality of surname†, four subgroups being distinguished:

- residents in Wales with "Welsh" surnames,
- residents in Wales with "English" surnames,
- residents in England with "Welsh" surnames,
- residents in England with "English" surnames.

It is suggested that, if race were more important than environment in determining physique, the average measurements of students with "Welsh" surnames would tend to be similar whether they lived in Wales or elsewhere in the British Isles, and that the same would be true of students with "English" surnames. The results (Table X) show a much greater similarity between subgroups by area of residence than by nationality of surname.

‡ The analysis was limited to males.

TABLE X
MEAN HEIGHTS AND WEIGHTS BY SURNAME AND PLACE OF RESIDENCE

Place of Residence	Surname	No. of Observations	Height (in.)		Weight (lb.)	
			Mean $\pm$ S.E.	S.D.	Mean $\pm$ S.E.	S.D.
Outside Wales	"English"	173	69.3 $\pm$ 0.13	2.3	150.2 $\pm$ 1.22	16.1
	"Welsh"	70	69.2 $\pm$ 0.21	1.8	149.4 $\pm$ 1.89	15.9
In Wales	"English"	403	68.6 $\pm$ 0.12	2.4	145.2 $\pm$ 0.79	15.8
	"Welsh"	828	68.2 $\pm$ 0.08	2.4	143.8 $\pm$ 0.63	18.0

TABLE XI
HEIGHTS AND WEIGHTS OF MALE STUDENTS FROM 1899-1951

Group	Source of Data		No. of Observations	Height (in.)		Weight (lb.)	
	Author	Date		Mean $\pm$ S.E.	S.D.	Mean $\pm$ S.E.	S.D.
Cambridge Undergraduates	Pearson*	1900	1,000	68.86 $\pm$ 0.08	2.52	152.78 $\pm$ 0.52	16.55
Oxford Students	Schuster†	1911	959	69.49 $\pm$ 0.08	2.60	151.94 $\pm$ 0.53	16.37
Students from certain British Universities	Cathcart, Hughes, and Chalmers	1935	1,735	68.9 n.s.		138.5 n.s.	
Cambridge Freshmen	Bailey	1951	3,100	69.91 $\pm$ 0.05	2.55	153.10 $\pm$ 0.29	16.29
University of Wales Freshmen	Present Study	1949-51	1,532	68.5 $\pm$ 0.06	2.4		
		1949-51	1,531			145.0 $\pm$ 0.45	16.5

* See also Powys (1901).

† Parnell (1952) states that there have been negligible changes in the heights and weights of Oxford undergraduates during the past 40 years.

The differences between the figures for students by areas of residence are significant at the conventional level. The differences between surname subgroups within each area of residence are no greater than could have occurred by chance.

Before attempting an interpretation of this finding, one further point must be considered. When the surname subgroups were examined for social distribution, there was a significant difference between the subgroups resident in Wales, though the groups from outside Wales were similar (see Table IX). Social Classes I and II were relatively less well represented in the English surname subgroup, and Social Class III was more heavily represented. One of several possible explanations is that students in Social Classes I and II with "English" surnames, resident in Wales, have a greater tendency to enter English universities. If this were so, students in this subgroup might be less representative than those with "Welsh" surnames. The possible effect on group physical measurements of "missing" students from the top social classes has already been discussed. Taking the findings at their face value, all that can be said with certainty, is that, despite a somewhat less favourable social distribution, the physical measurements of students with "English" surnames resident in Wales do not differ significantly from those with "Welsh" surnames resident in Wales.

It must be admitted that the use of surname is a crude index of racial origin. Nevertheless, the analysis in Table X suggests that environmental rather than racial factors accounted for the observed differences in physique between students grouped by area of residence.

(6) *Heights and Weights of Students during the Past 50 Years.*—Finally, it is not without interest to compare measurements obtained from undergraduate groups during the past 50 years. The figures (males only) are shown in Table XI.

Except in the case of the mean height of Cambridge students, which has increased by about one inch, there appears to have been little change in the mean height and weight of undergraduates at the older universities since the turn of the century.

Students in the survey of Cathcart and others (1935) were, on the average, some 13-14 lb. lighter than students at Oxford and Cambridge 40 to 50 years ago. The method by which Cathcart's students were selected for measurement is not clear. If, despite the inclusion of some Oxford students, the survey may be taken as more or less representative of provincial universities in 1935, and if it can be assumed that mean weights of students at provincial universities to-day would be at least as high as those obtained at the University of Wales, it would appear that an increase of about 7 lb. in the mean weights of students at provincial universities had occurred during the past 15 years or so.

During recent years, social and economic barriers to university education have been progressively relaxed, and the consequent broadening in social structure may account for the absence of a gain in the mean weights of students at the older universities. On the other hand, the comparison between Cathcart's findings and our own lend support to the view that any tendency that changes in social structure might have had in reducing mean weights has been more than counterbalanced by the improved nutritional opportunities of the population at large.

SUMMARY

(1) The superior stature and body weight of student groups compared with young men and women in the general population is demonstrated.

(2) Among undergraduates at the University of Wales, students residing outside Wales were superior in height and weight to those who lived in Wales.

(3) A small but significant positive correlation between weight and age was found among men at the University of Wales. No correlation between weight and age was found among women.

(4) Among male undergraduates at the University of Wales, no significant differences were found between mean heights and weights when students were grouped according to parental social class. Among women students there was a small but significant difference between the mean heights and weights in Social Classes I and II combined and those in Social Classes IV and V combined. Possible reasons for the absence of social class differences are discussed.

(5) Area of residence appeared to be of greater importance than nationality (using surname as a criterion) in determining differences between the mean heights and weights of residential groups.

(6) The trend of mean heights and weights among male students at a number of universities during the past 50 years is discussed.

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* Powys is given as author. Footnote by Pearson states: "The following data were freely placed at my disposal by Powys. I have added little to his own notes."