SECULAR CHANGES IN THE PHYSIQUE OF ABERDEEN MOTHERS, 1950-64

BY

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Many reports have shown that during recent decades schoolchildren in Britain have been taller, heavier, and healthier. There is less evidence on trends in adults, but it is often stated that with increased prosperity and mechanization the disorders of overnutrition may be replacing those of under-nutrition.

Baird (1945) was probably the first to point out that pregnant women in the poorer social classes are, on average, shorter than those in the more affluent groups, and that maternal shortness is associated with relatively high rates of caesarean section, prematurity (low birth weight), and perinatal mortality. These findings, which have been repeatedly confirmed in Aberdeen, have recently been demonstrated on a national scale (Ilsley and Kincaid, 1963). Baird thought that such associations are probably due to malnutrition and impaired growth in childhood, leading to stunted physique and impairment of reproductive efficiency in adult life. That hypothesis still stands, though Thomson (1959) questioned whether it was sufficient in itself. Since growth in children has been improving, it might be expected that the stature of mothers would tend to increase, with benefit to perinatal mortality and other indices of "reproductive efficiency".

Weight-for-height also has an influence on reproductive efficiency, relative obesity in primigravidae being associated in particular with a raised incidence of pre-eclampsia (Thomson and Billewicz, 1963). Despite fears of increasing "overnutrition", there is very little evidence of a secular trend in weight-for-height. The only large anthropometric survey in Britain was made in 1943, and small groups from the original sample were followed until 1950.

According to Kemsley (1953), men and women both lost a little weight during 1945-6, and gained a little between 1947 and 1950. In the United States, insurance statistics indicate considerable increases of body weight in men of all ages during the last quarter-century; but women under 35 have shown only slight increases while those over 35 have become lighter (Metropolitan Life Insurance Company, 1966).

Married primigravidae attending the clinics of the Aberdeen Maternity Hospital, who represent over 90 per cent. of all primigravidae in the city, have been weighed and measured for about 20 years. Heights were measured without shoes, and weights in minimal clothing. The opportunity has been taken of examining the data for secular trends during the 15-year period 1950-64. Accurate lever balances were used throughout the period under review.

RESULTS

HEIGHT

Table I shows mean heights in three age groups. There is no evidence of any secular trend, except in the youngest primigravidae, in whom the mean for 1963-4 is significantly higher than in preceding years

TABLE I
MEAN HEIGHTS (IN.) OF ABERDEEN PRIMIGRAVIDAE,
1950-64, BY AGE
(Numbers in parentheses)

Age (yrs)	1950-3	1954-6	1957-9	1960-2	1963-4
Under 25	62.6 (2,336)	62.6 (1,963)	62.7 (2,078)	62.6 (1,963)	62.9 (1,332)
25-29	63.0 (1,033)	63.1 (874)	63.1 (824)	63.2 (712)	63.1 (407)
30 and Over	63.1 (480)	63.3 (306)	63.0 (322)	63.2 (281)	63.1 (173)

(P at least <0.01). This might be due to the fact that, with a falling average age at marriage, and a rising marriage-rate, more women in the upper social classes are having their first babies at a relatively early age. The apparent increase of stature with age is due to an excess of women from the more affluent social classes in the older age groups.

Table II breaks down the data for primigravidae under 25 years of age by husband's social class. It appears that most of the secular increase in height has occurred in Social Classes IV and V, but caution is necessary, since the mean height in Class IIIA (non-manual) in 1960-2 is unexpectedly low. Any upward trend within Classes IV and V might be obscured by a secular change in the size and composition of the classes. Illsley (1955) noted that these classes are tending to form a smaller and more highly selected proportion of the total population.

TABLE II
MEAN HEIGHTS (IN.) OF ABERDEEN PRIMIGRAVIDAE AGED UNDER 25 YEARS, 1950-64, BY HUSBANDS' SOCIAL CLASS

(Numbers in parentheses)					
Social Class	1950-3	1954-6	1957-9	1960-2	1963-4
I and II	63.7 (159)	63.7 (151)	63.7 (184)	63.8 (219)	63.8 (172)
III	Clerical, etc.	62.9 (247)	62.9 (296)	62.5 (274)	63.0 (159)
	Manual	62.5 (1,189)	62.5 (1,033)	62.6 (1,143)	62.7 (646)
IV and V	62.2 (741)	62.3 (511)	62.2 (455)	62.3 (485)	62.8 (355)

If there is, indeed, an incipient increase in mean height, it could be due to earlier completion of growth. During the earlier years, fewer of the youngest primigravidae might have attained their full adult stature. To test this point, primigravidae aged 17-18 years in 1950-3 were traced through the hospital records to ascertain their heights in subsequent pregnancies. No differences in the means were found, so this explanation is unlikely to be valid.

During the years under review, there was some movement of families, especially in the upper social classes, to new housing areas outside the city boundary. Records for a high proportion of "Aberdeen-conurbation non-city" maternities were available. There is no indication that the patterns shown in Tables I and II would be significantly altered by extending coverage to the whole conurbation.

WEIGHT-FOR-HEIGHT

The statistic used is the percentage ratio of observed weight to standard weight-for-height in British women generally (Kemsley, Billewicz, and Thomson, 1962). Observed weight in the present context is weight at 20 weeks of gestation, obtained directly or by interpolation: by that stage, the great majority of women had been weighed at the hospital clinics. The ratios are greater than 100, not because Aberdeen women are relatively obese, but because their weights had increased during the first 20 weeks of pregnancy. Weight gained between 13 and 20 weeks of pregnancy has been estimated for years 1950-3 and 1963-4; the means are almost identical, so that weight gained during early pregnancy is most unlikely to have had any appreciable influence on the secular trends discussed below.

Table III shows the trends in three age groups of primigravidae, in terms of medians and quartiles (which are more appropriate than means, since the distributions are skewed). There are clear increases in weight-for-height in all age groups, more marked in the older than the younger. The increases from 1950-3 to 1963-4 are approximately equivalent to average increases of 2, 4, and 8 lb. from the youngest to the oldest groups.

A more elaborate analysis by husband's social class as well as by age has been made. In Social Classes I and II there seems to have been little change in women aged under 30 years; in the remaining classes there was a steady increase at all ages. (But trends in women aged 30 and over are erratic, as the numbers are small.)

TABLE III
WEIGHT-FOR-HEIGHT RATIOS (MEDIAN AND QUARTILE VALUES) OF ABERDEEN PRIMIGRAVIDAE AT 20 WEEKS OF GESTATION, BY AGE, 1950-64

Data are not available for 1960-2

Age (yrs)	Under 25				25-29				30 and Over			
	1950-3	1954-6	1957-9	1963-4	1950-3	1954-6	1957-9	1963-4	1950-3	1954-6	1957-9	1963-4
Q ₁	100.7	101.4	101.5	101.8	101.2	102.6	103.4	103.6	102.5	103.1	105.4	109.0
Median	107.3	107.7	109.0	109.0	108.3	110.1	110.7	111.7	109.5	110.8	113.9	116.8
Q ₃	114.9	115.9	116.6	117.6	116.9	118.8	119.2	120.8	119.6	121.4	122.8	124.5
N	1,749	1,557	1,653	1,057	756	692	669	345	332	229	252	136

DISCUSSION

HEIGHT

Since girls of school age have been becoming taller for several decades, the absence of any increase in the mean heights of Aberdeen primigravidae during most of the period 1950–64 is somewhat unexpected. The evidence available at present may indicate the start of an increase during 1963–4, but it is so small that it will have to be confirmed by examining the data for subsequent years.

A possible explanation for a considerable delay in a response among adults may be that adult stature is largely determined by the pattern of growth during the pre-school years. This would be in line with the findings of McCance (1966) that in some species ("cattle and probably sheep, poultry, and man") serious interference with growth in early life prevents the attainment of full adult dimensions, whereas interference at a later age has little or no permanent effect. The main nutritional landmark during recent decades was probably the wartime "feeding experiment" when, for the first time, measures were taken as a matter of national policy to safeguard the nutrition of pregnant and lactating women, and of infants and children, regardless of economic status. At the same time, unemployment and gross poverty practically disappeared in Britain. Most of the younger mothers delivered in Aberdeen during 1963–4 would have been born during the war years.

It is generally agreed that adult stature responds less dramatically to environmental improvement than does the stature of children. Most of the evidence of secular increase in adult stature has been derived from men, and there may be a sex difference. McCance (1966) notes that "Males are more vulnerable [to undernutrition in early life] than females in some and possibly all species and rehabilitate less completely." Acheson and Fowler (1964) considered that "Boys are more readily influenced by environmental factors than are girls, both as to their rate of skeletal maturation and to their linear growth." Bakwin and McLaughlin (1964) found that male Harvard entrants from public schools (American-style) had increased in average height, but not those from private schools; but female entrants to Wellesley showed no change in either group. It may be noted that, by contrast with these highly selected American groups, the Aberdeen mothers cannot in general be considered as having grown up in an optimum or near-optimum environment.

If future data confirm that mothers in Britain are becoming taller this would be expected to be

accompanied by lower perinatal mortality rates and other indices of reproductive efficiency. With reference to the considerable fall in perinatal mortality rates in England and Wales since 1958, Baird and Thomson (1967) have suggested that this may be "due in large measure to the cumulative effect of 25 years of economic prosperity (leading to a better grown and healthier generation of mothers) who are having their families at an earlier age and planning them more sensibly."

WEIGHT-FOR-HEIGHT

Aberdeen mothers, with the possible exception of younger women in Social Classes I and II, have been becoming relatively heavier since 1950. The trend could be due to a general increase in food consumption: the annual reports of the National Food Survey Committee suggest that average family diets have increased in calorie value, especially since 1954, "the year of transition from a controlled to a free economy" (Ministry of Agriculture, Fisheries, and Food, 1956). Possibly, too, increasing mechanization has led to decreased expenditure of energy.

The effects of change in weight-for-height on reproductive efficiency will not be easy to assess, since improvements in the maternity services are probably leading to better control of pre-eclampsia, diabetes, and other abnormalities which are associated with relative obesity.

SUMMARY

Height and weight records of Aberdeen city primigravidae for the years 1950–64 were examined for the presence of secular trends.

The only suggestion of an increase in height is seen in primigravidae aged under 25 years, in whom the mean for 1963–4 was slightly but significantly greater than in the preceding years. Most of the change occurred in Social Classes IV and V. The observed increase does not seem to have been due to earlier completion of growth in 1963–4. Since the distribution of social classes altered considerably during the years under review, the result must be treated with caution.

To assess secular changes in body weight, the percentage ratio of observed weight at 20 weeks of gestation to standard weight-for-height was used. Clear increases in the average ratios were found in all age groups, more marked in the older than in the younger. The increases from 1950–3 to 1963–4 are approximately equivalent to average increases of 2, 4,

and 8 lb. at ages under 25, 25–29, and 30 years and over, respectively.

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