

A STATISTICAL ANALYSIS OF CAMBRIDGE UNIVERSITY HEALTH SERVICE RECORDS, 1948-50

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1. INTRODUCTION

The Cambridge University Health Service started work in October 1948. So far it has been restricted to preventive measures and has been confined to new entrants to the University on an entirely voluntary basis. The Service provides a clinical examination and a chest X-ray. A general survey of the scope of the Service and the results obtained have been given in the annual reports of the Senior Health Service Officer, Sir Alan Rook (1950, 1951). In addition to the original clinical records a Hollerith punched-card record system has been used since the inception of the Service to facilitate detailed investigations. In Appendix I to the first annual report mentioned above (Rook, 1950) I gave a few preliminary results on various physical measurements for the first 900 men examined. It has now been possible to complete a much more extensive investigation, the results of which are given in the present paper. In some cases this has been based on the completed records for the year 1948-9, while in others the records for the two years 1948-50 have been utilized. I have already given a brief summary of the contents of this paper in Appendix I to the second annual report (Rook, 1951).

The total amount of information available is of course very large, and in selecting topics for discussion drastic selection is inevitable. The plan adopted for this first analysis was to choose a number of physical measurements such as height, weight, blood pressure, unaided visual acuity, etc., for special study. The data were examined for possible age effects, and also with reference to both academic performance on entering the University—judged by the possession of the appropriate kind of scholarship or exhibition—and the type of school previously attended. The latter was used because it is presumably related to the undergraduate's social and economic background before coming up to the University. The percentages of men who had been vaccinated or inoculated, and who had undergone a tonsillectomy or appendicectomy were also examined. These showed some interesting variations with the type of school attended. Finally a striking, though expected, correlation between the first year University Examination results and the type of college entrance was demonstrated.

The data available on women undergraduates are so far rather small and have in general not permitted detailed sub-classification, but where possible comparisons of the averages for men and women have been made.

Two preliminary remarks on the analysis must be made. First, apparent discrepancies between the totals for similar groups in different tables are to be accounted for by the inevitable incompleteness of some of the records.

Secondly, it cannot be too strongly emphasized that this analysis is based on

about 70–75 % of freshmen only—those who volunteered for the Service. The data constitute, therefore, neither a complete survey nor a random sample. This means that conclusions may well be statistically suspect when there is any reason for supposing that those who have volunteered for the Service are not entirely representative. With this qualification in mind, one can say that any particular result is the best available at present, but that its value would have been materially increased had it been based on something approaching a 100 % coverage.

2. GENERAL SURVEY OF VARIOUS PHYSICAL MEASUREMENTS

Table 1 gives some data for the year 1948–9 on blood pressure, pulse rate, height, weight and body-build for about 1500 men in each case; the actual numbers vary slightly from 1500 on account of a few incomplete records. For each type of measurement the average value with an attached standard error is quoted, together with the standard deviation of the series of observations.

Table 1. *Measurements on about 1500 freshmen (1948–9)*

Measurement	Average (with standard error)	Standard deviation
Blood pressure:		
Systolic (mm.)	129.7 ± 0.3	11.2
Diastolic (mm.)	79.2 ± 0.2	7.6
Pulse rate (b.p.m.)	70.3 ± 0.3	11.4
Height (in.)	69.9 ± 0.1	2.6
Weight (lb.)	153.1 ± 0.4	16.2
Body build (lb.)	+ 3.2 ± 0.3	13.2

A correction must be made to one of the earlier results where the average pulse rate should have read 70.9 instead of 72.4 b.p.m. It can now be seen that all the revised averages agree with those given previously, allowing for sampling variation.

The body-build figures have been calculated with reference to a table giving average weight for given age and height, which has been prepared by Dr G. M. Morant (1946) for the Air Ministry.

Although considerable variation between apparently normal and healthy individuals of most plant and animal species is a biological commonplace, a similar situation in man has not always been widely recognized. For this reason it is essential to give estimates of the variation in addition to average values. In most cases the standard deviation provides an adequate indication of the extent of this variation. This means that if the observations are distributed in the so-called 'normal' or Gaussian form (which is frequently at least approximately true), then 32 % of individuals will fall *outside* the range stretching one standard deviation on each side of the average. For example, the standard deviation for body build in Table 1 shows that about one man in three is more than a stone over weight or under weight, compared with the average for his age and height.

Height and weight figures are also available for the year 1949–50, and as can be seen from Table 2 they agree very closely with the values obtained in Table 1.

The measurements appearing in Table 1 have been further investigated for

Table 2. Height and weight of 1645 freshmen (1949-50)

Measurement	Average (with standard error)	Standard deviation
Height (in.)	69.9 ± 0.1	2.5
Weight (lb.)	153.1 ± 0.4	16.4

possible age effects. Except perhaps for weight, such effects, if they exist at all, appear to be very small. Special attention has been given to the average height and weight to be observed in the different age groups. The figures are substantially the same for both 1948-9 and 1949-50, and results for the 2 years have been pooled, giving about 3100 measurements in all. These results for age groups 18 to 22 are shown in Table 3. Schuster (1910) gave some data on 959 Oxford undergraduates, and these are also shown for the same age groups in Table 3 for comparison. Each estimate appears with the appropriate standard error. Schuster's original data gave probable errors, but these have been converted to standard errors for the present purpose, in accordance with modern practice.

Table 3

Age group	Oxford undergraduates, 1908-10			Cambridge freshmen, 1948-50		
	No. of observations	Height (in.)	Weight (lb.)	No. of observations	Height (in.)	Weight (lb.)
18	129	69.0 ± 0.2	147.6 ± 1.3	203	70.0 ± 0.2	148.7 ± 1.1
19	330	69.6 ± 0.1	152.1 ± 0.9	376	70.0 ± 0.1	152.1 ± 0.9
20	209	69.5 ± 0.2	151.6 ± 1.1	835	70.0 ± 0.1	154.8 ± 0.6
21	137	70.0 ± 0.2	158.0 ± 1.5	810	69.9 ± 0.1	152.8 ± 0.6
22	95	69.2 ± 0.3	152.6 ± 1.8	484	69.9 ± 0.1	153.8 ± 0.7

There are some curious irregularities in this table. In 1908-10 the Oxford undergraduates in the age group 21 appeared to be rather taller and heavier than those older or younger. In 1948-50 Cambridge freshmen, on the other hand, while showing no difference of height with age, did have a small peak in weight for age group 20. Comparison between similar age groups suggests an increase of about an inch in stature over the 40 years at the lower end of the scale, falling away to zero for age groups 21 and 22. The only significant differences in weight are those occasioned by the different positions of the two peaks mentioned above.

Overall averages for height and weight are available not only for Schuster's Oxford undergraduates of 1908-10, but also for 1000 Cambridge undergraduates of about 1899, given by Karl Pearson (1900). Table 4 compares these figures with those for Cambridge freshmen of 1948-50, where now the data have been drawn from all available age groups. Pearson's probable errors have also been converted to standard errors, as before. In Schuster's results no errors for the general averages were given, but standard errors have been specially calculated from his data for inclusion in Table 4.

The Cambridge men of 1948-50 and the Oxford men of 1908-10 were measured for stature without boots or shoes; but whereas the latter were weighed fully

Table 4. *Heights and weights of male undergraduates from 1899 to 1950*

Group	Date	No. of observations	Height (in.)		Weight (lb.)	
			Average	Standard deviation	Average	Standard deviation
Cambridge undergraduates	c. 1899	1000	68.86 ± 0.08	2.52 ± 0.06	152.78 ± 0.52	16.55 ± 0.37
Oxford undergraduates	1908–10	959	69.49 ± 0.08	2.60 ± 0.06	151.94 ± 0.53	16.37 ± 0.37
Cambridge freshmen	1948–50	3100	69.91 ± 0.05	2.55 ± 0.03	153.10 ± 0.29	16.29 ± 0.21

clothed the former were weighed in trousers only. No information is available about the conditions of measurement for the earlier Cambridge results, but perhaps we can assume that they too were weighed in their clothes without shoes. It seems likely that there has been an increase of about an inch in the height of undergraduates over the last 50 years, half of this increase occurring in the first 10 years. The differences in weight are not significant as they stand, but allowing for the fact that the Oxford men were weighed in their clothes, and probably the earlier Cambridge men as well, there has probably been an increase of 3 or 4 lb. weight. This is about what we should expect for an increase of an inch in stature.

The standard deviations of height and weight have remained steady, and the values in the different groups do not differ significantly.

A possible objection to the above comparisons of straight averages is that these may be affected by differences in the age structure of the populations compared. A way out of this difficulty is to compare mean values for a standardized age composition. Referring to the figures in Table 3 we can calculate standardized averages of height and weight for both the Oxford and Cambridge men of ages 18–22, based on the Cambridge age structure of 1948–50. These are 69.6 in. and 153.5 lb. for the Oxford men of 1908–10, and 70.0 in. and 153.2 lb. for the Cambridge men of 1948–50. These figures, though differing slightly from those in Table 4, leave the general conclusions given above unchanged—at least so far as the last 40 years are concerned. The age structure of Pearson's data is unfortunately not available, but he says 'The bulk of the students were between nineteen and twenty-five years of age, although some few were older'. Although by no means certain, it would appear likely from this statement that standardizing his averages would not materially alter the figures for 1899 given in Table 4. If this is so, the increases in height and weight over the last half-century, suggested above, still stand.

So far we have been comparing values for undergraduate populations. A further comparison can be made with the figures published by W. J. Martin (1949). Martin's data are based on the medical examinations of about 91,000 men who were called up for military service just prior to September 1939. All these men were between the ages of 20 and 21—on average presumably a little younger than the 1948–50 group of Cambridge freshmen (average age 21.0 years). Martin's

results for height and weight are shown in Table 5; he does not give the standard errors of the standard deviations, but these have been derived from his data.

Table 5. *Height and weight of 91,000 recruits in 1939*

Measurement	No. of observations	Average	Standard deviation
Height (in.)	91,163	67.5 ± 0.009	2.62 ± 0.006
Weight (lb.)	91,084	135.7 ± 0.055	16.54 ± 0.04

It can be seen, by comparing Tables 4 and 5, that the Cambridge freshmen are 2.4 in. taller and 17.4 lb. heavier than the group of recruits. These differences are strongly significant. Although the two groups differ in respect of their average height and weight, the 'normal variation' indicated by the standard deviation is practically the same. (Actually, the difference in standard deviation for weight is not significant, while the difference for height, though significant, is still very small.)

Similar analyses have been made for women. The total number of Cambridge women accepting the University Health Service is not yet very large, and an analysis by age groups is unprofitable. The results given in Table 6 are based on 271 women for the 2 years 1948–50. The majority of women examined were between 18 and 20 years of age, with an average of 19.3 years. Table 6 also gives for comparison the measurements on 160 women undergraduates of about 1899, taken from the paper by Karl Pearson referred to previously (with probable errors replaced by standard errors as before).

Table 6. *Heights and weights of female Cambridge undergraduates c. 1899 and 1948–50*

Date	No. of observations	Height (in.)		Weight (lb.)	
		Average	Standard deviation	Average	Standard deviation
c. 1899	160	63.88 ± 0.19	2.36 ± 0.13	125.61 ± 1.11	14.03 ± 0.78
1948–50	271	64.98 ± 0.15	2.50 ± 0.11	133.21 ± 1.09	17.87 ± 0.77

It looks as though the women have also gained an inch in stature and about 7½ lb. in weight over the last 50 years. Comparison with Table 4 shows that for present-day Cambridge undergraduates the women are on average 4.9 in. shorter and 19.9 lb. lighter than the men. The range of 'normal variation' for height and weight is about the same in the two sexes.

Change in weight over the year

Of the 1711 men who joined the Service in the year 1948–9, 406 returned in the following year to be re-weighed. While no one can pretend that these are likely to be a representative group it is of some interest, for what it is worth, to examine the change of weight over the year (actually, on average, rather less than this).

The average increase is 2.1 ± 0.3 lb. which, although strongly significant, is

probably due to these men having been re-weighed with their shoes on. The standard deviation 5.3 ± 0.2 is fairly large and represents a considerable degree of variation of loss or gain in weight during the course of the year.

3. CLASSIFICATION OF THE DATA ACCORDING TO 'SCHOOL' AND 'COLLEGE ENTRANCE'

It is well known that individuals from different social, occupational and economic groupings and environments often show marked differences in a variety of mental and physical characteristics, and it was thought worth while attempting some such analysis of students taking part in the University Health Service. At present no detailed information is available about social or economic background before coming to Cambridge, and so a broad classification was made based on (a) 'Type of school', and (b) 'College Entrance'.

(a) 'Type of school'

Freshmen were classified according to the school to which they went before coming up to the University. In general this was a school attended for a period of several years. In a few cases, where the last school was attended only for a short period, a previous school was taken. The schools fall into the broad groups: public schools, other schools and school abroad. A very few cases in which no secondary school had been attended, or tuition was mainly private, have been omitted. Public schools have been further subdivided into boarding schools (or predominantly boarding), day schools and a few other public schools for which information was not available. Finally, the public boarding schools were subdivided into five groups according to the range of annual fees (based on the scales for 1949 as standard). These fees are liable to change from year to year and are not always strictly comparable at different schools because of the different items included under basic fees. However, with the grouping into £50 intervals which we have adopted, we may expect such variations to tend to cancel out.

(b) 'College Entrance'

A classification related to academic standards was also desirable. For this purpose freshmen have been classified according to whether they entered the University with a State Scholarship (with or without other emoluments), a College Entrance Scholarship (Major, Minor, Open, etc.), a College Exhibition, or none of these.

Age, height and weight

The average ages, heights and weights, with their standard errors, are given in Table 7 for the 'Type of school' classification and in Table 8 for the 'College Entrance' classification.

The first thing that strikes one about Table 7 is that for the group of public boarding schools there is a slight but steady drop in average age for increasing 'fee group'; at the same time there are slight but steady increases in height and

Table 7. *Analysis by schools (men) 1948-9*

Type of school	Fees in £ p.a. (1949)	No. in group	Average age	Average height (in.)	Average weight (lb.)
Public Schools					
Boarding school	250-308	129	20.6 ± 0.1	70.7 ± 0.2	155.5 ± 1.4
	200-249	343	20.9 ± 0.1	70.4 ± 0.1	154.5 ± 0.9
	150-199	247	21.1 ± 0.1	70.0 ± 0.2	154.4 ± 1.0
	100-149	55	21.3 ± 0.2	69.7 ± 0.4	151.8 ± 2.2
	50- 99	41	21.5 ± 0.3	69.5 ± 0.4	151.7 ± 2.1
Day only	—	139	21.0 ± 0.2	69.6 ± 0.2	153.4 ± 1.4
Other schools	—	482	21.5 ± 0.1	69.4 ± 0.1	150.9 ± 0.7
School abroad	—	49	22.2 ± 0.5	69.5 ± 0.4	153.5 ± 3.0

weight. The regressions of age on fee and height on fee are both significant but that of weight on fee is not. The effects are small, but nevertheless it appears that freshmen in the highest fee group come up to Cambridge nearly a year earlier on average than those in the lowest fee group, and are 1.2 in. taller. Men from other schools correspond with men in the lowest fee group of the public boarding schools with respect to both average age and height. Although the progression of weights does not appear significant, there is a significant difference between the average weight (154.2 ± 0.5 lb.) of all the public-school men, and the average weight (150.9 ± 0.7 lb.) of men from other schools, the former having an advantage of 3.3 lb.

Men whose school was abroad were near the overall mean for height and weight but were on average about a year older.

Table 8. *Analysis by 'College Entrance' (men) 1948-9*

Type of entrance	No. in group	Average age	Average height (in.)	Average weight (lb.)
State Scholarships (with or without other award)	39	19.8 ± 0.3	68.8 ± 0.4	149.7 ± 2.7
College Entrance Scholarship (Major, Minor, Open, etc.)	113	20.1 ± 0.1	69.8 ± 0.2	149.6 ± 1.5
College Exhibition	141	20.7 ± 0.1	69.9 ± 0.2	152.6 ± 1.3
Other	1208	21.4 ± 0.02	69.9 ± 0.1	153.6 ± 0.5

It is probably safe to say that the men with higher entrance qualifications stand to come up to Cambridge earlier, but that possible differences in height and weight are as yet uncertain.

Blood pressure, pulse and body build

Blood pressure, pulse and body build have also been examined using similar classifications to those in Tables 7 and 8, but although certain small irregularities were found it is not possible without further data to say whether these are decisive or not.

Vaccination and inoculation

The proportions of those who have been vaccinated against smallpox, and those who have been inoculated against diphtheria, have been analysed by 'Type of school'. The results for the year 1948-9 are presented in Table 9, where the totals for women are given as well.

Table 9. *Percentages of freshmen vaccinated and inoculated (1948-9)*

Type of school	Fees in £ p.a. (1949)	No. in group	Percentage vaccinated (smallpox)	Percentage inoculated (diphtheria)
Men:				
Public schools				
Boarding school	250-308	130	89.2	73.8
	200-249	346	90.7	72.8
	150-199	249	90.0	72.7
	100-149	55	70.9	61.8
	50- 99	43	79.1	60.5
Day only	—	138	76.8	61.6
Other schools	—	486	59.9	60.5
School abroad	—	51	86.3	43.2
All men	—	1498	77.9	66.0
All women	—	138	81.2	82.6

So far as vaccination is concerned there is no very obvious correlation with 'fee' having regard to the small numbers in some of the classes, although the proportions vaccinated in the lower range £50-£149 are probably lower than in the higher range. There is, however, a distinct drop from the average of 86.7% vaccinated from public schools to 59.9% from other schools, probably due to more stringent regulations in the former. The difference between the averages for men and women is negligible.

With inoculation against diphtheria, the top three fee groups are very similar with an average of about 73%, dropping to about 61% for the two lower fee groups, day only, and other schools. Comparing the averages for men and women, a significantly higher proportion of the latter have been inoculated.

The percentages vaccinated or inoculated did not vary significantly with 'College Entrance'.

Tonsillectomy and appendicectomy

An analysis similar to the preceding one has also been done for tonsillectomy and appendicectomy. These results are available for the 2 years 1948-50 and are given in Table 10.

Table 10. *Percentages of freshmen who have undergone a tonsillectomy or an appendicectomy (1948-50)*

Type of school	Fees in £ p.a. (1949)	No. in group	Tonsillectomy (%)	Appendicectomy (%)
Men:				
Public Schools				
Boarding school	250-308	286	58.0	18.2
	200-249	724	57.9	16.4
	150-199	520	52.5	13.3
	100-149	148	43.2	10.8
	50- 99	73	39.7	5.5
Day only	—	283	43.5	7.1
Other schools	—	940	37.6	8.6
School abroad	—	153	47.1	11.8
All men	—	3127	47.9	12.1
All women	—	279	37.3	6.8

It is very evident from this table that there is a distinct tendency for the higher fee groups to be more likely to have undergone an appendicectomy or tonsillectomy. Moreover, only 6·8% of the women have had an appendicectomy compared with 12·1% for the men.

Again there was no significant variation with 'College Entrance'.

Visual acuity (unaided)

The available data on the unaided visual acuity of freshmen have been analysed into the seven classes adopted by W. J. Martin (1949). State Scholars, College Scholars and Exhibitioners all showed about the same proportions in each class and these have been grouped together in Table 11, where they are compared with non-scholars and also with Martin's figures.

Table 11. *Unaided visual acuity of 1477 freshmen (1948–9)*

Visual acuity	Percentage of total of 286 Scholars and Exhibitioners	Percentage of total of 1191 others	Percentage of total of 1477 freshmen	Percentage of 90,913 recruits (W. J. Martin)
6/6 or better in both eyes	52·8	64·3	62·1	65·9
6/6 or better in one eye, the other being worse	9·8	12·4	11·9	13·3
6/9 or 6/12 in both eyes	4·5	3·1	3·4	7·6
6/9 or 6/12 in one eye, the other being worse	4·5	4·4	4·4	3·8
6/18 to 6/36 in both eyes	10·5	6·8	7·5	4·6
6/18 to 6/36 in one eye, the other being worse	2·1	2·8	2·6	2·2
6/60 or worse in both eyes	15·7	6·2	8·1	2·6

The differences between scholars (i.e. State Scholars, College Scholars and Exhibitioners) and non-scholars is very striking. Only 53% of the former as against 64% of the latter had perfect vision; while 16% of scholars were 6/60 or worse in both eyes—the corresponding figure for non-scholars being 6%. Even the non-scholars compare unfavourably with Martin's figures for recruits, and although the differences in the proportions with perfect vision are not significant there is an appreciably greater number in the two lowest classes, 9% for freshmen without scholarships or exhibitions, and only 5% for the recruits.

Schuster (1910) classified the Oxford undergraduates of 1908–10 according to visual acuity, but he adopted a slightly different method of grouping. Commenting that the correlation in acuity between the two eyes is high he proceeded to analyse his data for the right eye only by different age groups. In Table 12 Schuster's results are given in brackets (his original results have been suitably grouped to make comparisons possible) and are to be compared with the corresponding figures for the Cambridge freshmen for the 2 years 1948–50.

So far as the Cambridge results are concerned the older men tend to have a higher proportion with an acuity of '6/6 and better'; otherwise there are no outstanding trends.

Table 12. *Percentages of Cambridge freshmen (1948–50) with different visual acuities (right eye) by age groups (Schuster's figures in brackets)*

Age group	Visual acuity			Total no. in group
	6/6 and better	6/9 to 6/24	6/36 and worse	
18	64.5 (62.0)	19.0 (23.3)	16.5 (14.7)	200 (129)
19	65.0 (58.9)	15.9 (21.5)	19.1 (19.6)	366 (326)
20	67.0 (65.8)	16.0 (18.7)	17.0 (15.4)	825 (208)
21	66.8 (65.4)	15.8 (25.6)	17.4 (9.0)	799 (133)
22	69.0 (58.9)	15.8 (21.1)	15.2 (20.0)	481 (95)
Weighted average	66.9 ± 0.9 (61.9 ± 1.6)	16.1 ± 0.7 (21.7 ± 1.4)	17.0 ± 0.7 (16.4 ± 1.2)	2671 (891)

Comparing the weighted averages for the two sets of undergraduates, the proportions in '6/36 and worse' are not significantly different; but for '6/6 and better' the Cambridge freshmen show a significantly higher proportion—66.9% against 61.9% in the Oxford men.

4. FIRST YEAR EXAMINATION RESULTS

It is instructive to compare the examination performance of freshmen at the end of the first year with their academic standard on entry, not only because of the intrinsic interest of such a procedure, but partly to check the value of the 'College Entrance' classification used previously and partly to establish a standard of academic achievement after a year of residence. Table 13 shows, for a given type of 'College Entrance', the percentages of men reaching the various levels of examination performance; the totals for women are also given for comparison.

Table 13. *First year examination results against type of 'College Entrance', 1948–9*

Type of 'College Entrance'	1st Class	2nd Class	3rd Class	Special	Pass	Fail	Total no. in group
Men:							
State Scholarship (with or without a College award)	56.1	34.1	9.8	—	—	—	41
College Scholarship	33.3	55.6	9.4	—	0.9	0.9	117
College Exhibition	17.1	65.1	17.1	—	—	0.7	146
Other	6.0	52.7	32.1	5.2	1.0	3.1	1202
Total (men)	10.6	53.6	28.3	4.1	0.9	2.6	1506
Total (women)	14.5	72.5	11.5	—	—	1.5	131

This table speaks for itself. The four classes of 'College Entrance' appear to correspond very closely with the order of success in the examination results. Actually it can be shown that if we distinguish State Scholars with and without

other College awards, and if we subdivide College Scholarship into College Major, College Minor and College Open, etc. *in that order*, then we have a total of eight classes for which the first year examination performance declines steadily from top to bottom.

It is sometimes said that women obtain less firsts and thirds than men—that they tend to crowd the second classes, and are thus more ‘steady’. A detailed analysis of all the examination results for 1948–9, taking particular notice of the small numbers in some of the groups as well as accounting for such classifications as ‘Special’, ‘Pass’, ‘Fail’, suggests that the proportion of firsts obtained by women does not fall below the proportion obtained by men until Tripos Part II examinations. Indeed, for both Tripos Part I and Prelim. to Tripos Part I, the women obtain *more* firsts and fewer thirds or worse than the men. Moreover, it appears that there is a distinct tendency for women to sit for the more advanced examinations at an earlier stage.

A comparison of results for men and women in Table 13 certainly does not suggest that the ladies have acquitted themselves unsatisfactorily. On balance, the relative difficulty of the examinations taken were in these groups probably about equal for both men and women.

The increased numbers of scholars coming up in subsequent years may be expected to lead to a slightly different distribution of results, owing to a change in the average academic standard on entry; but the general correlation between ‘College Entrance’ and examination result is expected to persist.

It will be interesting to follow through these groups of students accepting the University Health Service over 3 or 4 years to compare their academic performances at different stages. It is also hoped to be able to relate them to various standards of health and fitness.

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