

APPENDIX.

PHYSICAL GROWTH AND MENTAL ATTAINMENT: NEW ZEALAND SCHOOL-CHILDREN.

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THE provision of right nurture and sound education for children is dependent upon a realization of the factors influencing their physical and mental development, of which, therefore, it is of first importance that we should possess exact knowledge. With the object of obtaining fuller information on these subjects, and of their interrelation, a joint survey was carried out by the New Zealand Education and Health Departments, officers of the school medical service (Health Department) undertaking the necessary physical measurements.

This survey was conducted in October and November, 1925. Briefly described, it consisted in (1) the application of standard educational achievement tests to pupils of Standards III, IV, V, and VI; (2) recording of physical measurements of the same children within a month of their receiving the attainment test; and (3) an effort to correlate the data so obtained in order to deduce such conclusions as would increase our knowledge of the physical and educational needs of the children.

METHOD.

Owing to the enormous amount of labour involved, a selection of only about one-fifth of the schools of the Dominion had to be made. We aimed at including a representative proportion of children from schools of various grades and geographical distribution, but actually only about 24 per cent. of children to whom physical measurements were applied were from schools Grade 1-3 (*i.e.*, up to 120 attendance). As the actual percentage of children in these schools is 35 per cent., it follows that the number of rural children included in our survey is somewhat low. The effect of this selection will be discussed later in the paper. Owing to the small proportion of New Zealand children who attend other than State primary schools, our findings may otherwise be regarded as fairly representative of the whole Dominion.

As the survey was carried out in Standards III to VI only (ages averaging 10 to 14), it follows that older dull and feeble-minded children in lower standards were not included, and also that intelligent and comparatively young children who pass out of school early were omitted. For the 11- to 13-year-old groups, however, the results are comprehensive and reliable. The number of children concerned in the whole survey was approximately twenty thousand.

MEASUREMENTS.

When these were taken the children were wearing indoor clothing, but no shoes. Weighing-machines used in the various districts were of a uniform type, specially purchased from Messrs. Avery and Co.

The sitting height and circumference of chest were taken by the methods described in Dreyer's "Assessment of Physical Fitness." In the case of chest-measurement the measure taken was that of the normally-breathing, not expanded, chest.

The data collected in the present investigation may be expressed in three ways. Take, for example, heights: (1) The "mode" or commonest measure—*i.e.*, the measure of which there are most cases; (2) the "median" or middle measure; (3) the arithmetical mean, commonly called "the average." Following the data for other countries (quoted), No. 3 has been used—*i.e.*, the arithmetical average.

The above three measures would be identical if the distribution in each case were "normal"—*i.e.*, as many cases above the average as below it—and symmetrically distributed. In general, however, this is not the case, the distribution being a "skew" one. An examination of the results showed, however, that, in the case of heights, the average, median, and mode did not differ by more than 0.15 in. In the case of weights the "average" is in excess of the "median" by about 1½ lb. for boys and 2½ lb. for girls.

From general statistical principles it is known that the modes or most probable values will be correspondingly lower, although they were not determined exactly. This shows that there are many cases of weights considerably higher than the average, the "majority" of children, however, being below the arithmetical averages given in the tables by about 4 lb.

In the case of sitting height for both boys and girls the average is, if anything, greater than the median for ages 10 to 13, and less than the median for children over 13.

In the case of chest-measurements the average exceeds the median by about 0.2 in. in both sexes for ages over 12. The degree of accuracy or probable error of the figures given in the tables has not been calculated. Apart from the possible errors of sampling, in the matter of which care was taken, the probable error depends on the number of cases and the "standard deviation" as deduced from the distribution of the measures.