First report by the Sub-Committee on Nutritional Surveillance.

Department of Health and Social Security

Reports on Health and Social Subjects
No. 6

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PREFACE

The Welfare Milk Scheme, the provision of school milk and of school meals have all played an important part in our food policy over the years. These schemes came into being when the nutrition of some sections of the population in this country left much to be desired, and at that time the schemes satisfied an obvious need. In October 1970, the Government announced their intention of making some alterations in food policy. At the same time an undertaking was given by Ministers that the nutritional status of the population would be carefully monitored with a view to detecting any unforeseen adverse effects which might arise from the change at a stage when they were mild and reversible.

The Committee on Medical Aspects of Food Policy delegated the assignment of advising on what monitoring procedures were desirable to a Sub-Committee on Nutritional Surveillance, under the chairmanship of Professor Sir Frank Young, FRS. The first report of the Sub-Committee, which has been accepted by the parent Committee, is here presented. We owe a debt of gratitude to the members for the time and effort they have expended in producing such a comprehensive report.

The Sub-Committee had a difficult task. The consequences, if any, of the modifications in food policy are unlikely to be specific and identifiable by clinical signs or laboratory tests in individuals, and even on a population scale and in the long-term may be only marginal. The Sub-Committee therefore had to consider all possible methods of nutritional surveillance, and to examine what evidence was available and how it could be used for their purpose. There is, for instance, much useful material from nutrition surveys and dietary records, but dietary information by itself provides only indirect and tentative evidence on nutritional state. The perinatal mortality rate and the frequency of low birth-weight are already analysed statistically by the Department. Since these indices may be partially determined by the nutritional status of women during pregnancy, the Sub-Committee recommended that the analyses should be continued and extended. For children, the Sub-Committee concluded that the regular assessment of the rate of growth would be the most direct and sensitive indicator of nutritional status. With this in mind they recommended both cross-sectional and special longitudinal growth studies of pre-school and schoolchildren. The studies are designed to reveal any significant adverse effects should these occur. All the various proposals were considered by the Committee on Medical Aspects of Food Policy and were approved for implementation as quickly as possible. Field work has already begun. The pilot studies were made in 1971/2 and the main studies are now in progress.

The report is an interim report, describing short-term measures only. The terms of reference given to the Sub-Committee included an instruction that

they should also advise upon measures to be used in the long-term. These are likely to develop from the short-term procedures proposed in this report and the studies thus begun, if continued, will provide a more comprehensive basis for future policy on food and welfare.

G E GODBER

Chairman, Committee on Medical Aspects of Food Policy (Nutrition)

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1. INTRODUCTION

1.1 Terms of reference

1.1.1. To advise the Committee on Medical Aspects of Food Policy of the steps that should be taken to detect any effects upon the nutritional state of the community of the changes made during 1971* in the arrangements for the provision of welfare milk, school milk and school meals, at a time when any harmful effects of the changes are likely to be mild and reversible.

1.1.2. To consider the long-term arrangements that would be required for the prediction and assessment of any nutritional effects of changes in relevant Government policy, whether social, economic or other.

1.2 Scope of the Report

This report is chiefly concerned with the short-term monitoring of the effects, if any, of changes in the provision of welfare and school milk and in the prices of school meals. The history of the arrangements made in 1906 and subsequently is surveyed in Appendix A. The changes which came into effect in 1971 were made either before, or soon after, our deliberations began, and although some baseline information existed, there was not enough for comparison with the results of all the monitoring procedures we propose.

1.3 Long-term plans

We have indicated at the end of this report the long-term arrangements which we think should now be put in hand to enable a prediction to be made of any nutritional effects of future changes in relevant policy.

2. THE CHANGES IN THE ARRANGEMENTS FOR THE PROVISION OF SCHOOL MEALS, SCHOOL MILK AND WELFARE MILK

2.1 School meals

2.1.1. The charge for the school meal, and the arrangements for remitting the charge on grounds of hardship, are laid down by regulation. This charge, which is a standard one for all schools other than special schools, stood at 1s. 6d. (7½p) in 1968 and at 1s. 9d. (9p) in April 1970. Under proposals made in the White Paper *New Policies for Public Spending* of October 1970, the charge was raised to 12p from April 1971 (Treasury, 1970). The White Paper also announced the intention to raise the charge further to 14p in April 1973, and ultimately to make it cover the running cost of the meal.

2.1.2. Parents who receive supplementary benefit have for some years been eligible for the provision of free school meals at school for their children without further enquiry, and a similar concession was applied to recipients of family income supplement when this benefit was introduced in the autumn of 1971. The Department of Education and Science estimate that under these arrangements a little over 80% of the one million children thought to be eligible for free school meals take advantage of their entitlement (Appendix A, paragraph 1.3).

* The changes were announced on 30th October, 1970, those for school meals and welfare milk to operate from April 1971, and those for school milk from September 1971.

This is a much higher take-up rate than for any other welfare benefit for which application has to be made.

2.2 School milk

2.2.1. The White Paper of October 1970 also announced the Government's intention to discontinue the supply of free milk to pupils after the end of the summer term following their seventh birthdays, except for children under 12 with a certified medical requirement. Younger pupils in nursery and primary schools and pupils in special schools were not to be affected.

2.2.2. These proposals were given effect in the Education (Milk) Act (1971)' which also conferred on local education authorities a new power to provide milk on payment to any pupil at any school maintained by them, secondary as well as primary.

2.3 Welfare milk

2.3.1. HM Government's policy has hitherto been to supply milk, either liquid or dried, to all pregnant women and to children up to the age of 5 at not more than about one half the market price of liquid milk, with special arrangements for low income families to receive these supplements free (Appendix A, Section 3). The present position is that, since April 1971, the supply of half-price milk has been discontinued, although entitlement to free milk is now on a more generous scale (Welfare Food Order, 1971) and includes 145,000 more members of needy families.

2.4 The reasons for concern

2.4.1. Milk forms an important part of the diet of pre-school children, and is especially important in the diet of younger children (paragraph 4.3.2). For expectant and nursing mothers too milk is known to be an important source of energy, protein, calcium and riboflavin (paragraph 4.3.1).

2.4.2. School meals and school and welfare milk are intended to make a substantial contribution to the nutrient intake of the recipients. Thus, a school meal should contain about one-third of the daily intake of nutrients and energy recommended for a child (Appendix A, paragraph 1.2). One-third of a pint of milk, which provides 130 kcal (0·5 MJ), also provides 6 g protein, 230 mg calcium and 0·25 mg riboflavin. If this milk were replaced by other foods in amounts giving the same energy value, the intake of the other three nutrients would almost certainly fall: for example, each 130 kcal of the national average household diet is accompanied by about 4 g protein, 50 mg calcium and 0·1 mg riboflavin (Ministry of Agriculture, Fisheries and Food, 1971).

2.4.3. The fundamental difference between the old and new procedures laid down by Government is that henceforth, with the exception of those children under 12 in need on medical grounds or children in special schools, only 5–7 year olds will continue to receive free milk at school. The children of parents for whom the increased cost of the school meal is beyond their means will continue to receive the meal free. Parents whose children benefit no longer from free milk may or may not accept the responsibility hitherto discharged by the State. But to assume that they will do so would be unsafe. There may also

be a fall in consumption of milk by pregnant women, and by mothers of young children not covered by the entitlement to free milk, unless these women themselves make good the deficit. For these reasons the monitoring of any effect on well-being attributable to the legislative changes is of great importance.

2.4.4. The problem before us was not only to detect any effects of the fall in the intake of nutrients and energy, which could directly result from a loss of school and welfare milk and a possible loss of a school meal, but also to assess the nutritional effect of any food or drink which is taken instead. If the diet were originally only marginally satisfactory and the nutrients and energy not replaced, a demonstrable nutritional change could result. But the State continues to make provision for those whose diet might, for economic reasons, be marginally deficient, and in the community there is a problem of over- rather than under-nutrition. Indeed a diminution in energy intake might well be beneficial for some children.

2.4.5. Not all the possible substitutes for the school meal and milk are necessarily bad. For example, a packed lunch taken to school could have a satisfactory nutrient content, and if fresh fruit replaced school milk it could provide extra vitamin C. But if the school meal were to be replaced by foods with a high energy content, and school milk by sweets and biscuits or sweetened drinks which were taken in excess of energy requirement, there could be an increase in the prevalence of obesity. In addition, since sugar is cariogenic there could also be a rise in the prevalence of dental caries.

2.4.6. When nutritional changes are small they may not only be difficult to detect but also may not be apparent in the short-term. They could however be cumulative, and so might be revealed by long-term monitoring.

3. METHODS OF NUTRITIONAL SURVEILLANCE

The procedures that might be useful for monitoring the nutritional status are summarized in paragraphs 3.1 to 3.6.

3.1 Measurements of growth

3.1.1. In children the rate of growth depends largely on the quantity and quality of the food consumed. In animals the impairment of growth by nutritional deprivation in very early life continues to affect growth and development during subsequent years, and determines the final size attainable (Widdowson and McCance, 1960). Full recovery, without permanent effects, can take place only when the deprivation occurs at later ages. The situation with man is almost certainly similar, but there is relatively little information about the times and extents of diminution of food intakes which on man may have a permanent effect. What seems to be certain is that the effect of a nutritionally induced period of slow growth can to some extent be compensated by prolongation of the period of growth. But any change in mean adult stature which follows the current legislative changes is likely to be too slight and too long delayed to be of value for our monitoring purposes.

3.1.2. Body weight responds sensitively to transient changes in the amount of food eaten. Such a consideration appears not to apply to measures of linear

growth, such as body height. An acceleration in the rate of gain in weight can be a sign of increasing obesity and not of improved health. Furthermore the achievement of a maximal rate of growth is not necessarily desirable.

3.1.3. We have no doubt that the regular assessment, on a sufficient scale, of the rate of growth of children, particularly in terms of height, would afford the most sensitive indicator now available of any change in nutritional status that might occur. But an alteration in diet is not the only possible cause of a change in growth rate, and an examination of other relevant circumstances, for example, an outbreak of infective or other epidemic disease, might help to account for any observed diminution in the growth rate of individual children.

3.1.4. If alterations in diet which slow down growth and physical development also retard intellectual development, the importance of nutritionally impaired growth in childhood would be great indeed; but the relevant evidence is scanty and controversial, and relates to a degree of primary malnutrition which we rarely, if ever, see in this country. The available methods for assessment of intellectual development are better applied to individuals than to groups, so that any general effect of this sort would be difficult to monitor. Furthermore it would probably be very slow in appearing.

3.2 Feeding trials

Feeding trials, that is the observation of any effect of the provision of additional food to groups of individuals, do not obviously fall into the category of monitoring procedures. They may be used either in their own right or to provide ancillary support for any presumptive evidence of nutritional inadequacy that may have emerged from one or more of the measures discussed here. In practice, feeding trials are difficult to conduct, especially if the effects they seek to reveal are likely to be relatively small.

3.3 Dietary surveys

3.3.1. The National Food Survey provides continuous information about the food consumption and expenditure of households by recording the kind and amount of the food which enters the household during the week of the survey. The information it furnishes could be used to reveal any gross effect of changes in the provision of welfare milk, school milk and school meals.

3.3.2. Dietary surveys of food eaten by those individuals (as distinct from that entering households) directly affected by such changes can be set up to illuminate specific problems, and, if necessary, be repeated at intervals to detect any alterations in the amounts of specific nutrients consumed.

3.4 Mortality statistics

Any increase in the prevalence of malnutrition is liable to be reflected in a rise in the number of deaths from some causes, or at least in a slowing down of the reduction in the death rate in the younger age groups which has been so prominent during recent decades. Perinatal mortality rates, though their interpretation requires caution, may afford useful indirect information on the nutritional health of pregnant women. Deaths among older children are now so rare that child mortality rates are unlikely to be helpful. Regularly collected

information other than that about mortality, for example about birth weights, could be of value.

3.5 Search for clinical signs of malnutrition

In Britain overt dietary deficiency diseases in children, such as rickets and scurvy, are no longer widespread. An Expert Panel on Child Nutrition said in 1970 that 'the distribution of overt rickets in Britain appears to be in pockets, some geographical, some perhaps racial, existing in the midst of areas of apparent freedom from the disease' (Department of Health and Social Security, 1970). For our present purpose, the prevalence of deficiency diseases, although always a matter for concern, is too crude an index of nutritional status to be of much use, while the assessment of milder and less specific clinical manifestations of malnutrition is at present too subjective.

3.6 Biochemical indices

In the absence of reliable clinical methods of diagnosing minor degrees of malnutrition, many attempts have been made to devise and use biochemical methods. Experience to date has not been encouraging and no sensitive biochemical indices likely to be useful and reliable in the present context are at present known. Nevertheless, tests may ultimately be devised to give warning in the future of the effects of any nutritional change, at an earlier stage than is now possible. This possibility should be kept constantly under review.

4. EXISTING INFORMATION

4.1 Evidence from growth records

4.1.1. In England some school health authorities measure heights and weights when children enter and leave school. In Scotland, where all areas make returns of heights and weights of children at ages 5 and 13, a more comprehensive system exists. The information is analysed centrally in terms both of family size and of the Registrar General's social classification.

4.1.2. Those annual reports of Principal School Medical Officers which contain records of heights and weights show that for many years there has been a more or less progressive increase in the rate of growth of schoolchildren in the United Kingdom. From about the beginning of the century to the present time children in average economic circumstances have gained in height at ages 5 to 7 by 1 to 2 cm each decade, and at ages 10 to 14 by 2 to 3 cm each decade. In Glasgow 5 year olds are about 5 cm taller than 5 year olds were in 1906; 9 year olds are some 8 cm taller than they were in 1906 and 11 year olds are nearly 10 cm taller (Tanner, 1969). In Britain such an acceleration in growth rate is now diminishing, and in some areas at some ages may even have ceased.

4.1.3. Children from large families are still age for age shorter than children from small families, and other social and environmental factors are associated with differences in stature independently of this relationship with family size. Davie, Butler and Goldstein (1972) have observed that the 7-year-old children of parents in the Registrar General's social classes I and II are 3·3 cm taller, on the average, than those of parents in social class V. At least one group of

children, the schoolboys of Eton, have been reported by Leitch and Boyne (1960) to have shown no difference in stature between 1957 and 1937; in 1957 their average height was still appreciably above that of other British boys of the same age. Despite the reservations with which such findings must be interpreted we think that the maximal rate of growth of most children has probably not yet been realized.

4.1.4. There are no comprehensive records of the growth of representative samples of pre-school children on a scale that could provide baseline measurements adequate for our needs. Measurements made on children in the Local Authority Infant Welfare clinics apply at present only to those who are brought voluntarily to the clinics. The only evidence we have is that collected by some school health authorities on children when they enter school. Any observed difference in average height (in those areas where such information is reported, after as compared with before the changes in the arrangements for the provision of welfare milk, will be of special interest.

4.2 Evidence from feeding trials

4.2.1. There have been four large-scale controlled feeding tests of children in Britain; but the most recent of them was nearly 30 years ago and since then there has been a significant rise in the rate of children's growth. The findings of these earlier tests are not necessarily relevant today. The experience of the four feeding tests showed that even when the number of subjects was large, only small differences in growth rate could be observed between supplemented and control groups.

4.2.2. In a study conducted in 1934–1935 by the Milk Nutrition Committee (1939) about 6,000 children received either a biscuit or one-third or two-thirds of a pint of pasteurized or unpasteurized milk in addition to their normal diet. All the milk-fed groups showed a greater increase in growth, over a period of a year, than did the biscuit-fed group; but only the mean increase in height of the children receiving two-thirds of a pint of milk was statistically greater than that of biscuit-fed children. In absolute terms the difference between the mean increase in height of these two groups amounted to 0·2–0·3 cm only.

4.2.3. In the second study, made in 1937–1939 by the Rowett Research Institute (1955), 552 children aged 2–13 years, mostly in poor circumstances, were fed for one year an amount and kind of food calculated to make good the deficiencies previously indicated by a dietary survey. The children who received the supplements at all ages and in all expenditure groups gained $\frac{1}{4}$ to 1 cm in height more than controls during the year of investigation.

4.2.4. The third study was in 1942 and was limited to supplements of vitamins A, the B complex, C and D, which were fed for a year. No acceleration in growth (or other improvement in health) was observed (Bransby *et al*, 1944).

4.2.5. In the fourth study, there were two groups of children totalling about 1,100. Half the children received a pellet containing vitamins A, B_1, C and D and the other half received a dummy pellet. Yudkin (1944) reported that among those who received the vitamin supplement there was a reduction in

absenteeism and, according to the teachers' assessment, the behaviour in junior (but not in senior) schools was improved. No significant increase was observed in the rate of gain in height or weight, and no other relevant changes were observed.

4.2.6. There have been no subsequent controlled feeding tests. Between 1953 and 1959 (the period which followed the removal of rationing and price control) the mean intake of protein in the United Kingdom fell, and there was a rise in the consumption of fat and sugar (Ministry of Agriculture, Fisheries and Food, 1956, 1961). The records of the School Health Service over this period do not show that the growth rate of children decelerated (Scott, 1955, 1961).

4.3 Evidence from dietary surveys

4.3.1. In 1968 a survey of the diets of 435 pregnant women from a sample drawn representatively* from 39 areas in England, Wales and Scotland was made by the Department of Health and Social Security. The uptake of welfare milk coupons was 97% but the average daily intake of milk was 15·7 oz, although the full entitlement to milk was 20 oz a day (unpublished report). Table 1 shows the average daily intakes by these pregnant women of energy and of some nutrients compared with intakes recommended in the Report of the Expert Panel on Recommended Allowances (Department of Health and Social Security, 1969).

Table 1

Contribution from milk to the mean daily intake of energy and some nutrients by 435 *pregnant women*

Nutrient	Contribution from milk	% of total intake derived from milk	Average intake of survey sample	Recommended intake in pregnancy
Energy (kcal/MJ)	299/1·3	14	2152/9·0	2400/10·0
Protein (g) ...	14·1	20	70·5	60
Calcium (mg) ...	530	55	960	1200
Riboflavin (mg)	0·6	37	1·6	1·6

4.3.2. Table 2 shows the proportion of their total intake of energy and of some nutrients that 1,321 pre-school children obtained from milk (Department of Health and Social Security survey in 1967-68, report in preparation). There was a wide range of intakes at all ages.

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* The composition of the actual sample was much affected by non-response. This report has been made available to *bona fide* research workers by the Department of Health and Social Security.

Table 2

Contribution from milk to the mean daily intake of energy and some nutrients by 1,321 *pre-school children*

Age group*	I	II	III	IV
Number of children	201	394	407	319
Mean daily intake of milk (oz) ...	16·2	13·7	12·1	12·0
Range of milk intake (oz) ...	3·3–47·9	1·5–41·1	0·6–35·1	0·7–39·3
Contribution from milk of:				
Energy (kcal/MJ)	308/1·3	260/1·1	230/1·0	228/1·0
Total protein (g)	14·6	12·3	10·9	10·8
Calcium (mg)	550	470	410	410
Riboflavin (mg)	0·6	0·5	0·5	0·5
Contribution from milk (percentage of total intake):				
Energy ...	29	21	16	16
Total protein ...	43	32	27	26
Calcium ...	71	67	63	62
Riboflavin ...	49	49	43	42

* Age group I: 6 months but less than 1½ years old
II: 1½ but less than 2½ years old
III: 2½ but less than 3½ years old
IV: 3½ but less than 4½ years old

4.3.3. The Report of the pilot survey of the nutrition of pre-school children in 1963 (Ministry of Health, 1968) said that 'though the numbers involved are far too small to be convincing, there appears to be a relationship at least between height and milk consumption'. Nevertheless in the survey made by the Department of Health and Social Security in 1967–68 (to be published), although there was a tendency for height to increase with milk intake, in most of the age/sex groups it was only slight and not consistent. A simple regression analysis revealed a significant relationship ($P = 0{\cdot}05$) between height and milk intake only for boys of 1½–2½ years. More children were surveyed than in the pilot survey, but the analysis under discussion still involved relatively small numbers in the individual groups. In addition, growth is not solely dependent on nutrition but may be affected by other environmental factors, and any relationship between height and milk intake may therefore have been coincidental.

4.3.4. The field work for dietary surveys on nearly 800 schoolchildren in Kent aged 8–11 and 13–15 years, and 800–900 schoolchildren in Birmingham aged 14–15 years has already been completed. Information on food intakes is being correlated with the results of a medical examination and with the answers to a socio-economic questionnaire; particular attention is being paid to the importance of the school meal. The full analysis is not yet available for either

survey (Holland *et al*, to be published; Department of Health and Social Security, to be published).

4.4 Evidence from perinatal mortality rate and low birth weight rate

4.4.1. Although many factors influence the perinatal mortality rate, the decline in perinatal mortality observed during the war could have resulted from an improvement in nutrition which related to the national food policy adopted (Magee, 1946; Duncan, Baird and Thomson, 1952). However, a fall in the proportion of protein in the diet in all sections of the population of the United Kingdom between 1953 and 1959 (Ministry of Agriculture, Fisheries and Food, 1956, 1961), when the price controls of food were lifted and food rationing came to an end, was not associated with a rise in perinatal mortality rate. The general improvement of the obstetric services in Britain recommended at that time (Ministry of Health, 1959 [Appendix II 1955]) may have obscured any slight effect of the dietary change. The continued fall in perinatal mortality rate which has since been observed may result from a better condition of present-day mothers who benefited from welfare foods in their youth (Thomson, Billewicz and Holliday, 1967).

4.4.2. One possible index of inadequate maternal nutrition is low birth weight rate, which gains in value if babies of low birth weight born at full term can be distinguished from premature babies. This is not yet possible on a national scale from the records of birth notifications to the Medical Officers of Health, but some information in this form is available in respect of babies born in hospital.

4.4.3. Information derived from birth notification records is analysed centrally but this only refers to birth weights of 2·5 kg or less. The period of gestation is not recorded. An increasing number of local authorities, however, now maintain computer files of birth notification records, in which information about all birth weights can be linked with other relevant information such as gestational age and parity. The information in such computer files has the advantage not only of being quickly available for monitoring purposes but also of being comprehensive, in that it relates to all births within the local authority area whether these are at home or in hospital.

4.4.4. For all babies born in hospital in Scotland the period of gestation as well as the birth weight have been recorded on the Maternity Discharge Record since 1970. This enables an analysis of any relationship between birth weight and many medical and social aspects of the mother to be made. In England and Wales, where 85% of births now take place in hospital, the Hospital In-Patient Enquiry (HIPE) maternity records since 1967 have included information on both birth weight and period of gestation of a 10% sample of the infants born in hospital (Department of Health and Social Security and Office of Population Censuses and Surveys, 1970, 1972). An analysis of information collected by HIPE about birth weights in relation to weeks of gestational age distinguishes between those infants who have grown normally *in utero* but who have been born early, and those who are small for their apparent gestational age (Appendix E). However, when modern hormonal contraceptives are taken, the use of the last menstrual period for the estimation of gestational age is even less reliable than usual.

5. PROPOSALS FOR THE DETECTION OF ANY SIGNS OF NUTRITIONAL INADEQUACY

5.1 Measurement of growth rate

5.1.1. *Schoolchildren.* In our surveillance of children we propose to seek evidence of any change in growth rate which is attributable to inadequate nutrition. Because the interpretation of mean changes in weight may be complicated by the development of obesity in some subjects under survey, we propose to study linear growth in the first place, and to use changes in weight only as ancillary information. Measurements of skinfold thickness might be valuable in providing an objective albeit arbitrary criterion of obesity.

5.1.2. The study of growth rates in future years which we advocate is not meant to discourage school health authorities from measuring the heights and weights of children. But at present the technical quality of such measurements, where they are done, is uneven. We therefore cannot rely on the use of these records as a sole basis for monitoring.

5.1.3. We propose to set up a new system of monitoring the growth of children between the ages of 5 and 11 years in selected local authority areas (Appendix B). In this study, records of height and weight will be obtained at each year of age, so that growth increments at various ages can be calculated. The study can be regarded as a prototype for long-term monitoring.

5.1.4. *Pre-school children.* At present, when children are usually measured for the first time on entering school at the age of 5, the full effect, if any, on growth rate of the changes in the provision of welfare milk is likely to be revealed only when those born after January 1972 first attend school in 5 years' time. We seek to encourage school health authorities to record heights and weights of children when they enter school and, if possible, we shall discuss with them ways of refining the measurements.

5.1.5. The growth rate of children is maximal in the earliest years of life, and the quality of the diet is then of great significance (paragraph 3.1.1). To wait until children are 5 years old before any measurements are made on them therefore seems to us to be unwise. We consider that a special study of the growth rate of a group of children from birth up to the age of $4\frac{1}{2}$ years should begin as soon as possible, and be parallel to that proposed for schoolchildren (paragraph 5.1.3). In addition we recommend that cross-sectional studies at various ages in the pre-school years be made in order to reveal any changes before the full 5-year study is complete (Appendix C).

5.2 Pregnant women and pre-school children

5.2.1. Some of the possible consequences of any reduction (if this occurs) in the milk consumption of pregnant women are potentially more serious than those that might occur in schoolchildren. Furthermore, if any diminution in growth rate occurred in pre-school children the effects might be more difficult to reverse than those of any diminution observed in schoolchildren. We therefore propose that a pilot test be made of any effect of supplementing the food of pregnant women, together with a study of their health during pregnancy and of the

subsequent development of the babies born to them (Appendix D). This study would continue over the pre-school period of the off-spring, as well as during the period of the mothers' pregnancy. The prevalence in childhood of obesity and of dental problems, in relation to any difference in both 'fed' and control groups, would be examined. The study would be complementary to that proposed in paragraph 5.1.5.

5.3 Milk feeding test in schoolchildren

If any effect of the legislative changes were to be observed on the growth of schoolchildren (paragraph 5.1.3), the probable dietary cause might be ascertained by means of feeding tests. We recognize the likelihood of equivocal results, and the difficulties of setting up such tests, and therefore do not propose to pursue this possibility at present (Appendix F).

5.4 Dietary studies

5.4.1. *Department of Health and Social Security surveys.* Our interest is especially directed to the diet of children aged 7–11 years because, in addition to a rise in the cost of their school meals, they will no longer automatically receive free school milk. The Department of Health and Social Security has already completed the field work in dietary and clinical surveys of 100 schoolchildren in the less well-off districts of each of three areas, concentrating upon children there who are not at present entitled to free school meals. The results of these investigations will complement the evidence derived from the study of growth (paragraph 5.1.3). These studies should be repeated in the same areas, after an appropriate interval, by the Department of Health and Social Security, and any association between changes in the nutrient content of the diet and the development of clinical signs (e.g. obesity, angular stomatitis) may then come to light.

5.4.2. At present, we see no need to repeat the Department's dietary surveys on pregnant women or on pre-school children.

5.4.3. *National Food Survey.* The Ministry of Agriculture, Fisheries and Food have offered to analyse the information obtained by the National Food Survey in order to ascertain whether or not parents replace at home the milk no longer consumed at school by children. The Ministry have also agreed to our request that the National Food Survey questionnaires be so revised that the consumption of liquid milk by the individuals in the household concerned can be ascertained. This information will then be analysed in order to find out whether or not households continue to buy, at full price, milk previously obtained cheaply under the welfare milk scheme. The information will also reveal how much of the milk is consumed by the housewife if pregnant, and by any children in the household under 5 years of age.

5.5 Perinatal mortality rate, low birth weight rate and other official statistics

5.5.1. We think that the records of low birth weight rate and of the perinatal mortality rate and its components (stillbirths and first-week death rate), should be scrutinized (paragraph 4.4.1). An analysis could with advantage be made of the distribution of all birth weights, but this is not at present possible from information which is collected centrally since only those weights below 2·5 kg are recorded.

5.5.2. If, after the withdrawal of cheap welfare milk, there were to be a trend towards a lower average birth weight, the change would be revealed more sensitively if sections of the community at greater or less risk could be identified for study. For this purpose, more detailed information on the form of birth notification would be required.

5.5.3. A comparison of the information about the births which occurred before April 1971 with information on births after January 1972 (that is of babies who were conceived before and after the changes in the provision of welfare milk in April 1971,) would be specially useful in this respect. We recommend that the computer files of birth records now maintained by some local authorities should be examined in this connection. Information could thus be obtained more rapidly.

5.5.4. Fullest use should also be made of existing hospital statistics in England and Wales and Scotland. The socio-economic information at present given only in the Maternity Discharge Record in Scotland should also be collected in England and Wales.

5.5.5. We think that further analysis of the information collected by HIPE about birth weight and period of gestation would be valuable and should be pursued. Should no trend in birth weight distribution emerge when further information becomes available, a baseline extending over 4½ years will have been obtained with the aid of which possible changes in maternal nutrition can be estimated in the future.

5.6 **Dental studies**

We realize that the possible replacement of milk in the diet of both pre-school and schoolchildren by cariogenic foods, for example those containing a high proportion of sugar, is a cause for concern (paragraph 2.4.5) and that studies of the prevalence of dental caries are of particular difficulty in the age group 7–11 (Appendix F). We therefore suggest that special dental studies be made in the children born to the pregnant women who participate in the study (paragraph 5.2.1). We are aware that long-term monitoring of dental caries by the Department of Education and Science is undertaken in the quinquennial dental surveys of children aged 5 years and 12 years. Baseline information from these surveys is available from 1948.

6. RECOMMENDATIONS

6.1 A new system for the assessment of the growth of schoolchildren aged 5–11 years should be set up (paragraph 5.1.3 and Appendix B), and be regarded as a prototype for long-term monitoring for any signs of nutritional inadequacy.

6.2 A special study of the growth rate of a selected group of children from birth until the children are 4½ years of age should be made, together with cross-sectional studies of children now aged 2, 3 and 4 years (paragraph 5.1.5 and Appendix C).

6.3 A study should be made of the health of women during pregnancy and of the growth and subsequent development of the babies born to them. Some families should receive a supplement of milk (paragraphs 5.2.1 and Appendix D).

6.4 The dietary and clinical studies already made to obtain baseline information on a sample of primary schoolchildren should be repeated (paragraph 5.4.1).

6.5 The National Food Survey questionnaires and analysis should be revised to provide information about the consumption of milk in the home by pregnant women and young children, and thus to reveal whether or not parents replace at home milk no longer supplied free at school and whether they continue to buy at full price milk previously obtained cheaply under the welfare milk scheme (paragraph 5.4.3).

6.6 The perinatal mortality rate and its components, the stillbirth and first-week death rates should be kept under review (paragraph 5.5.1).

6.7 The birth notification procedure should be modified so that birth weight and gestational age are recorded, together with information that would reveal differences in birth weights of babies born before April 1971 and after January 1972, in groups of the population which are specially at risk (paragraphs 5.5.1, 5.5.2, 5.5.3).

6.8 The computer files of birth records already maintained by some local authorities should be scrutinized for any evidence of a diminution in birth weight of babies born after January 1972 (paragraph 5.5.3).

6.9 Information from the Hospital In-Patient Enquiry in England and Wales should be so analysed as to reveal any change from January 1972 onwards in birth weight in relation to gestational age and maternal parity (paragraph 5.5.5).

7. LONG-TERM CONSIDERATIONS

7.1 We have recommended that studies be undertaken which will provide further baseline information about the present nutritional status of school-children, pre-school children and pregnant women. Although this action has been stimulated by the recent legislation on milk and school meals, the nutritional welfare of the population of Britain is also likely to be influenced by other changes, for example, in the price of foods and in methods of production and marketing, that may follow entry into the European Economic Community. The effects on health of such developments will not be monitored adequately unless we take steps to provide information which is relevant to the situation *before* the changes take place, as well as during and after them.

7.2 Most of the proposals we make for the establishment of *ad hoc* surveys of the growth and health of children could form, with such modifications and extensions as time and experience may show to be desirable, the basis of a permanent monitoring service. The University departments which have agreed to initiate studies of growth will continue them over a period of about 5 years, and their experience will be of the greatest value in showing how similar information might continue to be most effectively obtained on a permanent basis.

7.3 The Sub-Committee therefore propose to examine the best way in which suitable long-term anthropometric studies can be mounted and maintained, and in due course to report under the second part of their terms of reference, with the advantage of the experience gained in the conduct of those studies which have been recommended for the short-term investigation.

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APPENDIX A

History of the Arrangements for the Provision of School Meals, School Milk and Welfare Milk

1. *School meals*

1.1. In 1906 the Education (Provision of Meals) Act gave local education authorities the power to spend the product of a half-penny rate on providing meals free, or at a reduced charge, for necessitous and other children in public elementary schools who would otherwise be unable to profit from the education provided. It was not until the Education Act, 1944, that their power was converted into a duty covering all pupils at maintained schools. By regulations made under Section 49 of the Act (the Provision of Milk and Meals Regulations, 1969), local education authorities are required to provide for every pupil at a maintained school on every school day a midday meal suitable in all respects as the main meal of the day and are empowered to provide such other meals and refreshment as they consider appropriate.* Local education authorities are also empowered, at their discretion, to provide midday meals during holidays.

1.2. The regulations do not specify what constitutes a suitable midday meal, but the present standards in England and Wales are those recommended in the report on the nutritional standard of the school meal (Department of Education and Science, 1965) by members of a working party which included representatives of local education authorities, medical experts on nutrition, dietitians and officers of the Department of Education and Science. School meals are intended to provide about one-third of the daily allowance of nutrients and energy for a child, and on average should contain: 29 g total protein, 880 kcal energy and 32 g fat. In practice flexibility can be achieved by allowing for second helpings or smaller helpings according to age and appetite.

1.3. The arrangements for remitting the charge for the school meal on grounds of hardship are laid down by regulation. For many years the income scale for the remission of the charge has been based on supplementary benefit rates (a typical three-child family being taken as the starting point in devising the scale), but to cushion the effect of the latest increases in charge on parents with modest incomes new and more generous remission arrangements were introduced in April 1971, concurrently with the rise of the charge to 12p. Intensive and apparently successful publicity campaigns have been carried out in the schools concerning the availability of free school meals. On a census day in October 1970, 627,000 children received a school meal free (8·3% of all children present at school or 12·2% of those taking the school meal). A census taken in May 1971 showed a rise in the number of free school meals to 763,000 (9·9% of all pupils present at school or 18·3% of those taking the meal). In Sept 1971, the income scale against which eligibility for remission is determined was revised again to be in line with increased supplementary benefit allowances; a census taken on a day in October 1971, showed a further increase of 42,000 to a total of 805,000 free school meals taken up (representing 10·3% of children present

* In Scotland the corresponding statutory provisions were respectively: The Education (Scotland) Act, 1908, s.6(2); The Education (Scotland) Act, 1946, s.47; and the Meals Service (Scotland) Regulations, 1953.

and 17·3% of those taking the meal).* In October 1972, there was a further increase to 850,000 free school meals (10·7% of children present and 16·7% of those taking the meal).

2. *School milk*

2.1. The milk in schools scheme was started in 1934 by the Milk Marketing Board in co-operation with the Board of Education, with the object of providing free milk for necessitous schoolchildren and enabling others at school to buy it at a cost of one ½d per one-third pint. During the war years the scheme was extended as part of the Government's measures to safeguard the health of children and in 1946 each pupil became entitled to one-third pint of milk free of charge as part of the 'Beveridge' family support arrangements. A census taken in October that year revealed that 92·6% of children at school were taking this milk.

2.2. In autumn, 1968, as part of economy measures, the Government decided to discontinue the supply of free milk to pupils at secondary schools, and to senior pupils at all all-age and middle schools. In the previous year the take-up of free milk by senior pupils was just under 60% and by juniors 95%. Children in primary schools continued to receive free milk, and also children in special schools irrespective of their age.

3. *Welfare milk for pregnant women and pre-school children*

3.1. This service was introduced in 1940 as part of wartime food policy. One pint of liquid milk per day, or one 20 oz pack of dried milk per week, was provided at a rate of 2d per pint or pint equivalent to all pregnant women and children up to the age of 5, these supplements being free to those in economic need. The price of liquid milk at that time was 4d per pint. These arrangements continued until 1946 when the cost of liquid welfare milk was reduced to 1½d per pint and the cost of the dried milk was reduced from 1s 2d per pack to 10½d. In 1957 there was a rise in the cost of liquid milk to 4d per pint (then half the market cost), and the price of dried milk rose to 2s 4d per pack or 4d per liquid pint equivalent. The following quotation from paragraph 111 of the National Food Survey Annual Report for 1957 (Ministry of Agriculture, Fisheries and Food, 1959) is relevant:

> 'Immediately after the reduction of the welfare milk subsidy on 1st April, 1957 milk consumption declined in families containing three or more children, or children and adolescents, though it was at least maintained in all other groups. The effect proved transient and records for the second half of the year suggest that the rise in the price of welfare milk was absorbed and had little effect on the nutritional position of the larger families.'

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* In Scotland the corresponding number of pupils receiving free school meals on a census day in January 1970 was approximately 96,000. These were in Education Authority schools and in those grant aided schools supplied by Education Authorities. This figure represented 11·3% of those present at school or 25·6% of those taking meals. In January 1972, approximately 143,700 were receiving free meals, i.e. 16·6% of children present and 39·7% of those taking meals. In January 1973 136,906 children were receiving free meals, i.e. 13·7% of the total school population and 34·8% of all those taking meals.

3.2. The only subsequent change in the price of liquid welfare milk has been a rise to 6d per pint in 1968, followed in the same year by the cancellation of the provision of milk in secondary schools. A slight fall in household milk consumption occurred which was quite quickly made good, except in the largest families where the intake fell to between about 1% and 3% below that recorded in 1967 and continued at this level.

3.3. Under the present arrangements, welfare milk is no longer supplied at a reduced price, but 7 pints per week or a 20 oz pack of dried milk are supplied free to the following recipients:

(*a*) an expectant or nursing mother who already has two young children or who is in a family in special circumstances;
(*b*) all but two of the children under 5 years in any one family;
(*c*) all young children in a family in special circumstances;
(*d*) a handicapped child aged 5 to 16 years who is not a registered pupil at a school;
(*e*) in addition young children attending day-nurseries and play groups are entitled to one-third of a pint on each day of attendance.

APPENDIX B

Anthropometric Surveillance of Primary Schoolchildren

1. *Aims*

The aim of the study is to set up an anthropometric system of surveillance on selected growth, nutritional and health characteristics which may help to identify the effects of changes in food policy while any such effects are reversible.

2. *Design of the study*

2.1. A cohort study will be made of a stratified sample of approximately 20,000 children resident in England and Scotland, who are between the ages of 5 and 11 years. During the first year approximately 12,000 children will be studied. Children who have reached the age of 5 will be added to the sample during each of the next 4 years. There should be about 2,000 of these each year. Children over 11 years will be dropped from the survey.

2.2. Figure B.1 shows the successive cohorts A to J moving through the 5 years of the survey. The diagram shows how it will be possible to investigate the children in the study in three ways: by cohort, and by age and time cross-sectionally so that the effects of the three variables, age, time and cohort, on growth and nutrition can be distinguished.

3. *The sample*

The sample will be weighted to obtain greater representation of children from what might be called poor areas, but with sufficient representation of the relatively better off to permit inter- as well as intra-group comparisons. Even though an area may be identified as poor or good by the use of multiple social indicators, children from all socio-economic groups will be included in each of the areas.

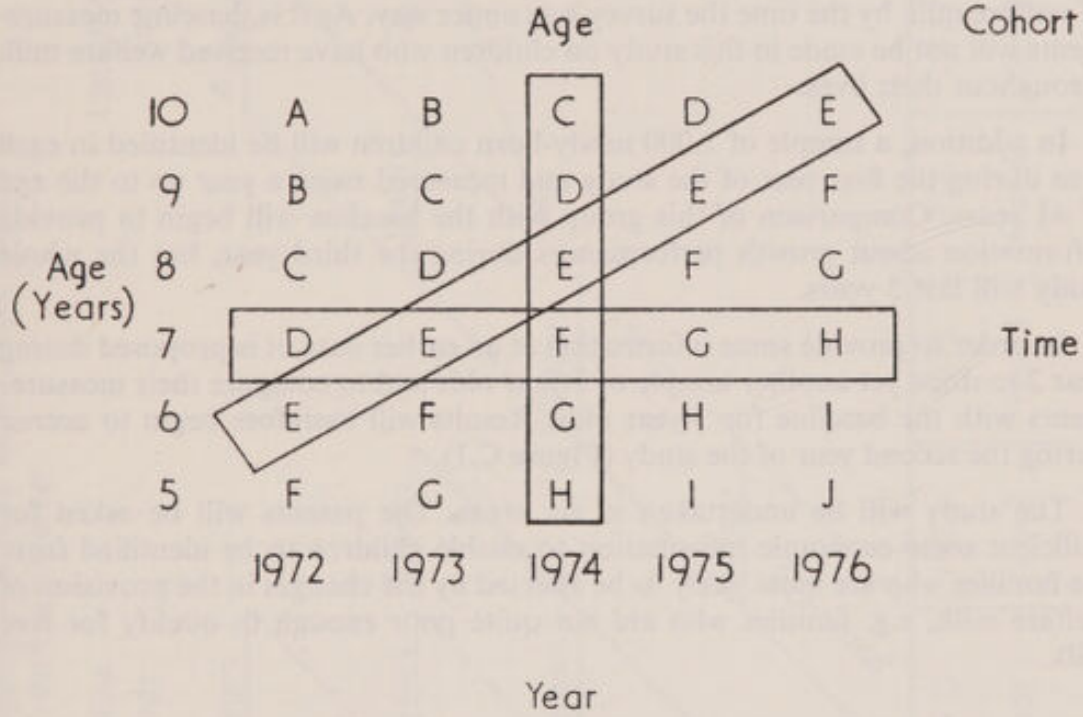
4. *Content of the study*

4.1. The proposal is that the growth of children will be monitored by measuring height, weight and triceps skinfold thickness annually for 5 years. Information on the consumption of milk and other dairy foods and on the type of midday meal eaten will be collected by questionnaire and its relationship to the growth of children explored. Other socio-economic information will be obtained and some assessment will also be made of the child's past history of respiratory illness and hospitalizations. Analysis will show whether these factors are related to any observed alterations in the rate of growth.

4.2. Variation in children's growth rates are likely to be understood better after this study. The information from nearly thirty areas will be more comprehensive than any previously obtained. The demographic characteristics related to nutrition will be studied with the aim of identifying areas and populations which might become at risk, with respect to growth and nutrition, as the result of changes in Government policy.

Figure B.1

Plan of the study



5. *Analysis of the information obtained*

Analysis will be in two stages, the first being the summary and description of 'baseline data' collected during the first year's survey, with similar analysis in succeeding years. A second, more comprehensive analysis will be made at the end of the 5-year period of surveillance.

APPENDIX C

Proposals for Growth Studies of Pre-school Children

1. Measurements of height and weight will be made on samples of children aged 2, 3 and 4 years, to be used as a baseline for further studies. Two years is considered to be the earliest age at which differences in size due to dietary changes are likely to be seen. Furthermore if a still younger age group were chosen they would already have been subjected to the changes in the provision of welfare milk by the time the survey was under way. As it is, baseline measurements will not be made in this study on children who have received welfare milk throughout their lives.

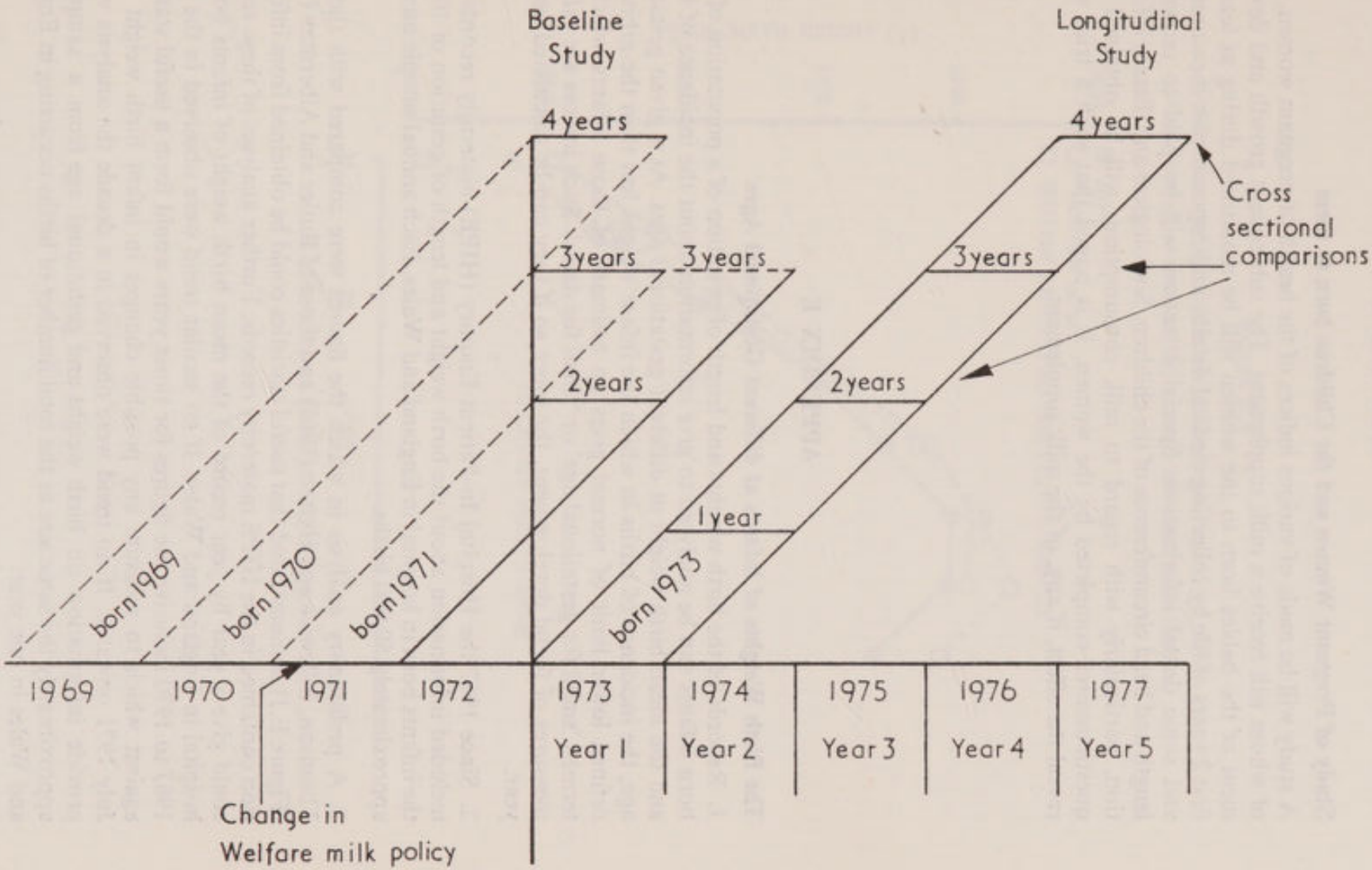
2. In addition, a sample of 1,000 newly-born children will be identified in each area during the first year of the study and measured twice a year up to the age of $4\frac{1}{2}$ years. Comparison of this group with the baseline will begin to provide information about growth performances during the third year, but the whole study will last 5 years.

3. In order to provide some information at an earlier date, it is proposed during year 2 to draw yet another sample of 3-year olds and to compare their measurements with the baseline for 3-year olds. Results will therefore begin to accrue during the second year of the study (Figure C.1).

4. The study will be undertaken in six areas. The parents will be asked for sufficient socio-economic information to enable children to be identified from the families who are most likely to be affected by the changes in the provision of welfare milk, e.g. families who are not quite poor enough to qualify for free milk.

Figure C.1

Diagram showing proposed growth study on pre-school children in each of six areas



APPENDIX D

Study of Pregnant Women and the Children born to them

A study will be made of various indices of the health of pregnant women, some of whom will receive a milk supplement. The subsequent growth and development of the babies born to the women will be monitored during at least the first 2 years of life by collecting medical details, anthropomorphic measurements and some dental information. Special attention will be paid to crown-heel length and head circumference of the children. Sociological and dietary information, particularly with regard to milk consumption, will be obtained from questionnaires completed by the women. It is hoped that such a trial would reveal the effect, if any, of the milk supplement.

APPENDIX E

The Birth Weights of Infants at different Gestational Ages

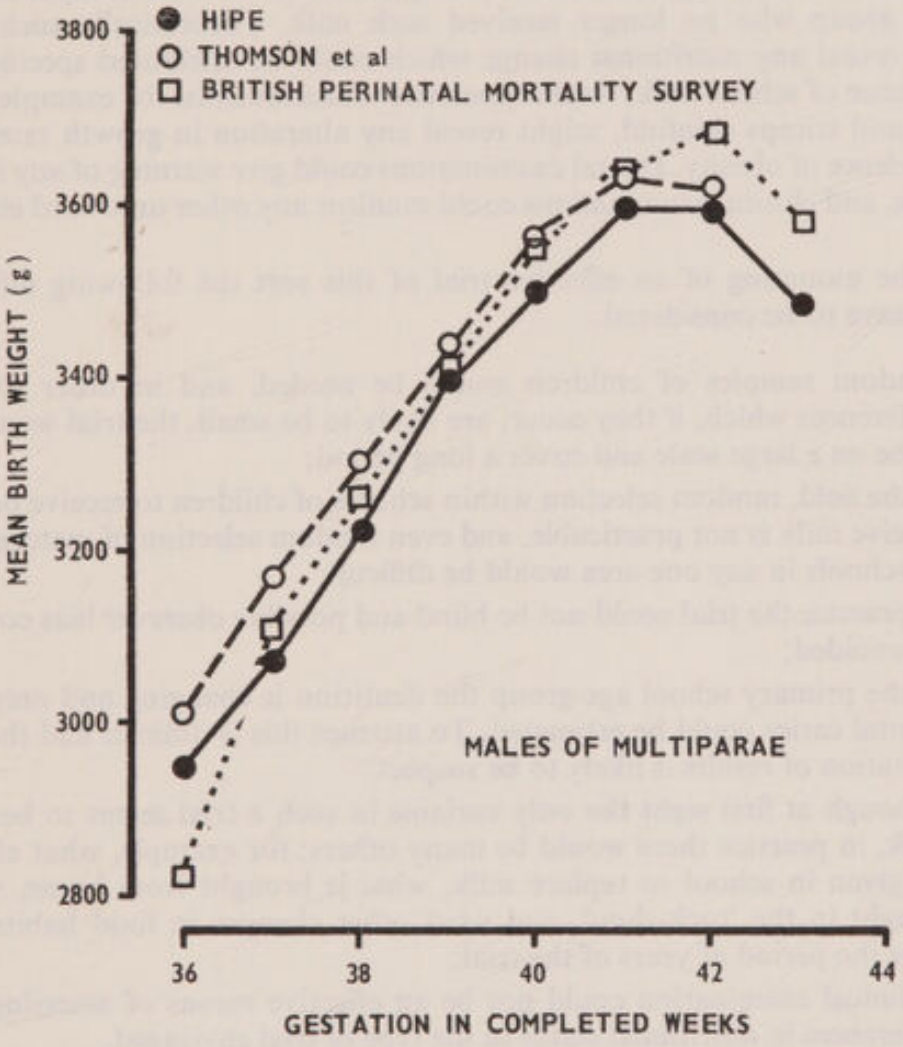
1. Records of the birth weights and length of gestation of a population of newborn infants can be analysed to give information about the incidence of births and the mean birth weight at different gestational ages. At a given gestational age, the incidence of births in which the infant weighs less than the arbitrarily defined lower limit of normal gives an estimate of those infants which are termed 'small for gestational age' or 'small for dates'. Such indices are valuable measures of foetal development, the more so if they can be calculated year by year.

2. Since 1967 the Hospital In-Patient Enquiry (HIPE) maternity records have included information about the birth weight and length of gestation of 10% of the infants born in hospital in England and Wales. Each annual sample numbers approximately 50,000 births.

3. A preliminary analysis in which the figures were compared with those of Thomson, Billewicz and Hytten (1968) and those of Butler and Alberman (1969) (Figure E.1) demonstrated that useful statistics could be obtained from information contained in the HIPE maternity records. Further analyses of these records could give a year by year record of the mean birth weight of infants born in hospital in England and Wales. If no secular trend were observed in the years 1967 to 1970 inclusive the figures for those years would form a useful standard against which to measure any possible changes in infant birth weight from July 1971 onwards. If no trend were observed in a decade the analysis would provide information on birth weight and gestational age from a sample of approximately the same size as the total number of births occurring in England and Wales in one year.

Figure E.1

Comparison of the birth weights of male children from multiparous women at different periods of gestation



APPENDIX F

The Reasons against mounting a Milk Feeding Trial in Schoolchildren

1. The Sub-Committee considered in some detail the possibility of investigating any effect of the provision of supplementary food, for example milk, on children affected by the legislative changes. A Working Party of the Sub-Committee was set up to investigate the practicalities of a trial in which a group of primary schoolchildren, who continued to receive without payment the school milk provided under the regulations before September 1971, were compared with a similar group who no longer received such milk. Theoretically such a trial should reveal any nutritional change which could be attributed specifically to the absence of school milk. Anthropometric measurements, for example height, weight and triceps skinfold, might reveal any alteration in growth rate and in the incidence of obesity. Dental examinations could give warning of any increase in caries, and clinical examinations could monitor any other untoward effects.

2. In the mounting of an effective trial of this sort the following difficulties would have to be considered:

(i) random samples of children would be needed, and in order to reveal differences which, if they occur, are likely to be small, the trial would need to be on a large scale and cover a long period;

(ii) in the field, random selection within schools of children to receive or not to receive milk is not practicable, and even random selection of matched pairs of schools in any one area would be difficult;

(iii) in practice the trial could not be blind and possible observer bias could not be avoided;

(iv) in the primary school age-group the dentition is changing and only incremental caries could be estimated. To attempt this is difficult and the interpretation of results is likely to be suspect;

(v) although at first sight the only variable in such a trial seems to be school milk, in practice there would be many others; for example, what else may be given in school to replace milk, what is brought from home, what is bought in the 'tuck-shop', and what other changes in food habits occur over the period of years of the trial;

(vi) a clinical examination could not be an effective means of assessing small differences in nutritional status in the type of trial envisaged.

3. The Working Party decided unanimously that the chances of obtaining any positive result were small and the difficulty of interpretation of any result, either negative or positive, would be enormous because so many variables could not be avoided. They therefore concluded that a feeding trial would not yield satisfactory results and they could not recommend it.

4. Dental surveys carried out on a large scale at regular intervals in children aged 5 years and 12 years by Dental Officers of the Department of Education and Science could assess any change in the incidence of dental caries. The School Medical Service would detect any clinical signs of nutritional deficiency in

individual children. Provision for the detection of any change in growth rate in primary schoolchildren had been made (Appendix B).

5. The Sub-Committee agreed unanimously with its Working Party's conclusion.

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