SCHOOL MEALS SINCE THE 1980 EDUCATION ACT
- THE NEED FOR NUTRITIONAL GUIDELINES

A study to assess the need for nutritional guidelines for school meals
and to examine some of the issues involved in their implementation
with particular reference to the need for nutrition education

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ABSTRACT

The school meals service developed from the beginning of the century into a service which was seen as making an important contribution both to the nutrition and education of schoolchildren.

Following the 1980 Education Act, there was an increase in the number of schools providing a cash cafeteria service where children had the freedom to choose their own meal. After this Act, also, Local Education Authorities no longer had to provide meals of set nutritional standard.

It was recognised that previous nutritional standards could no longer be applied in a cash cafeteria system, and it could also be argued that they no longer reflected current thinking. Nevertheless, concern has been expressed that these changes in the provision of school meals would have an adverse effect on the nutrition and health of schoolchildren.

This study sets out to establish the need for 'guidelines on the nutritional aspects of school meals' which could be used as the basis of planning and monitoring. Such guidelines would need to include both dietary goals based on current nutritional recommendations, and dietary guidelines, in terms of foods, to help caterers to achieve those goals.

Recognising that the nutritional value of the meals consumed in the cash cafeteria will depend as much on the foods chosen by children as on those provided by the caterer, it is suggested that the proposed guidelines should also include emphasis on the importance of nutrition education to help children in their choice. While recognising that this is the job of those responsible for nutrition education in schools and in the community, the need for liaison between school caterers and those involved in nutrition education should also be an aspect of these guidelines.

The need for such guidelines for school meals in the 1980s is established in two stages. Firstly evidence is examined which suggests that nutrition is an important factor in the health and growth of all schoolchildren. This evidence indicates that there is particular need for concern, further research and monitoring of the nutrition of children in families from lower socio-economic groups, of adolescents and of the role of childhood diet in the prevention of the degenerative diseases common in the adult population. This last aspect provides the justification for the use of the recommendations of the NACNE and COMA reports as the basis of the dietary goals for school meals.
Secondly the role of the school meal in the nutrition of schoolchildren in the 1980s is examined, thereby establishing its important contribution, particularly to those children in families from lower socio-economic groups, that is those most adversely affected by the changes in provision.

Further evidence of the nutritional importance of school meals is provided by the study described in Chapter Five, which found that the nutritional value of school meals compares very favourably with that of alternatives, mainly packed lunches and those eaten off school premises at local shops and cafes.

The need for guidelines is also shown by this study. While the protein, vitamin and mineral content of school meals is adequate when enough food is eaten to meet energy needs, the proportion of energy coming from fat and sugar in school meals, (both in traditional service and the cash cafeteria), is too high, and the fibre content too low. An examination of the nutritional content of meals at the ends of the range of values illustrates the importance of wise choice from the cash cafeteria if a balanced meal, in the modern nutritional sense, is to be consumed. This provides evidence of the need for nutrition education to help children in their choice.

The implementation of the proposed guidelines for school meals is examined in the context of the wider issues involved in the implementation of dietary guidelines in the UK. Implementation will involve not only the school caterer and the food industry in the provision of foods, from which a balanced diet can be chosen, but also nutrition education in the school and in the community to create demand for such foods. A national nutrition policy is needed to co-ordinate the supply and demand.

It is suggested that the proposed guidelines for school meals should be seen as an aspect of a national nutrition policy which co-ordinates the interests and activities of all those involved in the supply and consumption of food. It is suggested that a nutrition education strategy should be an important aspect of such a national policy, co-ordinating the activities of all those various agencies at present involved in nutrition education to ensure consistency of message, and effective communication. It is suggested that nutrition education in schools should be seen as an important aspect of this nutrition education strategy.
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INTRODUCTION

The 1980 Education Act made two important changes in the provision of school meals;
- it removed the statutory obligation of Local Education Authorities to provide school meals except for those pupils whose parents are in receipt of supplementary benefit or Family Income Supplement,
- the school meal no longer had to conform to the previous nutritional standards (DES, 1975).

These changes drew considerable media attention, and concern was expressed over the possible effects on children's health. The British Dietetic Association Policy Statement (1980), issued soon afterwards, expressed the official concern of dietitians over the effects of these changes.

In reality however, the effect of this Act was to hasten changes which were already occurring in the school meals service in response to changing social and economic conditions. These changes are discussed in the 'Catering in Schools' report (DES, 1975a). The main change occurring was the increasing number of secondary schools serving an a la carte (or cash cafeteria) meal instead of, or in addition to, a traditional fixed price meal.

At this point (1975) the difficulties of applying nutritional standards to an a la carte meal were recognised. The 'Nutrition in Schools' report (DES, 1975b) acknowledged that the freedom of choice which was the essential feature of this system was 'incompatible with the imposition of closely prescribed nutritional standards'. The committee felt however, that this did not 'relieve the authorities of the responsibility of ensuring as far as they can that pupils receive a suitable meal'. It was suggested that children 'would probably need guidance in their choice'.

As a result of the greatly increased number of cash cafeterias in schools following the 1980 Education Act, the majority of secondary school pupils now have considerably greater freedom of choice over the food that they consume at lunchtime than was previously available. This not only makes the application of nutritional standards very difficult, but very clearly points to the need for nutrition education to guide children's choice. The British Dietetic Association, in their policy statement (1980) stress the importance of educating children to make sensible food choices.
Over approximately the same period of time as the changes in the school meals service have been taking place, that is since the mid 1970's, there have been changes in emphasis in nutritional thinking and thus in nutrition education. Until recently, due to the prevalence of inadequate nutrition earlier this century, the emphasis in nutrition education was on ensuring adequate intakes of nutrients. Recent research in nutrition has focused on a number of diseases common in affluent Western society, in which overnutrition or an imbalance of nutrients may be a contributory factor.

Several leading nutritionists (Truswell, 1977; Whitehead, 1979; Mann, 1979; Passmore et al, 1979; Lewis, 1980) have proposed modifications to eating habits to correct this imbalance which, it is suggested, is contributing to the so-called 'diseases of affluence'. These suggested dietary modifications are becoming the basis of much current nutrition education.

The British Dietetic Association Policy Statement (1980) endorses this change of emphasis in nutrition education and suggests that nutritional guidelines for school meals should be based on the suggestions made in the DHSS publication 'Eating for Health' (DHSS, 1979).

The dietary modifications suggested in this publication were quantified in the 1983 report of the National Advisory Committee on Nutrition Education (NACNE Report). This report sets out proposals for nutritional guidelines for health education in Britain, and represents the consensus of opinion amongst experts in this country. It thus serves as a useful reference document for those professionally involved in nutrition education. In 1984, the Committee on Medical Aspects of Food (COMA) also made recommendations for dietary changes, aimed at the prevention, specifically, of cardiovascular disease.

It can be seen therefore that changes have been occurring in two separate areas at the same time. Changes in school meals provision have lead to a greater freedom of choice for pupils at their midday meal; and changes of emphasis in nutrition education have been given considerable impetus by the recommendations of the NACNE and COMA reports.

In the light of these developments, this thesis puts forward the argument for a reconsideration of nutritional standards for school meals.

A number of surveys which have compared school meals with previous nutritional standards (Bender et al, 1972 and 1977; McAllister et al, 1981) have shown that school meals do not always meet these standards,
particularly with respect to energy. Both Bender and McAllister have expressed the view that this may be because the recommendations are possibly inappropriate rather than the meals inadequate.

In a letter to the British Medical Journal (1979) Bender, in support of the cash cafeteria, suggests that in view of the very large variation in children's energy needs, a cafeteria service offering a choice of foods and portions may be helpful. He suggests that children, when given a choice 'perhaps select what they need (physiologically) rather than what the nutritionist thinks that, on average, they ought to have'. While there may be some truth in this theory, many experts (DES, 1975a; BDA, 1980) believe that nutrition education should provide children with some guidance in their choice. The incidence of obesity in schoolchildren (Royal College of Physicians, 1983) perhaps supports this view.

Thus, taking all these factors into consideration, it is suggested that the nutritional standards for school meals (DES, 1975b) removed by the 1980 Education Act should be replaced by 'guidelines on the nutritional aspects of school meals', based on the recommendations of the NACNE and COMA reports.

Such guidelines on nutritional aspects for school meals could provide guidance in three areas;
- provision of food by the caterer,
- nutrition education to guide children towards a wise choice of food,

The recommendations of the NACNE and COMA reports could be used as the basis of the guidance provided in both these areas.
- liaison between caterers and those involved in nutrition education, so that nutritional guidelines could be implemented more effectively.

This study will therefore examine, firstly, the need for 'guidelines on the nutritional aspects of school meals', and secondly, some of the issues that would be involved in the implementation of such guidelines.

In order to provide the necessary background to a discussion of the suggested guidelines, the development of the school meals service up to the 1980 Education Act will be examined in the first chapter, with particular reference to the establishment of nutritional standards and ideas on the educational role of school meals. This will be set against the background of changing social and economic conditions, and developing
knowledge of nutrition.

The background to the development of dietary goals and guidelines for nutrition education, as suggested in the NACNE report (1983) and the COMA report on Diet and Cardiovascular Disease (1984), is discussed in Chapter Two.

In Chapter Three, the evidence relating to the role of nutrition in the health and growth of schoolchildren is examined.

The effects of the 1980 Education Act on the school meals service are examined in Chapter Four, as is the role of the school meal in the nutrition of schoolchildren. This provides the rationale for the suggested 'guidelines for the nutritional aspects of school meals' which are set out in this chapter.

Chapter Five describes a study which was carried out to ascertain the effects on the nutritional value of meals consumed by children, of the change to a cash cafeteria service for school meals. This study provides evidence of the need for the proposed guidelines for school meals, including the need for nutrition education to help children to choose wisely from the range of foods available.

In Chapter Six, some of the current ideas in nutrition education will be examined, with a view to suggesting how school meals could be used as a resource in this field. This chapter will also discuss the need for liaison between school caterers and those involved in nutrition education to facilitate the implementation of the suggested guidelines. The initiatives already taken by a few local authorities in this direction will be discussed in order to demonstrate the feasibility of such liaison. In this chapter the implementation of the suggested guidelines for school meals will be discussed in the context some of the issues involved in the implementation of dietary guidelines in the community as a whole.
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CHAPTER ONE

CHANGES IN THE SCHOOL MEALS SERVICE

(With particular reference to the development of nutritional standards for school meals and the role of school meals in the education of schoolchildren.)

1.1 INTRODUCTION

This thesis is concerned with the school meals service after the 1980 Education Act, and with the post 1983 NACNE report era of nutritional thinking. In order to provide a historical perspective, a study of the development of the school meals service since the beginning of this century, and the legislation governing provision and nutritional quality of school meals is a necessary preliminary.

Just as the post 1980 school meals service must be studied in relation to the current state of knowledge in the field of nutrition and against the background of prevailing social and economic conditions and political priorities, so also must the early development of the school meals service be related to these factors. A detailed examination, however of changing social, economic and political conditions and their relationship to nutrition is beyond the scope of this study, but their influence on the development of the school meals service is clearly recognised.

This point is made by Simpson (1981) in an article which puts forward the argument that the historical role of school meals should continue (after the 1980 Education Act). He states that 'from that date (1906) until 1939 the level of service provided fluctuated with succeeding governments and reflected the conflicting priorities of social welfare and economy in public expenditure'. It could be argued that this is a permanent factor affecting the provision of school meals, and seen in this light, after the war and early post war years when school meals were an important part of family welfare provision, the 1980 Education Act reflects a clear change in government priorities.

The development of the school meals service is also closely linked to developing knowledge in the field of nutrition. It is interesting to reflect that, while the connection between diet and health was beginning to be recognised, when the first legislation concerning school meals was passed in 1906 the term vitamin was not yet in use and none of the chemical compounds now known as vitamins had been isolated or identified.
If the development of nutritional knowledge this century is seem as a continuing clarification of the relationship between diet and health, then the development of the school meals service can be seen as an aspect of governmental involvement in promoting the health of schoolchildren through good nutrition. In 1980 the government passed this responsibility over to local education authorities, whose commitment to translating current ideas on nutrition into practice is variable.

1.2 **PRE 1914 SCHOOL MEALS**

1.2.1 Pre 1906 school meals

Although the first legislation was passed in 1906, school meals have been provided on a philanthropic basis for needy children since the 1880's. The establishment of Board schools following the 1870 Education Act highlighted the problem of underfed children unable to benefit from their education (DES, 1975a).

This was a period in which there was increasing interest in the social conditions, including diet, of certain groups of the population, and the beginnings of an awareness of the connection between diet and health. Interest in surveying diets dates back to the investigations of Dr Edward Smith (1864) in the early 1860's, which revealed infants and children in urban working class families having very poor diets. The studies of Charles Booth between 1886 and 1902, Seebohm Rowntree (1901), The Statistical Society (1902) and the Board of Trade (1903) revealed the extent of poverty in many urban areas and the consequent effect on diet in many families. Those findings had little effect on either public conscience or government policy, but considerable difficulties were also being experienced in recruiting sufficient healthy volunteers to fight in the Boer War, and as Burnett (1979, p.271) points out it was concern for national safety rather than individual health which led to the appointment of the Inter-Departmental Committee on Physical Deterioration. The report of this committee, published in 1904, led to the introduction by the Liberal government of several measures which can be seen as the foundation of the Welfare State.

1.2.2 1906 Provision of Meals Act

The 1906 (Provision of Meals) Act permitted local authorities to add a maximum precept of one halfpenny in the pound to the rates to provide
meals for 'any of the children attending an elementary school... who are unable by reason of lack of food to take full advantage of the education provided for them'. Thus from the beginning, the important role of the school meal in the education of children was established. Other measures included the Medical Inspection Act of 1907, the setting up of Infant Welfare Centres and School Clinics, and the establishment of the Medical Research Committee in 1913 'to investigate the nature and cause of disease' (Burnett, 1979, p.272).

1.2.3 1906 - 1914

The number of children receiving free meals steadily increased between 1906 and 1914 - 'by 1911 more than 200,000 poor children were benefiting from free meals of one sort or another' (Hollingsworth, 1957, p.409). Two factors, however, contributed to the need for an amending Act in 1914; the money available from charitable sources declined - from £17,000 in 1908 to £950 in 1914 and the difficulties of raising the cost of school meals from the rates in poorer areas meant that provision was least adequate in areas where it was most needed (Hollingsworth, 1957, p.409).

1.2.4 1914 Act

The new Provision of Meals Act of 1914 removed the halfpenny limit on the rates, and enabled the Board of Education to make grants to local authorities for school meals; thus began governmental control over the provision of school meals by local authorities (Le Gros Clark, 1948, p.10).

1.3 1914 - 1939

Despite a growing awareness of the connection between food and health, the factors affecting the provision of school meals between 1914 and 1939 can best be summarised in the words of Simpson (1981) 'the conflicting priorities of social welfare and economy in public expenditure'.

1.3.1 School meals during the First World War

Following the 1914 Provision of Meals Act the numbers of children
taking school meals rose from 156,000 at the beginning of the war to 422,000 by the end of the first year of the war. Numbers then declined to 43,000 at the end of the war and in the early post war years (Le Gros Clark, 1948, p.10).

Hollingsworth (1957, p.431) suggests that 'the 1914 - 18 war provided an opening for the first attempt to use the findings of science in the feeding of the nation'. The food shortages and rising prices throughout 1916 led to the establishment, at the end of that year, of a Food Department at the Board of Trade (a forerunner of the Ministry of Food), and a food controller. Despite this, Burnett (1979, p.282) believes that it was 'the virtual disappearance of unemployment' ensuring that 'the wage earning classes had income more regular and better adjusted than ever before' that was the main factor in the improvement of living standards of the poor during this war; at the same time he acknowledges that food control was responsible for the fact 'that there was food for them to buy, that it was fairly distributed, and that they were protected from exploitation of scarcity'. However, as Le Gros Clark (1948, p.10) pointed out, in direct contrast to the policy in the second World War, for reasons of economy 'the Food Minister not only refrained from integrating the (school meals) service into his total war time economy, he took measures to discourage its growth'.

1.3.2 School Meals in the 1920's

With rising unemployment in the depression of 1921 - 22, numbers of children taking school meals again rose to nearly 600,000, but only temporarily.

Following the Geddes Commission Report in 1922 proposing a considerable reduction in education expenditure, the government decided to restrict the grant to local authorities for school meals. The circular issued in May 1922 stated that 'expenditure has been incurred on the provision of meals on a scale quite outside the scope of the Acts as Parliament intended them to operate' (Le Gros Clark, 1948, p.12). Grants for the provision of meals were cut down by about 50 per cent. Le Gros Clark (1948, p.12) also quotes from Sir Eric Geddes personal reply to protests at this measure and other measures to reduce expenditure in education, 'we have been accused of starving the minds, and indeed of endeavouring to starve the bodies also of the children. But is that reasonable? We are passing through a period of extreme difficulties and of great financial stringency. This is not the time for a vast increase
in educational expenditure like this, when trade and industry are being strangled by heavy taxation. The only thing that matters in this country is to get down taxation or we die' ('Plus ca change, plus c'est la meme chose').

School meal provision fell to as low as 2 per cent of children attending school and was rarely above 3-5 per cent during this period.

1.3.3 Post 1914 - 1918 War developments in nutritional knowledge

Immediate post war years

The post war period was also a time of acceleration in the development of knowledge in the field of nutrition. Hollingsworth (1957, p.442) points out the effect of the First World War on knowledge of the functions of food, and of other food problems, 'it was directly responsible for a great deal of technical investigation into methods of preparation, preservation, storage and transport'. The appearance of 'deficiency diseases in more than one theatre of war' and the tentative suggestion that 'much of the physical unfitness revealed by the examination of the adult male population might have originated from faulty or inadequate nutrition' led to the demand for more 'extensive research into the physiological functions of foods'. Thus the increasing interest in the scientific aspects of food and nutrients lead to considerable experimental research, by both the Medical Research Council and the Food Investigation Board of the Department of Scientific and Industrial Research, and by newly established research departments of commercial organisations interested in food. In addition the realisation during the 1920's that there was little information on actual food consumption of families or of individuals led to a number of surveys in different parts of the country (Hollingsworth, 1957, p.443).

The years of depression - the growing awareness of the relationship between nutrition and health.

The depression and unemployment of the late 1920's and 1930's again drew attention to the connection between poverty, ill health and malnutrition; and the early work on vitamins lead to the concept of protective foods.

Dietary surveys at this time again revealed very poor diets among the low wage earners and the unemployed who were 'just able to purchase
sufficient calories to keep body and soul alive' (Hollingsworth, 1957, p.444), but whose diets were inadequate in protective foods - milk, fruit and vegetables. The British Medical Association in 1933 had undertaken an inquiry 'to determine the weekly expenditure which must be incurred... if health and working capacity are to be maintained' (Burnett, 1979, p.304) This worked out at five shillings and one penny (approximately twenty-five pence) per person. This was the first attempt to provide a standard by which diets could be measured.

Surveys in Cardiff (1936), Cuckfield (1936) and Newcastle upon Tyne (1936), also work by McGonigle (1936), Boyd-Orr (1936), and Crawford (1938) found not only many people with incomes lower than the B.M.A. minimum, but also much ill-health and malnutrition particularly among children. Crawford's survey also, interestingly, revealed very little knowledge of, or interest, even in the highest social classes, in the newer knowledge of nutrition. Burnett (1979, p.317) mentions this as the main reason for poor diets at this time 'for many millions the problem was not so much a financial one, as an educational one: a nutritionally adequate diet was probably possible in the 1930's for five sixths of the population, but because of ignorance or prejudice, lack of time or lack of facilities only half the population was able to receive it'.

There is evidence to suggest that the situation is not so very different today; in the 1980's the main nutritional problem is rarely one of inadequate nutrition, but more often of overnutrition, or of an imbalance of nutrients. Recent correspondence in the Times following publication of extracts from 'The Food Scandal' (Cannon and Walker, 1984) indicates not so much ignorance, but an unwillingness on the part of many of the general public to alter their attitude to food even for the sake of their health. This is also borne out by the results of a recent survey carried out by the British Nutrition Foundation 'Attitudes to Eating' (BNF, 1984) 'housewives and mothers are less concerned with providing nutrition for their families than with buying food that is quick and easy to prepare, acceptable and reasonably cheap' (The Times 27.6.84).

The awareness of the extent of malnutrition at this time led to several measures which can be seen as the beginning of the realisation of the need for a national food policy. As Hollingsworth (1957, p.432) pointed out 'it took the depression and unemployment of the thirties to cause the nation to consider by what means sufficient food of suitable nutritional composition could be provided at a cost within the means of all sections of the community'.

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In 1931 the Minister of Health appointed an Advisory Committee on Nutrition to advise him 'on the practical application of modern advances in the knowledge of nutrition' (Hollingsworth, 1957, p.445). Early work of this committee involved emphasis on the importance of protective foods; also an attempt to ascertain the 'lowest cost for which a diet adequate in all respects could be obtained' (Hollingsworth, 1957, p.445).

In 1934, a group of concerned doctors formed themselves into a Committee against Malnutrition, whose aim was to centralise their information and co-ordinate all efforts to one end - the securing of adequate nourishment for every man, woman and child' (Bulletin of the Committee against Malnutrition 1934). This Committee was formed mainly as a result of the realisation that 'widespread undernourishment among families of the unemployed and lower paid workers' was largely responsible for 'a steady deterioration in the physical standards and health of the population'. The Committee was in agreement that 'the last thing upon which a community must economise is the nutrition of its working class'... 'we are perfectly aware that the nutritional standards of the working class can only be maintained and improved by an increase, often a substantial increase, in the scale of wages and relief and by an extension of such services as School Feeding and the provision of milk and meals at clinics'. Among the work that the Committee undertook was 'to support any direct campaigns, for example school feeding for families of unemployed workers'. Thus the important contribution of school meals to the feeding and health of schoolchildren was recognised by this early group of nutritionists. The membership of this committee and contributors to the bulletin included Sir F.Gowland Hopkins, J.B.S.Haldane, Sir Jack Drummond and J.Boyd-Orr. The members of the Committee, which disbanded itself in September 1939, presumably went on to form the Nutrition Society in 1941 (Nutrition Society, 1981).

Study of the bulletins of this committee revealed the main nutritional priorities of the time: an emphasis on the relationship between nutrition and income, medical reports on school children and reports of schemes for feeding school children in urban and rural areas. In July 1935 a whole issue of the bulletin was devoted to the nutrition of school children. The importance of milk as a 'protective food' was emphasised by the bulletin of March 1936, which was devoted to discussion of various aspects of milk and nutrition.

These bulletins particularly emphasised the connection between the developing knowledge of the role of nutrition in promoting health, and...
current social and economic conditions. It could be argued that, until relatively recently, the preoccupation of many nutritionists with the physiological aspects of nutrition has lead to insufficient attention being paid to the social and economic factors affecting food choice, and thus health. Certainly the argument of this thesis is that the approach to the problem of changing food habits should be mainly through education, particularly in the context of school meals. An educational approach in turn necessitates an understanding of the social, psychological and economic factors affecting food choice. The relationship between knowledge of nutrition, attitudes to food and health, and eating behaviour will be discussed in connection with nutrition education in Chapter Six.

1.3.4. The provision of school milk

The recognition of the importance of milk in the nutrition of school children has already been mentioned; this was due to the intervention studies by Corry Mann and others in the 1920's (Darke, 1979; DHSS, 1978, p11)

Le Gros Clark (1948, p.12) indicates that while the practice of providing milk in schools became more general towards the close of the twenties, many authorities tended to view this as a solution to their difficulties, (that is as an alternative to the provision of school meals). The National Milk Publicity Council had been promoting sales of milk in schools since about 1927 by means of a scheme by which one third of a pint of milk could be obtained for one penny (Hollingsworth, 1957, p.447). This was the forerunner of the Milk Act of 1934. The 'Milk in Schools' scheme, started in 1934, made milk available to all elementary schools at a half penny for one third of a pint, paid either by local authorities or by parents, the rest of the cost being borne by the government. Children from very poor homes were able to obtain milk free. Very soon nearly half the children in elementary schools were having milk under this scheme.

In 1938-39 an experiment by the Milk Nutrition Committee demonstrated that school children receiving supplementary milk not only showed an improvement in health, but derived greater benefit from their lessons (Burnett, 1979,p.321). However both Hollingsworth (1957) and Fisher and Patton (1977) suggest that the increasing provision of school milk was not solely due to belief in the nutritional value of milk, but was also a means of disposing of surplus milk, the 'Milk in Schools' scheme benefiting both children and farmers.
Consumption of milk rose during the Second World War as part of the deliberate national nutrition policy — provision of welfare milk being extended to children under 5 years and to pregnant and nursing mothers. The provision of milk that was established at this time remained a feature of welfare feeding until changes were made in 1971.

In the 1980's however, the farmers interests are less compatible with the health of schoolchildren. It is doubtful whether schoolchildren today, few of whom are undernourished, need the full fat milk provided by many local education authorities, however important a factor this is in helping to dispose of E.E.C. milk surpluses. The belief in the supreme nutritional value of milk which has been the basis not only of welfare policy in this country, but also of much nutrition teaching almost certainly contributes in no small measure to the high fat intake of many people in this country.

1.3.5 School Meals in the 1930's

Whilst a national policy for school meals had yet to be formulated, the 1930's were a period when, as the Bulletin of the Committee against Malnutrition indicated, the provision of school meals and school milk was increasingly seen as a means of helping to alleviate the problem of malnutrition amongst the unemployed and poorly paid.

This was also being recognised by the general public, yet 'there were few who suggested that the provision of meals or milk should become a national charge. There was no true revival of the Labour policy of 1906. Concern for the wellbeing of children was tempered by a desire that the provision of meals and milk should not be too great a financial burden' (Le Gros Clark, 1948, p.13).

This conflict was seen in the discussion between the Boards of Education and local authorities, concerning the means of selecting children for free meals. The discussion centred on whether children should be selected on grounds of medical need or on the basis of income. The authorities who preferred to feed children on the basis of income argued that they wished to anticipate the onset of malnutrition. The concern of the Board of Education was that, should the practice of selecting on income become general, the level of grants would have to rise, which would in turn attract the attention of the Treasury (Le Gros Clark, 1948, p.13).

At the same time, in the eyes of parents, the social context of school
meals was that of the Poor Law and the Relieving Officer. One local medical officer wrote 'free dinners unfortunately are still looked upon as a last resort; and many ill-nourished children of very necessitous parents, as well as children from less necessitous families, either do not wish to go to the dinners, or the parents have an objection to their children receiving extra nourishment, although other forms of free medical treatment and privileges are accepted without hesitation or feeling of degradation'. The unattractive surroundings and the monotony of the food were also commented upon by the Chief Medical Officer in his reports in 1935 and 1937.

Also during the 1930's there was a difference between authorities as to whether meals should be free or provided on payment. The division seemed to be between rural and urban areas 'a number of the counties were making some attempt to provide meals on payment in a few rural schools; but they troubled themselves little about the supply of free meals. On the other hand, the attention of the boroughs was concentrated upon the provision of free meals to their poorly nourished children'. More than 80 per cent of meals for which payment was made were provided in rural schools, and more than 80 per cent of free meals were supplied in towns (Le Gros Clark, 1948, p.14).

The Bulletin of the Committee against Malnutrition in June 1935 included an account of the extent of malnutrition in school children by the School Medical Officer for West Suffolk - Dr Critchley. He described the two criteria that he used to provide clinical evidence of the extent of undernourishment;

- absence of fat, underdevelopment or flabbiness of muscles, faulty posture, easy fatigueability, anaemia, drawn haggard faces, headaches, lassitude, and general malaise.
- a nutritional index at least 10% below normal for age and sex, the nutritional index being taken as 100.(weight/height).

Dr Critchley concludes his general discussion on the causes of malnutrition with a strong plea for the provision of school meals.

Also in this issue of the Bulletin, the Headmaster of a school in the same county gave an account of the provision of lunches in his school 'this meal consists of meat, vegetables and pudding, and is cooked on the school room fire by two girls, who are changed each day. When there is roast meat the village baker cooks it free of charge. Some of the vegetables are grown in the school garden, and in future all will be.
Thirty four children have five meals each week for which they pay sixpence, and the loss on the whole school works out at about one shilling and eight pence halfpenny. If one teacher on his own without official encouragement can organise an almost self-supporting scheme for feeding his children, it is not too much to suggest that with the organised help of the county authorities a widespread adoption of school meals would not incur any large expenditure'. This gives an early example of the involvement of school meals in the general education of children.

The important contribution of school meals was beginning to be recognised, although by no means universally, 'the Chief Medical Officer (to the Board of Education) from time to time made some passing reference to the social and educational value of the school meal' (Le Gros Clark, 1948, p. 14)

1.3.6 The realisation of the need for a National Nutrition Policy

Despite the concern about finance, there was evidence, by the close of the 1930's, that the recognition of the importance of nutrition in the growth and development of children was having some effect. The Times in its leading article for August 9th 1939 said 'the schools have to do more than merely train the mind and the body of the child; they have to eradicate the results of the last century's hectic industrialisation ... they are rectifying the great social injustices of the past'. Le Gros Clark (1948, p.15) attributed this to the 'efforts of the modern nutritional school of thought... having influence in the public mind', and also to the impending war 'the forebodings felt by the country were compelling us to direct our attention once again to the physical fitness of all children'.

Burnett (1979, p. 321) also emphasised the effect, on the development of the welfare services, of the official recognition of malnutrition, resulting from the experimental research of the Medical Research Council, the Food Investigation Board of the Department of Scientific and Industrial Research and from the statistics assembled by Medical Officers of Health and others.

By 1939, as Burnett (p.321) points out, 'the government was coming to recognise, at least in part, the need for a nutritional policy as an essential part of constructive health services'. Dietitians were urging that 'it now had a similar duty to ensure nutritional adequacy for the
population as a whole. Agricultural economists saw a greatly increased consumption of protective foods, subsidized by the state, as the only way to restore the prosperity of British farming, while at the same time rescuing the health of the nation'. It is interesting to speculate on how long it would have taken to achieve this utopian 'nutritional adequacy for the population as a whole', if the food shortages of the Second World War had not precipitated the formulation of a most successful national nutrition policy, some aspects of which remain part of government policy in the 1980's, despite changes in nutritional priorities.

1.4 1939 - 1945

1.4.1 Wartime nutritional policy.

Wartime nutritional policy - relevance to the 1980's?

It is interesting to note that several papers written in the late 1970's (Darke, 1979; Hollingsworth, 1979; Fisher & Patton, 1977; DHSS, 1978) discussing the current need for a national nutrition policy, begin with an account of the Government's wartime nutrition policy. Although the situation now is significantly different, it may be useful to study how a national nutrition policy was devised and put into practice by the government. These were times of national emergency, undernutrition rather than overnutrition was common, and the country faced a drastic reduction in food supplies if not starvation. None of these conditions, one hopes will apply in the 1980's.

As mentioned previously, the Second World War occurred at the end of a period of fairly intense research into nutritional requirements and the nutritional composition of foods; and of general recognition of the problem and causes of malnutrition.

The basis, therefore, of the wartime nutrition policy was the fair distribution of scarce foods resources according to physiological need, rather than income. This was done by means of food subsidies and control of the price of foods such as meat, bread, sugar, milk, potatoes, margarine, butter and cheese; foods such as bacon, fats, sugar, preserves and sweets, cheese and meat were rationed; bread and potatoes were left unrationed (at least to begin with) to meet the needs of those with high energy requirements.
As Hollingsworth (1957, p. 448) states 'war in 1939 found this country better fitted than ever before to apply the findings of nutritional science to the task of feeding the population'. This was recognised some years earlier by Magee (1946) in an paper 'Nutrition Applied to Public Health' published in the British Medical Journal 'the wartime food policy was the first large scale application of the science of nutrition to the population of the United Kingdom. This application was brought about by home production, and importation of suitable foods in suitable amounts, by rationing according to needs, by subsidies on staple foods, and by adequate wages. A diet more than ever before in conformity with physiological requirements became available to everyone, irrespective of income' (Darke, 1979).

There are certain parallels in the situation at the beginning of the 1980's when nutritional problems are those of overnutrition or of an imbalance of nutrients.

Changes in food consumption during the relative affluence of the 1960's and early 1970's, and changes in disease patterns, both of which will be discussed in the next chapter, led to research which has been generally accepted as indicating that many of the current so-called 'diseases of affluence' are, at least partially, diet related. There is, therefore, again a need for such modification in food habits that some sort of government involvement is necessary.

Darke (1979), however, points out the obvious differences between then and now, 'in a democratic society, a nutrition policy must be one of sound education so that individuals make a wise choice of foods. Their choice creates demand and indirectly influences food production both from agricultural production and from the food industry.'

Given the government influence not only in agricultural production and the food industry, but also their role in health education, many would suggest that the apparent lack of co-ordination of policies between different departments hinders rather than helps the efforts of those involved in the type of education suggested by Darke and others (Hollingsworth, 1979). This contrasts with the co-ordination shown by government departments during the war; Hollingsworth (1957, p. 449) mentioned that one of Professor J.C. Drummond's first acts on being appointed Scientific Advisor to the Ministry of Food in 1940, was to prepare a memorandum, stressing the need for 'co-ordination of all scientific investigations into food problems.'
A paper read by Fisher & Patton (1977) at a Nutrition Society Symposium on 'Nutritional Aspects of Food and Agricultural Policies in the UK' gives an interesting and detailed account of the well co-ordinated promotion of nutrition by the Ministry of Food from 1940 – 1945, 'a scheme of practical nutrition and communication had to be devised to help people to accept these changes in their food habits and to make appetizing meals from food available'.

The three divisions of the Ministry of Food working together to this end were;

- The Scientific Advice Division - providing the basic scientific facts of nutrition; responsible for the nutrition education policy and for clearing material put out by the other two divisions.

- The Food Advice Division had food advice centres throughout the country which dealt with food preparation and the practical applications of the food policy, producing from their experimental kitchens attractive recipes, meals, diets, budgets, also giving advice on cooking, prevention of waste and preservation of home grown food. It is interesting to note the obvious and very important use made of the expertise of the wartime equivalent of Home Economists in the practical application of nutrition policy.

- The Public Relations Division which was in close contact with the media, and using material produced by the other divisions, produced leaflets, films and broadcasts.

A more detailed account of the activities of these divisions is given by Fisher & Patton (1977). While times and problems are different, those involved in nutrition education in the 1980's would do well to study this example of a well planned, well co-ordinated and successful nutrition education campaign.

**Wartime Food Measures**

As part of the policy of distributing food according to physiological need, in addition to rationing, price control and subsidies previously described, special provision was made for mothers and children 'as it was realised that failure to support them would imperil a whole generation' (DHSS, 1978). Welfare foods were important aspects of the wartime nutrition policy, and included measures such as the expansion of the Milk in Schools scheme, cheap milk for expectant and nursing mothers, welfare
cod liver oil, orange juice, and vitamin tablets, also the expansion of the school meals service. At this time the important tradition of school meals contributing to the health and welfare of schoolchildren was established. The argument of this thesis is that school meals should still have this important role, not just to meet physiological needs, but even more importantly now, have an educational role.

Another aspect of wartime food policy was the change in composition of important foods such as flour; this was fortified with calcium carbonate, and the extraction rate raised to 85 per cent to improve the intake of calcium, iron and the main B group vitamins, also margarine was fortified with vitamins A and D. In the words of J.C. Drummond 'good was done by stealth' and 'the public benefited without having to make a conscious effort' (Hollingsworth, 1979). Both these measures are still in force today, though the necessity for the continued fortification of flour has been debated.

Restriction of imported foods lead to changes in the availability of foods. The emphasis was placed on the consumption of home grown green and root vegetables; to compensate for lack of vitamin C from imported fruit, of which there was very little except oranges, encouragement was given to serve vegetables raw, or cooked correctly to conserve vitamin C. In this and in the use of other unfamiliar foods such as dried eggs, boneless carcass meat (imported in this form to save shipping space), the advice and recipes issued by the Ministry of Food played an important part.

Effects of Wartime Nutrition Policy

As a result of wartime nutrition policy, the health of the population improved considerably 'at the end of the war, all measurements of health, including the growth of children, infant and maternal mortality, and the condition of childrens teeth showed an improvement' (Hollingsworth, 1977), 'Between 1940 and 1948 the perinatal death rate showed one of the steepest falls ever recorded. This can be attributed largely to an improvement in maternal nutrition' (DHSS, 1978).

These efforts were recognised by the giving of the Lasker Award of the American Public Health Association to the 'British Ministries of Food and Health, and the four great leaders of this historic enterprise' Lord Woolton, Sir Jack Drummond, Sir Wilbur Jameson, and Sir John Boyd-Orr; for the unprecedented program of food distribution in Great Britain with resulting improvement in the health of the people' (Hollingsworth, 1979).

Fisher and Patton (1977) describe the amazed reaction of European
Delegates to an international Nutrition Society meeting in 1946, to the improvement in health of the population, particularly of infants and children, despite food shortages. These improvements in health are attributed, by Hollingsworth (1977), to the fact that 'at all times adequate, but not excessive, supplies were distributed, more or less, according to physiological requirements, and that the mixture of food available was nutritionally well balanced'. Fisher and Patton also make the point that 'for the first time in our history everyone in Britain, rich and poor, had a nutritious diet and a food policy controlled by nutrition experts instead of politicians and financial interests at home and abroad. For the first time, a reliable, practical scheme of nutrition education was promoted at all levels to the people'. As both these papers were written in 1977 the authors obviously feel that these comments have some relevance to the current situation.

Applications in the 1980's?

Fisher and Patton (1977) describe the effects on nutrition education, when in 1954, the Ministry of Food was disbanded, (saving £3,000,000 of public expenditure) and commercial interests took over from government control 'lacking the reliable, co-ordinated, unified policy, nutrition became a 'free-for-all', with too many diverse methods and loss of impact'. They conclude their paper with two questions;

- 'Could the experiences of the Ministry of Food help people now, to cope with food shortages and poor food choice resulting from a lack of nutrition knowledge and from today's high prices?'
- 'Would a national nutrition policy, based on a core of low priced, value foods, available to all as 'rations for health' and supported by a national scheme for nutrition education, help the country today?'

In considering 'A National Nutrition Policy - can we devise one?' Hollingsworth (1977) comes to the conclusion, 'as does Darke (1977), that given the important power of consumer demand an educational approach is the most feasible 'the best way to implement a nutrition policy is likely to be through consumer demand for nutritious food and for information about its nutritional value. I hope the greatest possible national effort will be put into enlightened nutrition education so that consumer demand will become increasingly sound and sensible'.

Evidence that this type of consumer demand is present, and is now beginning to bring response from the food industry and from other
quarters, is discussed in Chapters Two and Six.

Perhaps the most important comment relating the wartime nutrition policy to the 1980's is the one made by Hollingsworth in 'The Englishman's Food' (1957) quoted in the paper of 1977 "... after the war... the public was vocal in its discontent, and the importance of palatability and acceptability of food supplies became abundantly clear'. In applying this principle to modifying eating habits in the 1980's, Hollingsworth 1977 recommends that we should 'find a diet which accommodates personal preferences, and in no way detracts from the pleasure of eating. If change for nutritional benefit is to be permanent, it must be pleasurable'. This important principle, sadly often overlooked by nutritionists, is obviously particularly relevant to school meals, and will be referred to again in this thesis.

Thus it would seem that the main point to be gained from the study of wartime nutrition policy is the one that, while the reversion to governmental control of wartime is neither feasible nor desirable, there are many who would wish for somewhat more co-ordination of policies, as a minimum, and possibly a more active involvement in promoting nutrition education. It is suggested that a more efficient use of available resources might be made by looking at the campaign run by the Ministry of Food in the 1940's.

In connection with school meals, the main argument of this thesis is that there should be some official resumption of the traditional (at least since the outbreak of war) concern for the health and nutrition of schoolchildren. This concern should preferably be at governmental level, but if not, then responsibility should be taken by the local authority. It is suggested that the now abandoned nutritional standards for the school meal, more relevant in times of under-nutrition, should be replaced by nutritional guidelines. The development of these guidelines will be discussed in Chapter Four.

1.4.2 School meals in wartime

As has been previously mentioned, school meals were an important aspect of the wartime nutrition policy. According to Le Gros Clark (1948, p.17) this dated from the Spring Campaign of 1940 'ten months after the outbreak of war the Board of Education issued a circular... from
that date (1940) school feeding became in effect a recognised part of wartime economy'. The circular referred to 'communal feeding arrangements, whether free of charge or on payment for children whose needs are not fully met by the normal provision of food at their home'.

It was established at this point that the school meal could be seen as the main meal of the day 'it became national policy to provide a main meal in school for all children whose parents wanted them to have it, on payment of a charge approximately equal to the cost of food, or free in cases of hardship' (DES, 1975a). It was recognised that four main factors led to this development;
- domestic rations took no account of school children's special needs.
- bombing and evacuation, and movements of the population led to the development of civic catering facilities, in which children's needs were best met through school canteens.
- employment of mothers made school meals a necessity for many children.
- the policy of family support was taking shape and there was an assumption that cash allowances would be supplemented by benefits in kind in the form of free meals and milk at school.

Le Gros Clark (1948, pp.17-26) gives a detailed account of the development of the school meals service under wartime conditions; development hampered by problems of evacuation, disruption due to war damage, supply of food and premises. This development was under the control of Local Education Authorities directed, by Board of Education circulars, and supported by Board of Education grants, also measures to give them priority on food, equipment and premises.

In 1940 LEA's were encouraged to extend and improve the school meals service with a 70 per cent grant on their expenditure, and an improvement in the allocation of rationed foods.

In 1941 the rate of government grant was raised to a maximum of 95 per cent and special priority given to the school meals service in the supply of rationed and other foods, premises and equipment (DES, 1975a).

The immediate target of one million school meals a day was reached by October 1942. However the target set by the government in 1943 of a school meals service to provide meals for 75 per cent of all school children (3 million meals per day) was never reached. (DES, 1975a)

One of the aims of the Board of Education at this time was to free
school meals from the stigma of the Poor Law. The term 'feeding centre' was to be discontinued and the term 'school canteen' to be used instead; circulars were issued to encourage the uptake of school meals. One such circular implied that the new scheme 'is not to be confused with the scheme under which for many years free meals have been provided for necessitous children' (Le Gros Clark, 1948, p.20).

The changing attitudes to school meals were noted in a report in 1941 by a school medical officer in Nelson, quoted by Le Gros Clark (1948, p.20) 'undoubtedly the inauguration of communal meals... has encouraged many... to attend, who did not do so before, because their attendance was mistakenly regarded as a stigma, indicating either the acceptance of charity, or the inability of the mother to cater satisfactorily'.

The problem of providing hot food, not only for schoolchildren, but also for adults under wartime conditions is discussed by Le Gros Clark (1948, p.22). There was a tendency for Local Education Authorities to set up central kitchens, and transport hot food to schools. This had obvious advantages under wartime conditions in that premises were difficult to find, and in emergencies hot meals could be provided also for adults, but Le Gros Clark recognised that 'it is not altogether an ideal method of providing cooked meals; and one may hope that, in the future, kitchens will gradually become more closely associated with the schools they serve'. This became an important post-war priority. In addition, the cooking depots set up by the Ministry of Food in 1941 to provide hot meals for industrial centres under emergency conditions could be used to provide meals for schoolchildren, after a Board of Education circular in 1941.

1.4.3 1944 Education Act, and 1945 Provision of Milk and Meals Regulations

The 1944 Education Act was the first Act of Parliament to mention school meals since 1922. This was implemented by the Provision of Milk and Meals Regulations of 1945 which imposed on Local Education Authorities a statutory duty to provide milk, meals and other refreshments. Local Education Authorities were required as from 1st April 1945 to provide school dinners for all maintained primary and secondary school pupils who wanted them. The regulations prescribed the rules governing the school meals service ... the charge for dinners in all maintained schools required the Ministers approval but could not exceed the cost of the food included in the meal'(DES, 1975a).

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Thus by the end of the war, school meals had become established as an important part of the developing child welfare system of this country. Writing in 1948 Le Gros Clark saw the introduction of meals and milk as a benefit in kind, related to the provision of children's allowances.

**Role of school meals in the education of children**

Le Gros Clark also expressed views on the role that school meals should play in the education of children 'the great teaching organisations have always been the first to go on record in support of the principle of school meals. But it is not quite so simple a matter for the members of these organisations to absorb the canteen into their curriculum. Yet the canteen is not an alien growth grafted to the school; it has become in every sense a part of our educational system. Since it has come to stay, let it be moulded unvexatiously into the lives of our children and make its full contribution to their training and happiness' (Le Gros Clark 1948, p.28). In 1986 this thesis puts forward, in rather less emotional terms, the same arguments. Current government moves to privatise all school meals, makes the achievement of this less, rather than more, likely.

1.5 1945 - 1970's

1.5.1 Post War Nutrition Policy

Magee (1946) quoted by Darke (1979) described the requirements for the post war nutrition policy 'if we are to retain what has been achieved during the war we must see that the quality and quantity of our agricultural produce and imports are determined primarily by health requirements and that, when, in the fullness of time, free choice of food returns, the public are made aware of the dietary requirements for health. Steps should also be taken so to arrange our social and economic affairs as to make it possible for everyone to secure a diet sufficient for his needs'.

This was achieved in the early post war years by the setting up of the welfare state and National Health Service, 'the Milk in School scheme provided free of charge one third pint of milk on each school day for all school children. A mid-day meal was available at school for any who wished to have it, and was free of charge to the impoverished' (Darke 1979).
1.5.2 Post War School Meals

In the immediate post-war years the target was set to expand the school meals service so that free meals could be offered to all children as part of arrangements for family support. This was to be achieved by 1949. By June 1949 capacity was sufficient only for 2.75 million or 52 per cent of all schoolchildren. However by this time improvements in the economic and social conditions of this country had reduced pressure for the introduction of free school meals for all children.

In 1950 a standard charge (sixpence) was imposed in all schools. This charge has been increased by successive governments; and in 1970 a White Paper on 'New Policies for Public-Spending' announced the government's aim, that 'the charge should eventually cover the running cost' of providing the meal (DES, 1975a).

From 1947 to 1967, Local Education Authorities provided school meals under central government control, and the net cost was covered by a government grant. In April 1967 'full financial responsibility for the school meals service passed to LEA's, their expenditure being aided in the same way as other local authority services under the rate support grant arrangements'(DES, 1975a).

Free School Meals

While the idea for free school meals for all children has now been abandoned, an important aspect of the school meals service throughout its development has been the provision of free meals for children whose parents could not pay for them without hardship, 'authorities were at first allowed discretion in deciding the level of income qualifying parents for free meals for their children' (DES, 1975a). However from 1964, this was standardised; the receipt of family income supplement, and supplementary benefit carrying automatic entitlement to free school meals.

Following publicity campaigns in 1966, 1970, and 1971, run by the DES to try to ensure that all children entitled to free school meals were getting them, the official view in 1975 was that 'take-up is now close to the practical maximum' (DES, 1975a).
Nutritional standards in 1941

Nutritional standards were first laid down in 1941 by the Board of Education. Circular 1571 advised authorities that as a general guide the school dinner should be planned to provide for each child:

- Energy value: 1,000 calories
- First class protein: 20-25 grams
- Fat in all forms: 30 grams (DES, 1975a)

These standards need to be seen in the light of war time conditions; the rationale for them was explained by the circular. The emphasis on first class protein and fat was explained by the need, in school meals, to make up for 'probable deficiency of certain factors in the home diet' due to the war-time restrictions. The circular explained that the food quantities recommended represented about one-third of the child's daily need for energy but 'most of the necessary first class protein and much of the fat must normally be obtained in this meal' (DES, 1975a). This principle, at least for protein, has remained the basis of nutritional standards for school meals until 1980.

Provision of Milk and Meals Regulations, 1945

These regulations included no quantitative statement as to the nutritional value and balance of the school meal, but the following provisions were included:

- Every meal shall be adequate in quantity and quality so as to be suitable as the main meal of the day for the pupil.
- The dietary for dinners shall be suitably varied and planned in order to secure nutritionally balanced meals appropriate to the ages of the pupils (DES, 1975a).

They re-affirm the principles of the 1941 nutritional standards, which had already laid down quantitative recommendations.

Circular 290, 1955, and Amended Provision of Milk and Meals Regulations, 1956

Circular 290, issued in 1955, amended the quantitative basis of nutritional standards slightly, but again based protein recommendation on the possible need to make good 'deficiencies in the child's home diet'.

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The school meal should supply on average;
- An energy value of 650-1,000 calories depending on the age and sex of the child, 'the calorie value can be varied by adjusting the quantities of energy-producing foods such as potatoes, flour, cereals and fats',
- 20 grams of protein of animal origin,
- 20 - 30 grams of fat in all forms.
'The school must also provide a sound diet for growing children and must take into account the possibility of deficiency in a child's home diet' (Ministry of Education 1955).

The circular also recommended that each meal be supplemented by three quarters of an ounce of dried milk, providing 45 grams out of a weekly total of 100 grams of animal protein. The daily one third of a pint of milk, to which each child was entitled, represented an additional weekly 30 grams of protein (providing the child consumed this).

The Amended Provision of Milk and Meals Regulations of 1956 again emphasised in non-quantitative terms that 'on every school day there shall be provided ... for every pupil as a midday dinner a meal suitable in all respects as the main meal of the day'. This statement was retained when the Regulations were amended in 1965 (DES, 1975a).


Background to establishing the Working Party

The setting up of this Working Party in 1965 was in response to pressure from associations of local authorities, and those employed in the school meals service, that nutritional standards should be reviewed, 'in the light of social and economic changes which had taken place since existing standards were fixed'.

With improvement in the national food situation which had occurred by the early 1960's, the small quantity of meat served at school meals had become a common criticism. Older children in particular were reluctant 'to accept almost half the protein content of the meal in the relatively inexpensive form of dried milk used in custards, sauces, milk puddings and mashed potatoes' (DES, 1965).

Nevertheless the introduction to this report stressed both the increase in numbers taking the school meal (3 per cent per annum) and the continued physical improvement of children, reflected in school medical
officers reports; also the basic nutritional soundness and the popularity of the school meals service with both children and parents. This latter could be attributed to the fact that very often there was little alternative, but it was probably true to say that 'the value for money which the meal has represented in a decade of rising food, overhead, and capital costs is also a factor of which account should be taken' (DES, 1965).

The Working Party described the prominence of the criticisms in the press and Parliament as 'unhelpful and ill informed', and due to 'widespread ignorance' of the school meals service in the mind of the public. They welcomed the opportunity for wider publicity for 'its (the school meals service) high nutritional standards, educational value and popularity' (DES, 1965).

Terms of Reference

The Working Party considered separately the three 'distinct, but inter-dependent' parts of the terms of reference;

- 'To review the nutritional standards laid down in the Department's Circular 290'
- '(To review) whether the proportion of first class protein needs adjustment for different age groups'
- 'To consider whether the present type of school dinner is appropriate in the light of changes in feeding habits since the current standards were fixed in 1955; and to make recommendations' (DES, 1965).

Nutritional Advice to Working Party

The Working Party received advice from the nutritional advisers from both the Ministries of Health, and of Agriculture, Fisheries and Food, and also took into account a paper prepared by the DES analysing the nutritional achievements of school dinners. The latter noted both the 'marked improvements in the standards of school meals over the last 15 years' and the fact that in 1963-4 school meals 'generally appear to conform with the recommendations of Circular 290; any minor shortfall being in reaching the target for animal protein, due almost entirely to under use of dried milk'. This paper did admit, however, that there was 'probably room for some further small improvement... by way of more variety'(DES, 1965).
The nutritional advisors detailed the changes in domestic food consumption, discussed in Chapter Two, noting an increased use of convenience foods; they also noted improvements in the health of school children. School medical officers' reports showed a decrease in numbers of children of 'unsatisfactory' condition (that is, reflecting mild degrees of malnutrition) from 2.5 per cent in 1956 to 0.45 per cent in 1964.

The Working Party also pointed out that the diets of most children contained a surplus of nutrients; but as there was no evidence to suggest that this was harmful, and there was 'no certainty that this applies to those pupils who are least well fed at home' there was no reason to lower the nutrient content of the school meal. While recognising that obesity was due to 'a consumption of calories in excess of requirements', they attributed this, when it occurred in children, to the diet as a whole, 'and there is no reason to believe that its causes are related to school meals or milk'.

When considering the adjustment of the proportion of protein for different age groups, the point was made that the children, usually the older children, who had larger portions to meet higher energy requirements usually automatically received more protein. This point is borne out by the results of this study of school meals (Chapter Five).

Protein terminology was discussed; the Working Party recognised that the term 'first-class protein' was obsolescent, 'and for the purpose of these considerations was equated with protein of animal origin other than gelatine'. The term 'animal protein' was retained, 'with the justification that, as a generalisation, proteins of animal origin are of greater nutritional value than those of vegetable origin and are often associated with sources of B vitamins. The proportion of animal protein to total protein is to some extent, therefore, an indication of the nutritive value of the diet' (DES, 1965)

**Working Party recommendations**

Taking into account advice from these sources the Working Party recommended that;
- there is no nutritional or medical evidence to suggest that the existing standards need to be changed.
- it is not necessary to make specific adjustments to the proportion of animal protein for different age groups since the amount of such protein is automatically regulated by the variations in the size of portions served to pupils of different age and sex. The protein target of
the school dinner should be expressed as a combined figure for animal and vegetable protein, but the amount of animal protein should be the regulating factor (DES, 1965).

The Working Party also concluded that there was 'considerable scope for improvement in the variety of menu and types of food used in the school dinner'; they therefore recommended that:

- the number of meals at which fresh meat is served should be reduced from the equivalent of 4 to 3 meals per week,
- the recommended meal pattern and food quantities should be revised to allow more variety in menus,
- in order to give effect to these recommendations the quantity of cheese, eggs, fish, tinned meat, offal, fresh fruit, fat for frying, and eggs for cooking purposes should be increased, and the amount of dried milk, dried fruit, potatoes and cereals reduced (DES, 1965).

It is to be noted that in many respects these recommendations are the reverse of many of the current nutritional guidelines.

Recommendations were also made concerning training of school meals staff, and perhaps more importantly communication at all levels.

**Implementation of recommendations - Circular 3/66**

The recommendations of this Working Party Report were implemented in Circular 3/66 which remained current until 1980, and they were welcomed by LEA's as enabling them to provide a better variety of menu and a more attractive and palatable meal (DES, 1975a).

The view that the school meal should provide the main meal of the day for some children was still held; 'the maintenance of existing standards for the school meal was therefore seen by the Working Party more as a safeguard for the child who had to rely almost wholly on the school meal as a source of protein and certain other nutrients, rather than as a minimum below which the meal for the average child should not be allowed to fall' (DES, 1975a). Work quoted in Chapter Three shows the important part played by school meals in the nutrition of some school children from poorer families and is a justification of this view.

**Role of school meals in the education of schoolchildren**

The educational and social aspects of the school meal had been increasingly acknowledged during the post-war period. Circulars were sent
to authorities in 1946 and 1959 pointing out 'that under proper conditions
the school dinner affords an outstanding opportunity for social training
without which education is incomplete, for teaching good manners and for
the establishment of sound dietetic habits' (DES, 1965). In the light of
current developments these words seem to have a somewhat old fashioned
ring, but they may contain something of value even today.

The Working Party in 1965 felt that the case for improving the
variety of foods served should be examined carefully in the light of their
view 'that food education is an important aspect of the school meals
service, and that children should be in the words of Rupert Brooke,
introduced to 'many tasting food' (DES, 1965).

This view was supported by that of the Working Party's nutritional
advisers, 'the more varied the diet, the more likely it is to be
nutritionally satisfactory and, as good eating habits established at
school may be maintained throughout life, the wider variation in diet
offered by the Working Party's recommendations may prove a useful
investment' (DES, 1965).

In Chapter Six it is emphasised that an important aspect of nutrition
education is to introduce children to a wide variety of foods, and to
discuss the different aspects of palatability so that choice may be made
from a sufficiently wide range of foods to ensure a balanced diet. This
argument will be illustrated by work done in schools showing liaison
between Home Economics departments and school catering staff.

1.6 SCHOOL MEALS IN THE 1970's

1.6.1 'Catering in Schools' (DES, 1975)

The publication of a government White Paper in 1970 on 'New Policies
for Public Spending' announced the idea 'that the charge should eventually
cover the 'running cost' of providing the meal' (DES, 1975a). This, and
the alteration of the financial basis of school meals by the passing of
full financial responsibility to LEA's in 1967, precipitated a thorough
examination of the school meals service during the early 1970's.

Background to establishment of Committee and terms of reference.

A committee investigating 'Catering Aspects of School Meals' was
set up in 1972 and reported in 1973 (DES, 1975a). The terms of reference
of this Committee were 'to review the aims and organisation of the meals and refreshment service in schools'.

This was thought to be necessary as, the school meals service was still operating, in the 1970's, on the lines that were set down during the Second World War, and had not changed very much in 25 years. The 'framework within which the service operated' had changed in several important respects. During these 25 years there had been considerable inter-related social and economic changes, also changes in the nutritional status of schoolchildren. The report listed and discussed these changes, set down aims, both nutritional and social, for the future service, and discussed the organisational aspects and financial arrangements for meeting these aims.

The development of a school meals service from this 'blueprint' has been hindered rather than helped by the 1980 Education Act.

**Inter-related socio-economic and nutritional changes.**

There have been improvements since 1945, in the general economic condition of the population, and social welfare benefits have been provided; the two main ones carrying automatic entitlement to free school dinners.

In addition, eating habits have changed as a result of the ending of post-war rationing, the wider availability of different foods arising from developments in food technology and marketing, and generally improved purchasing power, also as a result of general social and economic changes arising from the greater employment of mothers outside the home.

Finally there have been improvements in the nutritional status of schoolchildren, surveys showing food consumption on average well above recommended minimum levels, and obesity in children (as in adults) being a more common problem than undernutrition.

As a result, children are less dependent on the midday school meal. These factors, together with the increasing cost of providing the school meal service, have called into question the necessity of providing 'on a vast scale a broadly standardised main midday meal' (DES, 1975a).

On the other hand, the Committee recognised that in areas of 'social deprivation' and to a lesser extent in other localities, 'there are children whose only adequate meal of the day is the one they get in school'. They felt, too, that a well balanced school meal was important not only for those children who were obese because they 'eat too much of
the wrong kind of food' but also as a way of developing good eating habits in all children.

In addition to all these factors the Committee felt that the social, economic and nutritional changes had resulted in pupils being 'more mature, discerning and independent' and thus to changed attitudes to school meals.

Thus the need was recognised for 'more flexibility and some changes in approach'.

It was hoped to promote a change of image by changing by changing the name from the School Meals Service to the 'School Catering Service'.

**Nutritional Aims**

These were considered in terms of providing a meal which made 'good sense in terms of their (children's) nutritional needs', but which was also attractive to the pupils. For the first time the idea of striking a balance between 'nutritional aims and the taste of the consumer' was introduced, a problem more than ever a feature of the post-1980 Education Act School Catering Service, and the main theme of this thesis, 'there is no merit in a well-balanced and nourishing meal that remains uneaten' (DES, 1975a). It was recognised also, that the nutritional aims would need specific consideration in the case of not only 'nutritionally deprived children, but also those children who, because of religious or cultural background have special catering needs'.

It was felt that the school catering service should still aim to provide a meal of set nutritional standards for younger pupils and those older secondary pupils who want it, but at the same time be flexible enough to cater for the 'growing number of pupils who want something different'.

The committee felt itself not competent to make a detailed statement on nutritional standards. However, in view both, of the changed recommendations for some nutrients in the recent report 'Recommended Daily Intakes of Nutrients for the United Kingdom' (DHSS, 1969), and also concern about nutritional problems such as obesity and dental caries, it was felt that the recommendations of Circular 3/66 needed to be reviewed, and that an expert committee should be set up to do this. This committee was set up in 1973 and reported in 1975 (DES, 1975b).

Finally the committee resisted any suggestion that it should accept responsibility 'for the whole or greater part of the nutrition of any pupil', by extending the service to provide meals other than midday meals.
or midday meals on non-school days - this being the responsibility of the parents.

Social Aims

The committee felt that the school catering service should have certain social and educational aims;
- it enables mothers to go to work 'secure in the knowledge that a good meal will be provided for their children and that they will have no reason to leave school at midday' (DES, 1975a).
- it makes a contribution to the resources of poorer families by providing free school meals 'to pupils whose parents income falls below a certain level, relative to size and other circumstances of the family'. It was felt that the importance of this contribution, and the uneven incidence of free school meals, justified recognition by the government through the system of distribution of grants.

Educational Role of School Meals

The third social aim concerned the important part played by the school meal in the education of children, 'learning how to eat in the company of others, (maintaining) civilised standards of behaviour when doing so, becoming acquainted with a wider range of food, knowing about balanced meals, including sensible decisions on preferences; all these form an important part of education in a wide sense, (and) serve to establish good eating habits and generally help the physical and social development of the individual pupil in a way which should be to his lasting benefit and that of the community of which he is part. This practical education in the art of taking meals together should form a powerful reinforcement to the food and nutrition education received by the pupils in the classroom. In turn the classroom education should exert a valuable influence on pupils approach to school and other meals' (DES, 1975a).

This was the most ambitious statement yet, concerning the educational role of the school meal. Of all the aims authorised by the committee it will be the most difficult to fulfill, particularly in the light of changes since 1980. The role of school meals in nutrition education is the subject of this thesis.
Recommendations

The keynote of the recommendations made by the Committee to meet those aims was flexibility, 'the arrangements should be flexible enough to meet the varying needs and tastes of children of different age groups and at different stages of their physical and social development'.

- for the 5 to 8/9 age group 'a set meal of a suitable nutritional standard is still the most appropriate',
- for the 9 to 14 age group 'there should be a choice of dishes, becoming wider towards the upper end of the age group, within a set meal of suitable standard',
- for age group 15 upwards there should be a set meal of a suitable nutritional standard for those who want it. For others there should be a choice from an à la carte menu of individually priced items'.

The emphasis is on the discretion given to LEA's and schools 'to choose the system of midday meal provision best suited to their organisation and available facilities, and to other local and individual circumstances' (DES,1975a).

The committee then defined the terms it used;

- 'suitable nutritional standard' - complying with the guidance on the subject current at any given time,
- 'set meal' - one which complies with the recommended standard and takes the form of the traditional two-course 'meat, two veg, and sweet',
- 'à la carte' system - one in which pupils choose one or more individually priced items from a wide selection; where, according to the choice made by the pupil, the selected items may or may not add up in nutritional value to that of a set meal, and where the pupil pays the marked price for each item he selects.

In most authorities the term 'à la carte' has been replaced by the term 'cash cafeteria', and since the 1980 Education Act there are no set nutritional standards.

Aspects of organisational arrangements for meeting aims.

The committee then considered in detail the organisational arrangements and financial aspects of meeting these aims and of implementing the recommendations in practice. The main needs, points of interest and areas of concern relevant to this thesis are;
- the appearance for the first time of a recognition of the need to promote the school meal against the competition of other lunchtime alternatives, now increasingly available as a result of changes in social organisation of many schools,
- the need to attract the middle age group (9-14) pupils and the support of their parents by providing at the same time a nutritious meal, but with enough 'variety to suit all reasonable tastes',
- the concern for older children who are boycotting school meals and go to 'eating places where the quality of food, the surroundings and the company may leave something to be desired',
- concern that 'for pupils who do not go home to a substantial meal in the evening there is the added risk that they are not getting enough to eat'.

That there is cause for concern in these areas is borne out by the results of this survey.

A la carte meals

The introduction of the à la carte system and the freedom of choice that this implies was seen as the main means of overcoming some of the above problems. However this system itself brought difficulties, mainly those of ensuring as far as possible that pupils, particularly those entitled to free meals, received a meal that was nutritionally adequate. These problems were discussed by the committee who felt that they were outweighed by the need to attract older pupils to school meals. That this view is justified, is shown by the study described in Chapter Five which indicates the poor nutritional value of some of the alternatives to school meals.

The philosophy of the committee was that 'the main aim should be towards meeting the customers wishes'. The argument of this thesis is that this should not be incompatible with good nutrition. They put forward the view that 'it is necessary to allow considerable freedom of choice to the pupils in this age group if the trend away from the school catering service among fifth and sixth formers is to be halted and reversed, even though it means that the meal chosen may not measure up to the recommended nutritional standard. We regard this as an acceptable risk' (DES, 1975a).

They justify this view with the following arguments;
- only older secondary school pupils are involved,
- set meals of the recommended nutritional standard would be available for all pupils who wanted them,
there would be ample opportunity for pupils to select dishes which did in practice satisfy the recommended nutritional standards.

'We are therefore discussing only a small minority of pupils in fifth and sixth forms, who, given the freedom to choose their midday meal, might not exercise it to what others would consider the best nutritional advantage' (DES, 1975).

Obviously the situation in the post-1980 Education Act School Catering Service is somewhat different from that envisaged by this committee and the results of this study, discussed in Chapter Five will indicate the extent to which these arguments are justified.

The committee discusses ways of organising the à la carte system, in order to minimise these problems;
- 'it is possible to organise an à la carte system which offers protein and other nutrients in balance and at the same time gives an ample and attractive choice of dish',
- 'indirect methods may be needed in some cases to ensure that the individual's choice is guided in the right direction, although experience suggests that any overt restriction, or control over choice will lead to rejection even of an a la carte system',
- 'an individual's choice may perhaps be encouraged by pricing policy' ... 'pupils exercising a free choice are, in general, more likely to choose nutritionally valuable dishes, for example, protein foods of animal origin, if these are subsidised, while other foods which are superficially more attractive to young people have to be paid for at an economic rate'.

Thus this carefully considered and researched report set down the aims and organisation of a school catering service to meet the needs of schoolchildren in the 1970's. The report 'Nutrition in Schools' (DES, 1975b) looked more closely at nutritional aspects of this service.

1.6.2 'Nutrition in Schools' (DES, 1975b)

Background to the establishment of the Working Party and their terms of reference.

Following the 'Catering in Schools' report (DES, 1975a), there was a feeling that the nutritional aspects of school meals should be reviewed,
in the light of recent developments in nutritional knowledge, changes in family eating habits, and the proposed changes in school meals. A working party, including medical experts on nutrition, and dietitians was therefore established in 1973. Their report, published in 1975, is a very detailed review of various nutritional aspects of school meals, including a discussion of the need for nutritional standards, the implications of the introduction of an 'à la carte' system, and recommendations.

The terms of reference of the working party were 'to review nutritional aspects of school meals in the light of developments since the issue of DES Circular 3/66, and to make recommendations.'

**Educational Role of School Meals**

In addition to what they saw as their main task, that of reviewing and making recommendations for nutritional standards, the working party also discussed 'school meals in the broader context of education'.

They felt that the school meal has an important role to play in 'the fostering of good eating habits in younger children, and the encouragement of an intelligent interest in the choice and preparation of food in older pupils'. They also welcomed 'curricular-links' such as 'the moves that are being made to bring the School Catering Service into closer working relationship with home economics departments in schools' (DES, 1975b).

**The need for nutritional standards**

The Working Party felt that there was still a need for nutritional standards, despite an adequacy of most nutrients in most households, and it was felt that 'parents whose children take the school dinner should be secure in the knowledge that it is a balanced nutritious meal' (DES, 1975b).
Recommendations

Energy and protein;

- the 1965 standards for the energy and protein content of the school dinner should remain unchanged i.e. the edible portion of food purchased should provide, on average,
  
  880 kilocalories (3.68 MJ)
  29 grams of protein,

- the energy and protein content of the meal as served on the plate should be regularly monitored; this should aim to provide a minimum of,
  one third of the recommended intake of energy
  one half to one third (say 42 per cent) of the recommended intake of protein

- individual differences in requirements to be met by adjusting the size of helpings to the appetite of the child,

- it was felt that the school meal should make an important contribution to the child’s daily protein intake to safeguard those children who do not receive a satisfactory diet at home, 'any shortage in protein in the midday meal might easily not be made up ... outside school' ... 'there is far less risk that the diet will be inadequate in energy content',

- the Working Party did not specify an exact proportion of animal protein to be included, but recommended that 'in view of the important contribution which animal protein foods (especially meat) make to the total dietary intake of iron, Vitamin B12 and other nutrients, and to palatability, we think that the school meal should continue to include a specified quantity of meat' (DES, 1975b).

Fat

- the minimum amount of fat to be provided should no longer be specified. This was in view of the fact that nutritionists were beginning to recommend a reduction of fat consumption. The Working Party did not feel able at that time to recommend a specific reduction in animal fats, but recommended that vegetable oils should be used for frying for culinary reasons.

Other nutrients.
it was felt that an adequate intake of most other nutrients could be ensured by a 'mixed diet'. It was recommended, however, that margarine fortified with vitamin D should be used, and the use of milk and cheese should be encouraged in order to ensure an adequate intake of vitamin D and calcium. The recommendation made for the more frequent serving of meat, would contribute to iron intake,

recommendations were made to ensure cooking and serving losses of vitamin C and water-soluble B vitamins were minimised.

Finally the importance of serving palatable and attractive meals was emphasised, 'however, a nutritious meal will benefit pupils only if they eat it' ...'menu planning should take account of the likes and dislikes of the children in their schools'. 'This does not mean that they will not at the same time be concerned to extend the children's horizons in eating as in school life as a whole'.

Nutritional content of à la carte meals.

The Working Party discussed in some detail the problem foreseen by the 'Catering in Schools' committee, that of ensuring that children's nutritional needs are met by the items which they choose from an à la carte system, without putting any restriction or control on this choice. This would defeat the purpose of this system, that of attracting older pupils to school meals.

This thesis argues that this is a problem of nutrition education, and thus is a priority area for 'curricular-links' with school meals. This argument is first introduced by this Working Party, 'it is an essential feature of the à la carte service that pupils should be allowed to choose what they wish to eat and this is incompatible with the imposition of closely prescribed nutritional standards. We feel, however that this does not relieve authorities of the responsibility of ensuring, as far as they can, that pupils receive adequate meals'.

The importance of both careful menu planning and nutrition education were discussed;

- provision of a choice of main dishes designed to provide a reasonable proportion of a pupils 'chief nutritional needs' or by provision of a wide and varied selection of dishes to 'enable any pupil who so wishes to take a balanced and nutritious meal'.
- 'we think it is important also that pupils who can choose their own
meal are aware of the implications for their health involved in their choice'. 'The need for some understanding of nutritional values is particularly important in the case of pupils who take the a la carte service'. The working party suggest that unobtrusive advice or guidance be given in the form of 'indicating that certain combinations of dishes will give a balanced diet'.

The working party also discussed the particular problem of ensuring that children who were entitled to free meals received a nutritionally adequate meal; they could suggest no solution except that parents appreciated the problem and took the responsibility for it.

**Nutritional problems, obesity and dental caries, in relation to school meals.**

The working party also discussed the nutritional problems of obesity and dental caries in relation to school meals. It was suggested that as long as sugar was used sparingly - the present recommended quantity of half an ounce per meal should not be exceeded - that the inclusion of a pudding in the school meal is probably less harmful than the consumption of sugar in the form of toffees or other sweet foods consumed in-between meals. Such sweet snacks are often sold in the school tuck shop.

That obesity is now a more common problem than undernutrition among school children was recognised, and the Working Party were satisfied that the school meal per se did not contribute to the problem of obesity. The child's overall intake of food for the day was the most important factor and thus was the parents' responsibility. It was felt, however, that while the staff serving the school meal could not be expected to initiate measures to limit a child's food intake, the school should co-operate with the home in identifying and helping children with this problem.

The Working Party also discussed areas such as the use of convenience foods and textured vegetable protein, monitoring and analysing meals, plate waste and staffing, a detailed consideration of which is outside the scope of this thesis.

1.7 **THE 1980 EDUCATION ACT**

The reports of the Working Parties in 1965 and 1975, have been
discussed in some detail even though some of the nutritional ideas, particularly from the 1965 report, now seem out of date. They do, however, indicate the depth of concern and the extent of the evidence considered, at government department level, before making changes to a service which has, for some time, been seen as making an important contribution to the health of schoolchildren.

Changes were obviously necessary, as was recognised in the 1975 Report 'Catering in Schools' (DES, 1975), and the Working Parties considered these changes and their implications. The two reports - 'Catering in Schools' and 'Nutrition in Schools' (DES, 1975a\&b) provided the framework for developing a school catering service to meet the needs of school children in the late 1970's and onwards.

The 1980 Education Act made the following important changes in the provision of school meals;
- it removed the statutory obligation of Local Education Authorities to provide school meals except for those pupils whose parents are in receipt of supplementary benefit or family income supplement,
- the school meal no longer had to conform to the previous nutritional standards (DES, 1975a\&b).

This chapter has examined the development of the school meals service in relation both to social and economic conditions, and also to the developing ideas on the nutrition of schoolchildren. This thesis is concerned with the post-1980 Education Act School Meal Service; the effects of, and reaction to this Act are discussed in Chapter Four. This discussion indicates that the effect of this Act is to produce a School Catering Service very different from that envisaged by the committee producing the Catering in Schools report in 1975.

The feeling of many involved in this field is that, before the Act was passed, very little consideration was given to the effects of the fairly drastic changes which would inevitably occur as a result of this Act. It seems to many that this represented a return to the situation of 1922 when financial expediency came before the health of school children.
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CHAPTER TWO - THE DEVELOPMENT OF DIETARY GUIDELINES.

2.1 INTRODUCTION

The previous chapter described the development of the school meals service against the background of social and economic changes, and also the developing knowledge of nutrition.

As emphasised, nutritional problems during the 1930's were related to inadequate supplies of food; at the same time nutrition research was revealing the role of nutrients in growth and health, and the relationship between poverty and malnutrition was increasingly being recognised. Thus government wartime food policy, ensuring that the population was adequately fed 'seemed to be the culmination of a remarkable two decades of nutrition research' (James et al 1981).

During the 1970's, at the same time as the school meals service was being reviewed, there was a change in emphasis in nutritional thinking, due to a realisation that the social and economic changes which had occurred since the war had affected eating habits.

During the 1960's and 1970's doctors and nutritionists were increasingly recognising that changing disease patterns might be related to the changes in food consumption associated with increasing affluence. This renewed interest in the relationship between nutrition and health followed a period when according to James et al (1981) 'there seemed to be few problems of public health importance which warranted attention, and the impetus for nutritionists had gone.

The realisation that diet may be a contributory factor in many of the so called 'diseases of affluence' led to a closer examination of the role of diet in the aetiology of diseases such as cardiovascular disease, and certain types of cancer, which are now the major causes of death; also conditions such as obesity, dental caries, maturity onset diabetes, diverticular disease and constipation, all of which are major health problems in this country. Diet is almost certainly one of the complex interacting factors contributing to these diseases, and the task of defining the role of diet is an extremely time consuming and difficult one, compared, say, with the relatively simple one of identifying the importance of vitamin A deficiency disease (James et al 1980). This task
will continue for some time, combining evidence from epidemiological, clinical, and physiological studies.

Despite this, from the mid 1970's onwards, many have felt that there was already sufficient evidence to suggest that certain dietary modifications should be made, in order to attempt to reduce the incidence of these and possibly other diseases. Many countries had officially accepted quantified dietary goals by the end of the 1970's. In this country the National Advisory Committee on Nutrition Education (NACNE) published 'A discussion paper on proposals for nutritional guidelines for health education in Britain' in 1983. This was followed in 1984 by a DHSS COMA report making recommendations specifically related to diet and cardiovascular disease. While there is by no means agreement on the details of the recommendations, the argument of this thesis is that there is sufficient consensus of opinion to be able to put forward a strong case for a re-examination of the nutritional basis of school meals, to take account of current nutritional ideas.

This chapter therefore examines firstly the changes in food consumption and nutrient intake since the end of the war, secondly the changing disease patterns over the same period of time and finally the dietary modifications suggested by various medical and nutrition experts in the late 1970's and early 1980's.

2.2 CHANGES IN FOOD CONSUMPTION AND NUTRIENT INTAKE

2.2.1 Source of data

Data on food consumption in this country comes from two main sources;
- Food Consumption Level Estimates (CLE) published annually by the Ministry of Agriculture, Fisheries and Foods (MAFF) These refer to total food supplies and are compiled from statistics of agricultural production, with allowances made for export and non-food uses, and food imports. They roughly correspond to food that is available for human consumption, sometimes expressed as 'foods moving into consumption'.
- The National Food Survey (NFS) also published annually by MAFF as 'Household Food Consumption and Expenditure'. This records actual household food consumption, but does not include drinks, food or confectionery consumed outside the home.
2.2.2 Discrepancy between CLE and NFS figures

The discrepancy between the CLE and NFS figures is shown by Figure 2.1. It can be seen, for example, that in 1982 the basic food supplies could have provided 12.4 MJ (2954 kcal) per person, while energy needs of the population are estimated to average only about 9MJ (2200 kcals) per person per day (Wenlock and Buss, 1984).

The difference between the CLE figures and the NFS figures varies between 19 - 30 per cent; this difference is due partly to small losses occurring at every stage in the distribution chain, and also to the fact that NFS figures do not show foods such as meals and snacks, confectionery, soft drinks, and alcoholic drinks, consumed outside the home. Allowance is, however, made for some meals eaten away from home.

Figure 2.2 would indicate that the difference between the two sets of figures is increasing, and it has been suggested (Turner and Gray, 1982) that this reflects the increase in 'out of home' eating which has occurred in the 1970's (King, 1983). This is supported by data on snacks and snack meals, Tables 2.1 and 2.2, (BNF, 1981).

Table 2.1. Data on meal occasions 1975 - 1977 (from BNF, 1981)

<table>
<thead>
<tr>
<th></th>
<th>1975</th>
<th>1976</th>
<th>1977</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of meal occasions</td>
<td>311m</td>
<td>315m</td>
<td>335m</td>
</tr>
<tr>
<td>Staff catering</td>
<td>44%</td>
<td>39%</td>
<td>31%</td>
</tr>
<tr>
<td>Take-away</td>
<td>13</td>
<td>14</td>
<td>18</td>
</tr>
<tr>
<td>Cafes and snack bars</td>
<td>12</td>
<td>14</td>
<td>15</td>
</tr>
<tr>
<td>Schools, hospitals</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>institutional</td>
<td>11</td>
<td>11</td>
<td>13</td>
</tr>
<tr>
<td>Hotels and restaurants</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Pub snacks</td>
<td>8</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>In-store restaurants</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

(Source: NEDO in Mintel, July 1979)
Figure 2.1. Mean energy content (MJ) of total food supplies (CLE) and average household diet (NFS) in the UK from 1950 - 1982 (plotted from data in DHSS, 1984).

Figure 2.2. Variation in percentage difference between mean energy values from CLE figures and NFS figures between 1952 and 1982.
Table 2.2. Consumption of three snack food items between 1975 and 1977 ('000 tonnes), (from BNF, 1981)

<table>
<thead>
<tr>
<th>Year</th>
<th>Sugar Confectionery</th>
<th>Chocolate Confectionery</th>
<th>Potato Crisps</th>
</tr>
</thead>
<tbody>
<tr>
<td>1975</td>
<td>308</td>
<td>328</td>
<td>461</td>
</tr>
<tr>
<td>1976</td>
<td>317</td>
<td>345</td>
<td>397</td>
</tr>
<tr>
<td>1977</td>
<td>331</td>
<td>339</td>
<td>399</td>
</tr>
<tr>
<td>1978</td>
<td>333</td>
<td>364</td>
<td>403</td>
</tr>
<tr>
<td>1979</td>
<td>306</td>
<td>370</td>
<td>500</td>
</tr>
</tbody>
</table>

(Source: Cocoa, Chocolate and Confectionery Alliance and Potato Marketing Board)

While the figures shown in Tables 2.1 and 2.2 relate only to the late 1970's, the consumption of food not recorded by the NFS would appear to be increasing.

This discrepancy between CLE and NFS figures is also shown by Figure 2.3 comparing the amount of carbohydrate in grams in total available food supplies and in the average household diet.

Figure 2.4 shows that in the case of carbohydrate content the percentage difference between CLE and NFS figures is also increasing; Lennon and Fieldhouse (1982) suggest that an increasing amount of carbohydrate is eaten outside the home. That this is mainly sugar in the form of soft drinks, sweets and confectionery which are not included in the NFS figures is indicated by the figures for foods moving into consumption where there is a steady decline in grain products but not in chocolate and sugar confectionery.

A comparison of CLE and NFS figures for both energy and carbohydrate, thus illustrates the point that if only one set of figures is examined incorrect conclusions may be drawn. The trend shown by both sets of figures is broadly similar, both showing a decline in energy and carbohydrate since about 1970, but the actual decline is not as steep as that indicated by the NFS figures. There is some concern among nutritionists that, with the increase in eating outside the home particularly of snack foods, often high in fat and sugar, the NFS figures will give an increasingly misleading picture. It is suggested that data
Figure 2.3. Mean carbohydrate content (g) of total food supplies (CLE) and average household diet (NFS) in the UK from 1950 to 1982 (plotted from data in DHSS, 1984).
Figure 2.4. Variation in percentage difference between mean carbohydrate content from CLE and NFS figures between 1952 and 1982.
on actual intake, while considerably more difficult to obtain, should be used as the basis of recommendations, and also to monitor trends.

2.2.3 Use of data for epidemiological studies

The data from both these sources (CLE and NFS) have been used in epidemiological studies relating morbidity and mortality to diet. CLE figures were used as the basis for the quantified recommendations made by the NACNE working party (1983); these figures were also used by Passmore et al (1979) as the basis for the recommendations they made in 'Prescription for a better British diet'. The NFS figures have also been used, the BNF publication 'Implementation of Dietary Guidelines' (1982) bases discussion of the link between diet and disease on NFS figures.

The issue that the discrepancy between the two sets of figures may affect their use in epidemiological studies has been discussed in two recent articles.

Wenlock and Buss (1984) discuss CLE figures; they point out that 'the purpose of this statistical series is to quantify, for policy purposes, the adequacy of the primary resources that are available for food manufacturers, distributors and caterers (and ultimately housewives) to use'. They also point out that while 'it is not intended to represent what the population as a whole is actually eating', the 'trends in total food supplies (CLE figures) run broadly parallel to those shown by the NFS and to other information on diets'. They thus justify their use as a basis for quantifying dietary recommendations in the UK. In an editorial comment on this paper Southgate (1984) justifies the use of CLE as the basis of NACNE recommendations on two grounds;

- the recommendations relate to changes in respect of the whole population, and CLE figures do apply at this level,
- much of the epidemiological evidence relating diet and disease is based on statistics for intake measured at this level.

Southgate, however, points out the difficulty of 'assessing changes in actual intake of food from estimates made at commodity level'. He argues that in present day conditions, where food supplies are plentiful actual intake is only weakly related to food supply.

Southgate also comments that 'the changes in CLE figures suggest that the UK diet may be changing in the direction recommended by NACNE'; but also that this, in fact, highlights the need to have better estimates of total actual dietary intakes. Wenlock and Buss (1984) question the extent to which these changes are reflected in the diet of different sections of
Derry and Buss (1984) discuss the use of NFS figures in epidemiological studies linking diet and disease. They mention five main limitations of the NFS;

- it is confined to food bought for consumption at home, although this has been estimated to represent at least 85-90 per cent of all food eaten,
- it excludes sweets, soft drinks, alcohol and vitamin supplements,
- it records food acquired rather than amounts actually eaten,
- the nutrient content is estimated using factors based on standard food tables rather than from chemical analysis of the items concerned,
- the survey does not provide estimates of the food consumption of individual household members or individual households

They conclude however, that the main strength of the NFS is 'that it provided continuous information on food and nutrient intakes, now spanning more than 30 years ... it remains an up-to-date, readily accessible, and comparatively cheap means of monitoring trends in household food consumption and of assessing a major aspect of nutritional status for epidemiologists to compare with any similar temporal or cross sectional data on morbidity and mortality'.

A synopsis of this paper appeared in the National Dairy Council Quarterly Review (NDC, 1984) with the editorial comment 'nevertheless there is some concern amongst nutritionists that, because of the breakdown in formal eating occasions and the increasing consumption of chocolate and savoury snack products (Table 2.3, overleaf), NFS figures may not, in the future, be sufficient to provide a true picture of energy and nutrient, particularly fat, intakes'.

Frank (1984) in an paper discussing the National Food Survey also points out one of the drawbacks of using NFS figures as a basis for drawing nutritional conclusions, that of comparing 'aggregate nutritional value of household food with aggregated estimates of nutritional need'. This author points out that averages obscure reality; this in fact supports the need for nutritional recommendations to be based on records of actual intake.

Frank suggests that the main purpose of the NFS figures are to yield economic information, and 'if detailed nutritional information is desired, then a parallel nutrition survey is needed, ... the single most important improvement which could be made to the NFS would be to actually answer the
question 'what do people eat?' and thus provide the nutritional information which is needed for the development of a considered food policy'. This must also be borne in mind when using these figures to monitor trends in food consumption when evaluating the effect of health education.

Table 2.3. Food Trends
(from Krausser, 1985)

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Chocolate ('000 tons)</td>
<td>352</td>
<td>360</td>
<td>393</td>
<td>409</td>
</tr>
<tr>
<td>Sugar confectionery ('000 tons)</td>
<td>275</td>
<td>267</td>
<td>261</td>
<td>247</td>
</tr>
<tr>
<td>Crisps (million packets)</td>
<td>3,300</td>
<td>3,300</td>
<td>3,400</td>
<td>3,500</td>
</tr>
<tr>
<td>Savoury snacks (million packets)</td>
<td>1,140</td>
<td>1,215</td>
<td>1,280</td>
<td>1,335</td>
</tr>
<tr>
<td>Vitamins (million pills)</td>
<td>675</td>
<td>740</td>
<td>820</td>
<td>1,040</td>
</tr>
<tr>
<td>Yoghurt (million pots)</td>
<td>680</td>
<td>720</td>
<td>800</td>
<td>863</td>
</tr>
</tbody>
</table>

(Source: KAE/Mintel)

However, despite the discrepancies, the trends shown by both CLE and NFS figures are similar enough to show changes in food consumption since the war and the resulting changes in energy and nutrient intake. The NFS figures are used in this chapter as a basis for discussing these changes.

2.2.4 Immediate Post War Changes

Darke (1979) traces the changes in food consumption back to the gradual ending of rationing between 1945 and 1954, by which time a wide range of foods was available again, and full employment meant that most people had money to buy food. The demand was noticeably greater for foods which had been rationed, scarce or unobtainable during the war. The demand for sweets and sugar increased (so much so that sweets had to be rationed again), meat appeared at least once a day in most homes, and fewer cereals and potatoes were eaten. Dissatisfaction with the national wheatmeal loaf created a demand for white flour of lower extraction rate. Hollingsworth (1979) mentioned the great demand for fat from a population 'tired of the lack of palatability associated with a diet low in fat'. This demand was at its peak in the late 1940's when the percentage of
total energy derived from fat was 33 per cent, estimated to be the lowest this century. This has been used to cast doubt on the acceptability, even in the long term, of the NACNE recommendation of 30 per cent energy from fat; it certainly emphasises the importance of introducing variety into the diet and alternative means of adding palatability to foods when reducing fat intake.

Also during this post-war period changes in life style created demands for convenience foods which were met by developments in food technology.

2.2.5 Changes in food consumption, 1952 - 1977

This chapter is concerned with the changes in food consumption which led to the suggestion, made in the late 1970's and early 1980's, that there was a need for dietary modification. The period of time, therefore, over which these changes are considered is from 1952 - 1977.

The main changes in food consumption over this time have been the decrease in consumption of bread and potatoes, and the increase in consumption of meat, of dairy products, such as cheese, butter, cream, and also of margarine and cooking fats. The changes in household consumption of these and other main groups of foods is shown graphically by Figure 2.5.

Hollingsworth (1978) examines NFS data from 1952 - 1977 and reviews the main changes in food consumption. These are summarised below.

Meat and meat products

The increase in consumption of meat and meat products is shown by Table 2.4; the notable increases being in the consumption of poultry and canned and frozen meat and meat products - classified under 'All other meat'.

55
Figure 2.5 Average household consumption of some groups of foods 1952 to 1979
(from Turner and Gray, 1982)

Source: MAFF, 1954 onwards
Table 2.4. Average household consumption of meats in 1952 to 1977 (oz per head per week) (from Hollingsworth, 1978)

<table>
<thead>
<tr>
<th>Year</th>
<th>Carcass meats</th>
<th>Bacon and ham, uncooked</th>
<th>All other meat</th>
<th>Total meat and meat products</th>
</tr>
</thead>
<tbody>
<tr>
<td>1952</td>
<td>11.9</td>
<td>4.9</td>
<td>12.2</td>
<td>29.0</td>
</tr>
<tr>
<td>1960</td>
<td>17.4</td>
<td>5.3</td>
<td>13.2</td>
<td>35.9</td>
</tr>
<tr>
<td>1965</td>
<td>16.8</td>
<td>5.4</td>
<td>15.4</td>
<td>37.6</td>
</tr>
<tr>
<td>1970</td>
<td>15.9</td>
<td>5.3</td>
<td>18.3</td>
<td>39.5</td>
</tr>
<tr>
<td>1973</td>
<td>13.7</td>
<td>4.4</td>
<td>18.5</td>
<td>36.6</td>
</tr>
<tr>
<td>1974</td>
<td>14.7</td>
<td>4.2</td>
<td>17.1</td>
<td>35.0</td>
</tr>
<tr>
<td>1975</td>
<td>15.3</td>
<td>4.0</td>
<td>17.8</td>
<td>37.1</td>
</tr>
<tr>
<td>1976</td>
<td>14.7</td>
<td>4.0</td>
<td>18.4</td>
<td>37.1</td>
</tr>
<tr>
<td>1977</td>
<td>14.6</td>
<td>4.3</td>
<td>18.4</td>
<td>37.3</td>
</tr>
</tbody>
</table>

(Source: National Food Survey Reports)

Other animal protein foods

Although milk consumption did not change over this period, cheese consumption increased by 75 per cent, and yoghurt (a food hardly known in this country in 1952) became popular, (680 million pots in 1980; Kraushar, 1985). Fish consumption decreased to 60 per cent of the level consumed in 1952, the increasing consumption of fish fingers and other frozen convenience fish products failing to compensate for this. Egg consumption increased from 3 to 4 per person per week over this period.

Visible fats

Consumption of these is shown in Table 2.5. The changes in consumption of different types of fat is shown by Figure 2.6, showing the relationship between the consumption of butter and margarine, and particularly soft margarine, from 1972 when it was first recorded separately by the NFS. Both Lennon and Fieldhouse (1982) and Turner and Gray (1982) attribute this relationship to price fluctuations rather than nutritional considerations. There has also been an increase in the consumption of vegetable oils over this period.
Figure 2.6 Trends in household consumption of butter, margarine and total fat in Britain from 1952 to 1982

(from Derry and Buss, 1984)
Table 2.5. Average household consumption of visible fats in 1952 to 1977 (oz per head per week) (from Hollingsworth, 1978)

<table>
<thead>
<tr>
<th></th>
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<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1st half</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Butter</td>
<td>2.8</td>
<td>5.7</td>
<td>6.1</td>
<td>8.0</td>
<td>5.2</td>
<td>5.6</td>
<td>5.6</td>
<td>5.2</td>
<td>4.6</td>
</tr>
<tr>
<td>Margarine</td>
<td>4.4</td>
<td>3.7</td>
<td>3.0</td>
<td>2.9</td>
<td>3.0</td>
<td>2.6</td>
<td>2.6</td>
<td>3.1</td>
<td>3.5</td>
</tr>
<tr>
<td>Lard and</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>compound</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cooking fat</td>
<td>2.0</td>
<td>2.1</td>
<td>2.1</td>
<td>2.2</td>
<td>1.8</td>
<td>1.8</td>
<td>2.0</td>
<td>1.9</td>
<td>1.8</td>
</tr>
<tr>
<td>Other fats</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
<td>0.9</td>
<td>1.1</td>
<td>1.1</td>
<td>0.9</td>
<td>0.9</td>
<td>0.9</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>visible</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>fats</td>
<td>9.8</td>
<td>12.0</td>
<td>11.9</td>
<td>12.0</td>
<td>11.2</td>
<td>11.0</td>
<td>11.1</td>
<td>11.0</td>
<td>10.9</td>
</tr>
</tbody>
</table>

(Source: National Food Survey reports)

Bread and cereal foods

The decline in bread consumption from 1960 to 1977 is shown in Table 2.6.

Table 2.6. Average household consumption of breads and flour 1960 to 1977 (oz per head per week) (from Hollingsworth, 1978)

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>1st half</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White bread</td>
<td>36.6</td>
<td>34.4</td>
<td>32.2</td>
<td>27.6</td>
<td>28.2</td>
<td>27.7</td>
<td>26.4</td>
<td>25.9</td>
</tr>
<tr>
<td>wholewheat, wholemeal and brown bread</td>
<td>3.3</td>
<td>3.5</td>
<td>2.9</td>
<td>2.8</td>
<td>2.6</td>
<td>3.3</td>
<td>3.6</td>
<td>3.8</td>
</tr>
<tr>
<td>Other bread</td>
<td>5.5</td>
<td>2.8</td>
<td>3.0</td>
<td>3.1</td>
<td>2.6</td>
<td>2.7</td>
<td>3.1</td>
<td>3.3</td>
</tr>
<tr>
<td>Total bread</td>
<td>45.4</td>
<td>40.6</td>
<td>38.1</td>
<td>33.4</td>
<td>33.5</td>
<td>33.7</td>
<td>33.2</td>
<td>33.0</td>
</tr>
<tr>
<td>Flour</td>
<td>6.8</td>
<td>6.1</td>
<td>5.7</td>
<td>5.2</td>
<td>5.3</td>
<td>5.2</td>
<td>6.0</td>
<td>6.5</td>
</tr>
</tbody>
</table>

(Source: National Food Survey reports)

The bread consumption in 1952 was even higher, at over 54 ounces per person per week. The fall shown is almost all white bread. Consumption of all other cereals, rice, barley, oatmeal, has also fallen. The
consumption of breakfast cereals has, however, within the overall decline in cereal consumption, more than doubled during this period. Buss (1979) suggests that this is not 'entirely independent of declining usage of both bacon and eggs'.

**Potatoes**

Consumption of fresh potatoes decreased from 4 pounds per head per week in 1952 to just over 2 pounds in 1977. However potato crisps, chips and other potato products purchased to eat at home, accounted for by the NFS have increased from 1 ounce per head per week to two and a half ounces. Many of these products are also consumed outside the home, and therefore are not accounted for. Total consumption in 1979 was 3,000 million packets (Davies 1980).

**Fruit and vegetables**

Consumption has not followed clear trends, but overall changes have not been great, except for fruit juices.

**Sugar and Sugar containing foods**

Figures for consumption of sugar and sugar containing foods are shown in Table 2.7

Table 2.7. Average household consumption of sugar and some sugar containing foods, 1952 to 1977 (oz per head per week)
(from Hollingsworth, 1978)

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Sugar</td>
<td>11.0</td>
<td>17.8</td>
<td>17.6</td>
<td>16.9</td>
<td>13.7</td>
<td>13.0</td>
<td>11.3</td>
<td>12.2</td>
<td>11.6</td>
</tr>
<tr>
<td>Preserves</td>
<td>6.0</td>
<td>3.2</td>
<td>3.0</td>
<td>2.6</td>
<td>2.5</td>
<td>2.5</td>
<td>2.4</td>
<td>2.3</td>
<td>2.4</td>
</tr>
<tr>
<td>Cakes and pastries</td>
<td>5.4</td>
<td>4.8</td>
<td>4.8</td>
<td>4.5</td>
<td>3.7</td>
<td>3.5</td>
<td>3.1</td>
<td>2.8</td>
<td>2.8</td>
</tr>
<tr>
<td>Biscuits</td>
<td>4.8</td>
<td>5.7</td>
<td>5.8</td>
<td>5.8</td>
<td>5.8</td>
<td>5.6</td>
<td>5.6</td>
<td>5.6</td>
<td>5.6</td>
</tr>
</tbody>
</table>

(Source: National Food Survey reports)

This shows a decline in sugar consumption except in the form of
biscuits. However, in this group the NFS figures are likely to be a less accurate reflection of intake, as sugar in the form of sweets, chocolates, soft drinks and other sweet snacks are frequently bought and consumed outside the home. Soft drinks have shown a threefold increase during this period. There is also indication that chocolate consumption is rising. The consumption of a new group of foods, frozen convenience cereal foods, including frozen sponges, eclairs, fruit pies, and pastry, separately identified by the survey in 1972, has also rapidly increased.

A detailed examination of the changes in types of food consumed within the main groups, and of the social and economic factors related to these changes is beyond the scope of this thesis. However, a number of factors which have been a feature of this period will have affected food consumption, and thus may be assumed to have nutritional implications. These factors are discussed below.

**Effect of rising food prices in the 1970's**

The sharp rise in food prices which occurred in the 1970's and its effect in food consumption and nutrition is discussed by Buss (1979). This author points out that incomes also increased rapidly (unemployment figures were also rising) and the overall distribution of the diet between the main groups of foods, meat, fish, dairy products, cereals, sugar, fats, fruit and vegetables remained comparatively steady. (There were greater changes in consumption of foods within these broad groups, but these had little effect on overall nutrient intake). Buss points out that, due to the decrease in the amount of food bought for household consumption (NFS figures), and thus the energy intake, the nutritional quantity as measured in nutrients per MJ (Table 2.7) actually increased. However as this discussion is based on NFS figures, food eaten outside the home is not accounted for, so this increase in nutritional quality may be more apparent than real.
Table 2.8. Nutritional quality of the average household diet, as nutrients/MJ
(from Buss, 1979)

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Protein g</td>
<td>6.9</td>
<td>7.1</td>
<td>7.5</td>
<td>7.6</td>
</tr>
<tr>
<td>Animal Protein g</td>
<td>4.3</td>
<td>4.4</td>
<td>4.8</td>
<td>4.9</td>
</tr>
<tr>
<td>Fat g</td>
<td>11.0</td>
<td>11.0</td>
<td>11.0</td>
<td>11.0</td>
</tr>
<tr>
<td>Carbohydrate g</td>
<td>29.0</td>
<td>29.0</td>
<td>29.0</td>
<td>29.0</td>
</tr>
<tr>
<td>Calcium mg</td>
<td>97.0</td>
<td>102.0</td>
<td>105.0</td>
<td>106.0</td>
</tr>
<tr>
<td>Iron mg</td>
<td>1.27</td>
<td>1.27</td>
<td>1.21*</td>
<td>1.16</td>
</tr>
<tr>
<td>Thiamin mg</td>
<td>0.11</td>
<td>0.12</td>
<td>0.12</td>
<td>0.13</td>
</tr>
<tr>
<td>Riboflavin mg</td>
<td>0.17</td>
<td>0.18</td>
<td>0.19</td>
<td>0.19</td>
</tr>
<tr>
<td>Nicotinic acid mg</td>
<td>2.8</td>
<td>2.9</td>
<td>3.0</td>
<td>3.1</td>
</tr>
<tr>
<td>Vitamin C mg</td>
<td>4.9</td>
<td>5.3</td>
<td>5.3</td>
<td>5.5</td>
</tr>
<tr>
<td>Vitamin A (retinol equivalent) ug</td>
<td>127.0</td>
<td>127.0</td>
<td>143.0*</td>
<td>156.0*</td>
</tr>
<tr>
<td>Vitamin D ug</td>
<td>0.27</td>
<td>0.29</td>
<td>0.28</td>
<td>0.28</td>
</tr>
</tbody>
</table>

(new factors in operation as a result of new analyses, which substantially affected the nutrient contributions ascribed to certain foods).

Introduction of new foods and convenience foods

The introduction of a wide range of new convenience foods was also a feature of this period. The increase in consumption of frozen convenience foods related to the growth of freezer ownership is noted by Hollingsworth (1978)

The NFS identifies new foods 'when they have become sufficiently popular to be noticeable'. Particular categories mentioned include yogourt, frozen meats and meat products, frozen fish convenience products, and frozen cereal convenience foods such as sponges, eclairs, fruit pies, pastry, and pizza. It is not clear what types of foods these have displaced, and so the nutritional implications cannot be discussed.

Some of the information comes from market research data, and this is discussed by King (1983), who also discusses hypotheses to account for what he calls the 'watershed' in food consumption trends which occurred in 1970. He suggests that social change is the most likely factor to account for this, with ideas on healthy eating and economic factors also
As the trends are even more apparent in the 1980's they will be discussed in Chapter Six.

The introduction of a wide range of snack foods both sweet and savoury is also a feature of this period, and as many of these are consumed outside the home they are not recorded by the NFS. This is causing concern among some nutritionists as many of these products are high in fat and sugar, and supports the case for dietary recommendations to be made on the basis of data on actual intakes, discussed in Section 2.2.3.

2.2.6 Effect of changes in food consumption on nutrient intake

In order to ascertain the likely health implications of these changes in food consumption the resulting changes in nutrient intake must be examined.

The most noticeable changes in food consumption, ie. the decrease in consumption of bread and potatoes, and the increase in consumption of meat and dairy products, margarine and cooking fats, have resulted in changes in consumption of the main nutrients, notably an increase in the proportion of energy from fat and a decrease from carbohydrate.

Effect of increasing affluence on nutrient intake

The relationship between those changes and increasing affluence was recognised and summarised by Hollingsworth (1979) 'as a nation or class becomes more affluent... they tend to increase their energy intake compared with their energy expenditure... and to increase the proportion of this food energy derived from fat at the expense of that from carbohydrate, and within the carbohydrate group, to displace starch by sugar. Little change occurs in the percentage derived from protein, though animal protein tends to displace vegetable protein. Probably these changes lead to a reduction in dietary fibre in the food supply'.

These trends were noted by a group of nutritionists (Perisse, 1969) and expressed graphically (Figure 2.7)

Thus the diseases associated with these changes in food consumption have become known as 'diseases of affluence' or 'diseases of Western Civilization' and are in direct contrast to the nutritional problems still occurring frequently in the Third World Countries. One might question how realistic it is to expect to achieve the reversal of such established
Figure 2.7 Energy derived from fats, carbohydrates, and proteins as a percentage of total calories according to income of the countries (1962)

(from Turner and Gray, 1982)

(a) Based on 85 countries
Source: Périssé et al., 1969
trends, as suggested by NACNE (1983) in a still relatively affluent society.

An examination of the nutrient content of the British diet derived from CLE and NFS Statistics for the period (1952 - 1977) over which these changes have been discussed, shows clearly these trends.

**Energy**

Figure 2.1 (Section 2.2.2) shows the variation in energy intake from both CLE and NFS figures, and the discrepancy between the two has already been discussed (Section 2.2.2). They both, however, show a decline in energy intake from about 1970. Turner and Gray (1982) attribute this to 'reduced physical activity, central heating, and the increased awareness of the hazards of overweight'. They also support the idea that the steeper decline in NFS figures represents the increase in out-of-home eating.

Table 2.9 shows the decline in energy value of average household diets expressed as a percentage of recommended intake. This decline is reflected in a changed RDA for energy in the DHSS (1979) figures.

**Table 2.9.** Energy value of average household food consumption as percentage of recommended energy intake 1952 to 1977 (from Hollingsworth, 1979)

<table>
<thead>
<tr>
<th></th>
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<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>99</td>
<td>106</td>
<td>108</td>
<td>111</td>
<td>104</td>
<td>101</td>
<td>96</td>
<td>95</td>
<td>93</td>
</tr>
</tbody>
</table>
| (source: National Food Survey reports)

**Fat**

Figure 2.8 shows intake of fat from both CLE and NFS figures. Both show similar trends, that is an increase to a peak in about 1970, and then a decline. However Figures 2.9 and 2.10 show the percentage of total energy derived from fat, which rose to about 42 per cent in the late 1960's, and according to the NFS figures (Figure 2.9) does not seem to be
Figure 2.8. Mean fat content (g) of total food supplies (CLE) and average household diet (NFS) in the UK from 1950 to 1982 (plotted from data in DHSS, 1984).
declining despite the reduction in amount of the fat consumed due to the fact that energy consumption is also declining. The different picture shown by the CLE (Figure 2.10) figures suggests that the food eaten outside the home, not accounted for by the NFS is high in carbohydrate, probably sugar.

**Carbohydrate**

Figure 2.3 (section 2.2.2) shows intake of carbohydrate from CLE and NFS figures, the discrepancy between them has already been discussed. Figures 2.9 and 2.10 clearly show the inverse relationship between proportion of energy from fat and that from carbohydrate, this being due to the fact that despite changes in consumption of foods, the percentage of energy from protein stays fairly steady. (Figures 2.9 & 2.10)

**Protein**

The intake of protein is shown by Figure 2.11, and has remained fairly steady, an increase in the proportion of protein from animal foods has occurred. The apparent increase in percentage energy from protein shown in Figure 2.9 from NFS data may again reflect the type of food consumed outside the home not accounted for by the NFS figures.

**P/S ratio**

The change in the type of visible fats consumed has resulted in a change in the ratio of polyunsaturated fatty acids to saturated fatty acids (P/S ratio). The increase in the consumption of soft margarine shown in Figure 2.6 has resulted in a small increase in the P/S ratio from 0.17 in 1959 to 0.21 in 1977 (and to 0.27 in 1982, a figure still far short of the 0.45 ratio recommended by the COMA report (DHSS, 1984))
Figure 2.9. Mean contents of fat, carbohydrate and protein in the average household diet (NFS) expressed as a percentage of total energy (plotted from data in DHSS, 1984).
Figure 2.10. Mean amounts of fat, carbohydrate and protein in total food supplies (CLE) expressed as a percentage of total energy (plotted from data in DHSS, 1984).
Figure 2.11. Mean protein content (g) of total food supplies (CLE) and average household diets (NFS) in the UK from 1950 to 1982 (plotted from data in DHSS, 1984).
Dietary fibre

Table 2.10 shows how little change there has been in intake of fibre since 1956, but, as is pointed out (DHSS, 1984) as the total energy intake has fallen the proportion of fibre has risen.

### Table 2.10. Dietary fibre in the British household diet (g/person/day) between 1956 and 1976.
(from DHSS, 1984)

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Dietary Fibre</th>
</tr>
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<tbody>
<tr>
<td>1956</td>
<td>22.5</td>
</tr>
<tr>
<td>1961</td>
<td>21.7</td>
</tr>
<tr>
<td>1966</td>
<td>21.2</td>
</tr>
<tr>
<td>1971</td>
<td>21.2</td>
</tr>
<tr>
<td>1972</td>
<td>20.6</td>
</tr>
<tr>
<td>1973</td>
<td>20.5</td>
</tr>
<tr>
<td>1974</td>
<td>20.4</td>
</tr>
<tr>
<td>1976</td>
<td>19.7</td>
</tr>
</tbody>
</table>
The changes in food consumption over this period 1952 - 1977 have meant relatively small changes in the intake of other nutrients. These are shown by Table 2.11 taken from the NFS figures.

**Table 2.11. Energy value and nutrient content of household food consumption 1952 to 1977 (per head per day)**
(from Hollingsworth, 1978)

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kcal</td>
<td>2,450</td>
<td>2,630</td>
<td>2,590</td>
<td>2,600</td>
<td>2,400</td>
<td>2,320</td>
<td>2,290</td>
<td>2,280</td>
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<td>MJ</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td></td>
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<td>75</td>
<td>75</td>
<td>71</td>
<td>72</td>
<td>72</td>
<td>72</td>
<td>73</td>
</tr>
<tr>
<td>Animal protein</td>
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<td>46</td>
<td>46</td>
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<tr>
<td>Fat</td>
<td>g</td>
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<td>1,020</td>
<td>1,050</td>
<td>1,020</td>
<td>1,010</td>
<td>1,010</td>
<td>1,010</td>
<td>1,000</td>
</tr>
<tr>
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<td>mg</td>
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<td></td>
</tr>
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<td></td>
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<tr>
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<td>mg</td>
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<td></td>
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<td></td>
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<td></td>
<td>1.28</td>
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<td>1.15</td>
<td>1.16</td>
<td>1.21</td>
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<tr>
<td>Riboflavin</td>
<td>mg</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.64</td>
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<td>1.70</td>
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<td>1.79</td>
<td>1.74</td>
<td>1.77</td>
<td>1.77</td>
<td>1.79</td>
</tr>
<tr>
<td>Nicotinic acid</td>
<td>mg</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>12.90</td>
<td>14.00</td>
<td>13.90</td>
<td>16.40</td>
<td>16.60</td>
<td>15.70</td>
<td>16.00</td>
<td>16.00</td>
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</tr>
<tr>
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<td>mg</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>29.90</td>
<td>29.00</td>
<td>28.50</td>
<td>28.90</td>
<td>28.70</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>mg</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>53</td>
<td>50</td>
<td>51</td>
<td>48</td>
<td>46</td>
</tr>
<tr>
<td>Vitamin D</td>
<td>ug</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.70</td>
<td>3.25</td>
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<td>2.66</td>
<td>2.63</td>
<td>2.69</td>
<td>2.66</td>
</tr>
</tbody>
</table>

n.a.– not available

(source: National Food Survey reports)

The decline in total protein (though not in percentage of energy from protein) is accounted for by the decline in bread consumption (Hollingsworth, 1978) not entirely compensated for by the increase protein from meat and dairy products. The decline in bread consumption also accounts for the decline in iron and thiamin intake. Hollingsworth (1978)
also suggests that the different methods used for slaughtering result in meat of lower iron content (as analysed). An additional factor may be the fact that a large proportion of the increase in meat consumption comes from poultry which is relatively low in iron. The fall in Vitamin C intake is mostly due to the decreased consumption of potatoes. However as shown in Table 2.7 and pointed out by Buss (1979) the fall in intakes of most nutrients was due to the fact that less food was eaten; Table 2.8 shows that the nutritional quality actually improved. Hollingsworth (1978) notes that the only possible concern in these trends is the one towards a reduced iron consumption; which she suggests needs to be watched. This is supported by Tables 2.12 and 2.13.

Table 2.12. Nutritional adequacy of household food:
National averages 1951 - 1973
(figures given as percentage of recommended intake)
(from Wardle, 1977)

<table>
<thead>
<tr>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy value</td>
<td>100</td>
<td>105</td>
<td>106</td>
<td>108</td>
<td>109</td>
<td>111</td>
<td>104</td>
</tr>
<tr>
<td>Protein</td>
<td>104</td>
<td>103</td>
<td>101</td>
<td>105</td>
<td>127</td>
<td>128</td>
<td>124</td>
</tr>
<tr>
<td>Calcium</td>
<td>111</td>
<td>108</td>
<td>108</td>
<td>109</td>
<td>188</td>
<td>194</td>
<td>193</td>
</tr>
<tr>
<td>Iron</td>
<td>104</td>
<td>109</td>
<td>115</td>
<td>116</td>
<td>126</td>
<td>124</td>
<td>193</td>
</tr>
<tr>
<td>Thiamin</td>
<td>126</td>
<td>124</td>
<td>130</td>
<td>136</td>
<td>137</td>
<td>124</td>
<td>134</td>
</tr>
<tr>
<td>Riboflavin</td>
<td>106</td>
<td>108</td>
<td>114</td>
<td>129</td>
<td>123</td>
<td>130</td>
<td>132</td>
</tr>
<tr>
<td>Nicotinic acid (1)</td>
<td>128</td>
<td>131</td>
<td>142</td>
<td>186</td>
<td>160</td>
<td>194</td>
<td>193</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>235</td>
<td>231</td>
<td>240</td>
<td>244</td>
<td>181</td>
<td>184</td>
<td>189</td>
</tr>
<tr>
<td>Vitamin A (2)</td>
<td>-</td>
<td>176</td>
<td>186</td>
<td>203</td>
<td>204</td>
<td>200</td>
<td>190</td>
</tr>
<tr>
<td>Vitamin D (3)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>90</td>
<td>90</td>
<td>84</td>
<td>89</td>
</tr>
</tbody>
</table>

(1) From 1965 based on nicotinic acid equivalents
(2) From 1965 based on retinol equivalents
(3) Most adults need no dietary Vitamin D since they obtain all they need from sunlight.

* Recommended intake levels were revised in 1965. Intake for that year is expressed as a percentage of the old British Medical Association recommended levels and as a percentage of the new Department of Health and Social Security levels.

(Source: Annual reports of the National Food Survey 1951 - 1973)
Table 2.13. Nutritional value of household food as a percentage of recommended allowances (DHSS, 1979)
(from Howat, 1985)

<table>
<thead>
<tr>
<th></th>
<th>National averages</th>
<th>Families with two or more adults and three or more children</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>April-June 1981</td>
<td>April-June 1982</td>
</tr>
<tr>
<td></td>
<td>Jan-March 1982</td>
<td>Apr-June 1982</td>
</tr>
<tr>
<td>Energy</td>
<td>97</td>
<td>94</td>
</tr>
<tr>
<td>Protein</td>
<td>125</td>
<td>121</td>
</tr>
<tr>
<td>Calcium</td>
<td>173</td>
<td>166</td>
</tr>
<tr>
<td>Iron</td>
<td>99</td>
<td>97</td>
</tr>
<tr>
<td>Thiamin</td>
<td>123</td>
<td>121</td>
</tr>
<tr>
<td>Riboflavin</td>
<td>134</td>
<td>123</td>
</tr>
<tr>
<td>Nicotinic acid</td>
<td>182</td>
<td>176</td>
</tr>
<tr>
<td>equivalent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vitamin C</td>
<td>196</td>
<td>162</td>
</tr>
<tr>
<td>Vitamin A (retinol</td>
<td>185</td>
<td>201</td>
</tr>
<tr>
<td>equivalent</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* All values make allowances for wastage in the home of 10 per cent of the edible portion of food acquired, and for expected losses of nutrients during cooking. The percentage do not take into account the contributions made to dietary intake by sweets, soft drinks, alcohol and some outside snacks, but they include allowances for meals out.

In view of the recent discussion on iron and iron deficiency anaemia, Elwood (1982), it is doubtful whether this trend will have any harmful effects.

Thus the main effects of the changes in food consumption which occurred between 1952 - 1977, were to alter the proportion of energy coming from fat and carbohydrate.

As will be discussed in a later section of this chapter, it is suggested that improvements in health would result from a reversal of this trend. Hollingsworth (1978), however, concludes her paper by suggesting
'that it is difficult to see how the now advocated return to the eating patterns of the 1950's, can be achieved without a reversal of the long term trends in the consumption of bread and potatoes, or the widespread adoption of habits still foreign to many British people such as greater consumption of pasta and rice'.

This view is somewhat at odds with the view expressed in 'A national nutrition policy' (Hollingsworth, 1979) in which this same author suggests that in order to find a diet that 'in no way detracts from the pleasures of eating' and translates 'nutrition into value for money ... might make use of the principles laid down by the best traditional French, Italian, and Chinese cuisine which have perfected the art of making a little luxury go a long way'.

There is, however, (as will be discussed in Chapter Six) evidence of increased use of foods such as rice and pasta; items such as spaghetti bolognaise, curry and rice and pizza occur frequently on menus, including those for school meals; these products are also widely available in various convenience forms. These trends are noted by Richardson (1982) 'other fast growing areas are the so-called pasta and pizza markets'. These products are cheap and offer convenience and variety as well as capitalising on the growing popularity of 'ethnic' foods', also by Baines (1977) 'no account of British food habits should omit the contribution made by immigrants to our diet ... Chinese food was almost unknown in Britain until the 1950's, yet almost every community now has its 'Chinese take-away' to rival 'fish and chips shops'.

It has been suggested that these trends are partly due to increased foreign travel but mainly due to the influence of ethnic minority groups; the growth of Indian, Chinese, and Italian restaurants and take-aways have familiarised many people with their foods. Their popularity may be partly due to their being seen as good value for money.

Thus a turning towards the traditional cuisine of other countries, may be a means of encouraging a reversal of the trend towards increased meat and decreased cereal consumption, which has nutritional benefits as well as economic ones. These dishes would apparently be more in keeping with modern lifestyles than the traditional British dishes such as Lancashire Hot Pot and Scotch Broth, which illustrate the same principle of making a little meat go a long way, by extending with cereals and vegetables.
2.3 CHANGING PATTERNS OF DISEASE

Over the same period of time - i.e. from 1950 to the early 1970's there have been changes in the disease patterns and mortality trends in this country and in other westernised countries. These changes, in fact, are a continuation of the trends shown since the beginning of the century. Since the early 1900's, not only has there been considerable research and development of nutritional knowledge as indicated in the previous chapter, but also developments in medical knowledge, and improvement in public health and hygiene.

2.3.1. Control of infectious diseases

At the beginning of the century the main causes of death in childhood were infectious diseases, such as scarlet fever, measles, whooping cough and diptheria; for those surviving childhood, the main causes of death in the later years were also infectious diseases such as tuberculosis, enteric fever (typhoid and paratyphoid), and respiratory diseases such as bronchitis. Poor nutrition was almost certainly a factor in reduced resistance to these diseases, particularly in childhood. By now many of these diseases have virtually disappeared, and the death rate from the infectious diseases of childhood has been reduced by 99 per cent or more.

Factors contributing to the decline in those and other infectious diseases are improvements in public health and hygiene such as improved sanitation, sewage disposal, and water supplies, also developments in immunisation and antimicrobial drugs. General improvements in social, economic and nutritional conditions have also contributed. Examination of life expectancy statistics, however, indicates that the improvement in health resulting from improvements in control and treatment of infectious diseases, have had their greatest effect on mortality in the young. This is shown clearly by Figures 2.12 and 2.13.

2.3.2 Life expectancy statistics

Life expectancy at birth has increased from 48.1 years (males) and 51.8 years (females) in 1901 to 69.8 and 76.0 years respectively in 1978, an increase of 45 per cent. However the increase in life expectancy is much less marked in those who survive infancy; for those surviving beyond 5 years of age life expectancy has only increased by 20 - 25 per cent, while for those surviving to old age, the increase is very small (Turner
Figure 2.12 A comparison of the age distribution of deaths in males and females at the beginning of the century and in 1977 (from James et al., 1980)

Figure 2.13 Years of life to be expected at various ages, 1871-1973 (from DHSS, 1976)
2.3.3 Mortality Statistics

Examination of mortality statistics shows the trend for changing patterns of mortality and disease. Figure 2.14 compares the cause of death (as percentage of total) in 1931, 1951, and 1973 at different ages for males and females. The reduction in deaths from infectious diseases at all ages is clearly shown, as is the reduction in deaths, (though less marked) from respiratory disease. The most striking feature of all however, is the increase in deaths from circulatory diseases, particularly in men in the 40 - 50 age group. Only slightly less marked is the increase in deaths from cancer particularly in women.

Similar trends are shown by other westernised countries. Table 2.14 compares causes of mortality in the Netherlands in 1903 and 1975.

<table>
<thead>
<tr>
<th>Cause</th>
<th>1903</th>
<th>1975</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuberculosis</td>
<td>192</td>
<td>1</td>
</tr>
<tr>
<td>Other infectious diseases</td>
<td>80</td>
<td>4</td>
</tr>
<tr>
<td>Cardiovascular diseases</td>
<td>94</td>
<td>372</td>
</tr>
<tr>
<td>Cancer</td>
<td>100</td>
<td>208</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>8</td>
<td>12</td>
</tr>
</tbody>
</table>

Figure 2.15 also shows the alarming rise in incidence of deaths from coronary heart disease between 1950 and 1975. This is most striking in men between 35 - 44, but is seen in both men of other age groups and women. The differences in mortality rates from coronary heart disease between the different countries of the United Kingdom, different regions in England and Wales, and different westernised countries, is a source of interest to epidemiologists.
Figure 2.14 Mortality by cause, age and sex, 1931, 1951 and 1973

(from Turner and Gray, 1982)
Figure 2.15 Percentage change in death rates of men and women in three age groups (from 35-64 years) from coronary heart disease in England and Wales 1950-75, (3 year moving averages 1950-52 = 100%)  
(from DHSS, 1978)

(1) 1950-67 International Classification of Diseases (7), categories 420-422.  
1968-71 International Classification of Diseases (8), categories 410-414.
2.3.4 Morbidity statistics

Prevalence of obesity and morbidity associated with obesity.

Morbidity statistics, while less precise, are also an indication of the changing pattern of disease. Turner and Gray (1982) cite the increase in incidence of conditions such as hypertension and other circulatory disorders, diabetes mellitus, gall bladder disease, arthritic diseases, as evidence of the morbidity associated with obesity.

The Royal College of Physicians report (1983) compares body mass indices and estimates of mean fat content of men and women over the last 30 - 50 years (Table 2.15).

Table 2.15. Mean values for the body mass index and calculated body fat of men and women in the UK in the last 50 years.  
(from RCP, 1983)

<table>
<thead>
<tr>
<th>Year of Survey</th>
<th>Sex</th>
<th>Group</th>
<th>Wt/Ht²</th>
<th>Fat%</th>
<th>Wt/Ht²</th>
<th>Fat%</th>
<th>Wt/Ht²</th>
<th>Fat%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1930</td>
<td>M</td>
<td>National</td>
<td>21.3</td>
<td>17.1</td>
<td>22.8</td>
<td>19.0</td>
<td>23.3</td>
<td>19.7</td>
</tr>
<tr>
<td>1943</td>
<td>National</td>
<td></td>
<td>21.8</td>
<td>17.7</td>
<td>22.7</td>
<td>19.0</td>
<td>24.6</td>
<td>21.3</td>
</tr>
<tr>
<td>1960</td>
<td>Birmingham</td>
<td></td>
<td>22.8</td>
<td>19.1</td>
<td>24.9</td>
<td>21.7</td>
<td>24.9</td>
<td>21.7</td>
</tr>
<tr>
<td>1971</td>
<td>BP employees</td>
<td></td>
<td>22.5</td>
<td>18.7</td>
<td>24.3</td>
<td>20.9</td>
<td>25.4</td>
<td>22.3</td>
</tr>
<tr>
<td>1980</td>
<td>National</td>
<td></td>
<td>23.0</td>
<td>19.3</td>
<td>24.7</td>
<td>21.5</td>
<td>25.2</td>
<td>22.2</td>
</tr>
<tr>
<td>1943</td>
<td>F National</td>
<td></td>
<td>20.7</td>
<td>23.4</td>
<td>22.5</td>
<td>26.3</td>
<td>23.6</td>
<td>27.9</td>
</tr>
<tr>
<td>1971</td>
<td>BP employees</td>
<td></td>
<td>21.6</td>
<td>25.0</td>
<td>22.9</td>
<td>26.9</td>
<td>25.9</td>
<td>30.6</td>
</tr>
<tr>
<td>1980</td>
<td>National</td>
<td></td>
<td>22.7</td>
<td>26.6</td>
<td>23.9</td>
<td>28.4</td>
<td>25.4</td>
<td>30.6</td>
</tr>
</tbody>
</table>

(Equations for body fat derived by T.P.Eddie)

Men  Fat per cent = 1.281 (Wt/Ht²) - 10.13
Women Fat per cent = 1.48 (Wt/Ht²) - 7.0

The working party conclude that 'there now seems little doubt that there is a general trend for both men and women to become heavier and presumably fatter, this change being particularly evident in young adults. The published data from older surveys do not provide information on the distribution of weights so it is not possible to assess whether the problem of obesity has increased. This however, does seem likely'
Table 2.16 shows that 39 per cent of men and 32 per cent of women carry excess weight as measured by Body Mass Index.

Table 2.16. The distribution of excess weight by age, expressed in percentages (OPCS, 1981) (from RCP, 1983)

<table>
<thead>
<tr>
<th>BMI figures (inclusive)</th>
<th>Age (years)</th>
<th>16-</th>
<th>20-</th>
<th>25-</th>
<th>30-</th>
<th>40-</th>
<th>50-</th>
<th>60-</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>19</td>
<td>24</td>
<td>29</td>
<td>40</td>
<td>50</td>
<td>60</td>
<td>65</td>
<td>All</td>
<td></td>
</tr>
<tr>
<td><strong>Males</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overweight (a)</td>
<td>25.0-27.9</td>
<td>7</td>
<td>17</td>
<td>23</td>
<td>28</td>
<td>31</td>
<td>32</td>
<td>33</td>
<td>27</td>
</tr>
<tr>
<td>(b) 28.0-29.9</td>
<td>7</td>
<td>2</td>
<td>3</td>
<td>5</td>
<td>12</td>
<td>11</td>
<td>11</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>obese 30 and over</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>7</td>
<td>9</td>
<td>6</td>
<td>10</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Total with excess weight (%)</td>
<td>15</td>
<td>22</td>
<td>29</td>
<td>40</td>
<td>52</td>
<td>49</td>
<td>54</td>
<td>39</td>
<td></td>
</tr>
<tr>
<td><strong>Females</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overweight (a)</td>
<td>25.0-27.9</td>
<td>9</td>
<td>15</td>
<td>11</td>
<td>15</td>
<td>21</td>
<td>25</td>
<td>26</td>
<td>18</td>
</tr>
<tr>
<td>(b) 28.0-29.9</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>6</td>
<td>8</td>
<td>9</td>
<td>8</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>obese 30 and over</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>9</td>
<td>13</td>
<td>16</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Total with excess weight (%)</td>
<td>15</td>
<td>23</td>
<td>20</td>
<td>25</td>
<td>38</td>
<td>47</td>
<td>50</td>
<td>32</td>
<td></td>
</tr>
</tbody>
</table>

Figure 2.16 shows the relationship between obesity as measured by Body Mass Index (BMI) and mortality.

Garrow (1979) points out that mortality increases above BMI 25 and doubles by 35. This would appear to be true for men and women, smokers and non-smokers alike.

The RCP working party discuss in detail the evidence for the association of obesity and increased risk of diseases such as coronary heart disease, hypertension, diabetes, gallbladder disease, some forms of cancer and respiratory disease, and conclude that obesity is a major public health problem requiring community measures and individual action.
Figure 2.16 Body weight, smoking and death rates for men and women (re-calculated from Lew and Garfinkel, with unpublished data from the American Cancer Society)

- smoking 20+ cigarettes  ○ - never smoked

(from Royal College of Physicians, 1983)
Table 2.17 shows the incidence of overweight and obesity in children and young adults. These tables indicate that obesity is by no means a rare occurrence in this country.

Table 2.17. The proportion of children and young adults living in Britain with different degrees of weight in excess of the mean for the age group. (from RCP, 1983)

(The term 'overweight' when applied to children refers to those with a weight of 120 per cent or more of the mean and is approximately equivalent to the 97th percentage of the WHO reference values)

<table>
<thead>
<tr>
<th>Relative weight (%)</th>
<th>101-110</th>
<th>111-120</th>
<th>120-130</th>
<th>130-140</th>
<th>140</th>
<th>Total children overweight, adults obese %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years) Individuals above the average weight</td>
<td>6</td>
<td>40.2</td>
<td>8.2</td>
<td>1.4</td>
<td>0.3</td>
<td>0.1</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>38.2</td>
<td>8.7</td>
<td>1.5</td>
<td>0.3</td>
<td>0.2</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>28.1</td>
<td>9.9</td>
<td>3.2</td>
<td>2.0</td>
<td>1.2</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>28.5</td>
<td>11.3</td>
<td>4.2</td>
<td>1.4</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>32.4</td>
<td>10.7</td>
<td>3.7</td>
<td>1.3</td>
<td>0.4</td>
</tr>
<tr>
<td></td>
<td>26*</td>
<td>30.3</td>
<td>18.7</td>
<td>8.2</td>
<td>3.2</td>
<td>0.9</td>
</tr>
<tr>
<td>Males</td>
<td>6</td>
<td>34.1</td>
<td>9.2</td>
<td>2.1</td>
<td>0.4</td>
<td>0.4</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>33.5</td>
<td>10.0</td>
<td>2.6</td>
<td>0.6</td>
<td>0.7</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>25.4</td>
<td>10.3</td>
<td>4.5</td>
<td>2.5</td>
<td>1.7</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>26.2</td>
<td>12.3</td>
<td>5.4</td>
<td>2.2</td>
<td>2.0</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>29.0</td>
<td>12.7</td>
<td>3.2</td>
<td>2.0</td>
<td>1.2</td>
</tr>
<tr>
<td></td>
<td>26*</td>
<td>28.9</td>
<td>15.4</td>
<td>5.8</td>
<td>2.5</td>
<td>3.0</td>
</tr>
</tbody>
</table>

* For this age group the mean weight of the 20 year olds was taken as the standard.
Other diseases of affluence

Mann (1979) discusses 'diseases of malnutrition in an affluent society' and lists two groups of diseases.

- **Group A** - Coronary heart disease, diabetes, diverticular disease, constipation, dental caries and obesity, these 'are indisputably conditions in which malnutrition plays an important role in the aetiology'.

- **Group B** - appendicitis, malignant tumours of the large bowel, ulcerative colitis, Crohn's disease, varicose veins and haemorrhoids, gallstones and cholecystitis, and duodenal ulcer; 'claims have also been made that nutrition plays a role in the aetiology of these diseases'.

Table 2.18 shows mortality rates from coronary heart disease and diabetes, accounting for 35 per cent of premature deaths in men aged 35 to 54, and 10 per cent of women in that age group (Mann 1979).

**Table 2.18. Mortality rates in middle-aged men and women from ischaemic heart disease and diabetes in England and Wales in 1973 (deaths per million of the total population)**

<table>
<thead>
<tr>
<th>Age</th>
<th>Male 35-44</th>
<th>Male 45-54</th>
<th>Female 35-44</th>
<th>Female 45-54</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHD</td>
<td>642</td>
<td>2865</td>
<td>106</td>
<td>519</td>
</tr>
<tr>
<td>Diabetes</td>
<td>25</td>
<td>46</td>
<td>11</td>
<td>31</td>
</tr>
<tr>
<td>All causes</td>
<td>2250</td>
<td>7231</td>
<td>1552</td>
<td>4372</td>
</tr>
<tr>
<td>CHD and diabetes</td>
<td>30%</td>
<td>40%</td>
<td>8%</td>
<td>13%</td>
</tr>
</tbody>
</table>

(Data derived from the Registrar General's Statistical Review of England and Wales, Pt 1 London HMSO)

Table 2.19 indicates the prevalence of the diseases in groups A and B as indicated by (Mann 1979) hospital admission figures - 18 per cent of admissions. There is little reason to suppose that the figures from these two Oxford hospitals are not representative of the country as a whole.
Table 2.19. Admissions to the Radcliffe and Churchill hospitals in Oxford. The data given are for men aged 45 - 64 years in 1975.

<table>
<thead>
<tr>
<th>Group A</th>
<th>Group B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Myocardial infarction 156</td>
<td>Duodenal ulcer 70</td>
</tr>
<tr>
<td>CHD (Other) 130</td>
<td>Carcinoma large bowel 38</td>
</tr>
<tr>
<td>Diabetes 86</td>
<td>Haemorrhoids 70</td>
</tr>
<tr>
<td>Diverticular disease 18</td>
<td>Varicose veins 34</td>
</tr>
<tr>
<td></td>
<td>Cholecystitis and gallstones 87</td>
</tr>
</tbody>
</table>

Total admissions: 4268; Group A (% of total): 10%
Groups A and B (% total): 18%
(Data derived from Hospital Activity Analysis reports for Oxford)

Mann further points out that the morbidity of a 'simple' condition like constipation should not be underestimated, 3 per cent of all prescriptions written in 1976 were for purgatives and laxatives, at a cost to the health service of about £4,000,000; in addition a far greater quantity is bought over the chemists counter. Also about 80 per cent of five year olds require treatment for dental caries, and about 10 per cent of all children enter school with more than half their teeth seriously decayed (Todd, 1975).

**Hypertension**

James et al (1980) and BNF (1981) review the evidence that diet is a contributory factor in the aetiology of hypertension and there is support for the view that this should be added to Mann's group B diseases. Evidence would suggest that hypertension is one of the major risk factors in both coronary heart disease and cerebrovascular disease. While comparative figures showing changes over the period under discussion are not available. Table 2.20 shows mortality from hypertension and related causes.

NACNE (1983) suggests that the prevalence of hypertension is influenced by the definition chosen, and the age and nature of the sample, quoting studies showing an incidence varying between 10 - 15 per cent and 39.8 per cent of adults depending on criteria chosen.
Table 2.20. Deaths assigned to hypertension and hypertension-related causes in England and Wales (1978)
(from NACNE, 1983)

<table>
<thead>
<tr>
<th>Deaths at all ages</th>
<th>Deaths under 65 yrs</th>
<th>Proportion of total deaths under 65 yrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>No.</td>
<td>Rate*</td>
<td>No.</td>
</tr>
<tr>
<td>Hypertension diseases</td>
<td>6893</td>
<td>14.0</td>
</tr>
<tr>
<td>(400-404)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ischaemic heart disease</td>
<td>160458</td>
<td>326.3</td>
</tr>
<tr>
<td>(410-414)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cerebrovascular disease</td>
<td>73532</td>
<td>149.5</td>
</tr>
<tr>
<td>(430-438)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All above</td>
<td>240883</td>
<td>489.8</td>
</tr>
</tbody>
</table>

*Rate/100,000

(Data from 'Mortality Statistics: Cause (1978)'
OPCS Series DH2 No 5, HMSO (1980)

2.4 THE DEVELOPMENT OF DIETARY GUIDELINES.

2.4.1 Establishment of links between diet and disease

The changes in food consumption and nutrient intake associated with increasing affluence have been examined in section 2.2. At the same time it would seem that increasing affluence is also associated with an increased prevalence of certain diseases, sometimes of alarming magnitude (Section 2.3). The term 'diseases of affluence' has thus been coined to refer to these diseases; they are also referred to as degenerative diseases.

In the late 1960's and early 1970's there was considerable concern among doctors and nutritionists about the health implications of the dietary changes which had occurred since the war; many became involved in examining the association between the changes in disease patterns and changes in diet. As was discussed in Section 2.2.3, epidemiology was an important means of identifying associations between diet and disease.

Thus on the basis, mainly of epidemiological studies, many doctors
and nutritionists both in Europe and North America were suggesting that diets should be modified in order to attempt to prevent such diseases.

These suggestions, particularly to begin with, were often met by the objection that until dietary factors were proved to have a causal relationship with disease, it was too soon to make recommendations for dietary change. These objections are still being made, and indeed one of the criticisms of the NACNE report (discussed in a later section) is that there is insufficient evidence for the benefits of dietary change.

The establishment of a causal link with dietary factors for many diseases is far from complete and this is complicated by the fact that it is now widely accepted that most of the degenerative diseases have a multifactorial origin, diet being only one contributory factor. Turner and Gray (1982) attributed the slow progress of this work to a 'simplistic approach originating from the previously successful methods used to combat infectious and dietary deficiency diseases, that is the discovery of a cause and development of a cure'. This supports the similar point made by James et al (1980) referred to in section 2.1. Turner and Gray (1982) feel the 'diet is examined all too often in isolation... without considering at the same time, other contributory causes such as cigarette smoking, physical inactivity, stress and individual genetic susceptibility'.

Nevertheless, in recent years, much research has been concentrated on attempting to establish the role of diet and the interaction of diet with other factors in these diseases of affluence. This work, and the picture built up so far is complex, and a detailed examination is beyond the scope of this thesis. However, a brief review of some of the papers discussing the relationship between diet and disease is necessary background to a discussion of the suggested dietary modifications.

2.4.2 Role of diet in aetiology of specific for the diseases

The papers studied review the evidence for the role of diet and other inter-related factors in the aetiology of certain diseases. Coronary heart disease, is probably the most extensively studied; but obesity, hypertension, dental caries, different forms of cancer and diabetes, all have dietary factors in their aetiology.

Coronary heart disease

Factors in the aetiology of CHD have been reviewed by a number of authors (including DHSS, 1974 and 1984; RCP, 1976; James et al, 1981;
These papers were attempting to establish the scientific basis for suggested dietary modification.

The aetiology of CHD is complex; genetic factors, and medical factors such as diabetes and hypertension are involved, also obesity, environmental factors such as cigarette smoking, lack of exercise stress and several dietary constituents have all been discussed as factors contributing either directly or indirectly to CHD.

Of dietary factors, fat has been most studied; total dietary fat, ratio of polyunsaturated to saturated fatty acids (P/S ratio), and dietary cholesterol, may all contribute. The evidence seems to point to these factors having their effect through raised blood lipid levels, and indirectly, in the case of high total fat, by contributing to obesity.

Other dietary factors studied are sucrose, dietary fibre, salt. Evidence suggests that these could be directly associated with CHD, or more probably indirectly by being associated with other conditions such as obesity, diabetes or hypertension. The association between alcohol, coffee intakes, the hardness of water and CHD have also been studied.

Work still continues; the role of certain polyunsaturated fatty acids (e.g. eicosapentaenoic acid) associated with fish oils and the role of Vitamin E needs further investigation. It has been suggested that perhaps the most important recommendation of the COMA report (DHSS, 1984) is that there should be 'ongoing review' of the prevention of cardiovascular disease by dietary and other means.

Obesity

The factors in the aetiology of obesity have also been extensively reviewed (RCP,1983). The NACNE working party based their discussion on this report.

To state that the underlying cause of obesity is a failure on the part of the individual (or a large number of individuals) to regulate their food intake to match their energy requirement and thus maintain balance is to state the obvious and over simplify the problem.

The various aspects of the maintenance of energy balance, the factors - both physiological and behavioural - controlling food intake, also the energy expenditure side of the equation, have been extensively studied. Much research is still being carried out to ascertain the role of behavioural, metabolic, genetic and endocrinal factors in the aetiology of obesity. However a diet high in fat, sugar and alcohol is also very
likely to be a high energy diet, and undoubtedly makes a major contribution to the prevalence of obesity. A lifestyle involving only a low level of physical activity is also obviously a contributory factor.

**Diabetes**

Mann (1979) reviews the evidence relating to dietary factors in the aetiology of maturity onset (type II) diabetes, and concludes that while a number of factors have been studied and there was a strong association between sugar and fat intake and the prevalence of diabetes, the strongest association was between diabetes prevalence and energy intake. The role of a diet low in dietary fibre in the aetiology of diabetes is controversial, but a diet high in fat and sugar is very often also one low in dietary fibre.

**Dental Caries**

The evidence relating diet and dental caries is reviewed by a number of authors (Mann, 1979; Johnson, 1979; Andlaw, 1977 and NACNE, 1983).

There is evidence to suggest that sucrose is the main dietary factor in the aetiology of dental caries; the extent to which different foods and patterns of eating contribute to plaque formation and a reduction in pH at the tooth surface, is the main factor determining cariogenicity. Sugar containing foods which are retained on the tooth surface and eaten in between meals are the most cariogenic.

Foods which may have a protective effect, such as high fibre foods, which stimulate saliva production or may contain an, as yet unidentified, protective factor have also been studied, as have foods such as cheese, which raise saliva pH and contain calcium, thus promoting redeposition of calcium salts. The protective effect of fluoride in water supplies is supported by considerable evidence.

**Hypertension**

The dietary factors in the aetiology of hypertension are reviewed by James et al (1980) and BNF (1981). The interaction of dietary and other factors is complex. Evidence seems to indicate that a high salt intake is only a factor of importance in those genetically predisposed to hypertension. Other factors such as body weight, dietary fat, potassium, (particularly sodium/potassium ratio) sucrose and calcium have been
Diverticular disease

The evidence connecting diverticular disease with a low intake of dietary fibre is reviewed by Mann (1979).

Cancer

The role of various dietary factors in the aetiology of different forms of cancer have been reviewed by Roe (1979) and Hill (1978) and at a symposium at Marabou (1978).

While knowledge of the causes of cancer is far from complete, dietary factors may be partly responsible for or indirectly associated with cancers of the gastrointestinal tract; also cancers of the breast, ovary and endometrium, which are all hormonally related.

Evidence suggests that a high intake of dietary fat and low intake of dietary fibre are factors in cancer of the colon; a high energy diet, particularly with a high fat content, may contribute to breast cancer, while a high intake of smoked and salted foods, possibly due to their content of nitrosamines may be connected with stomach cancer. The protective role of dietary fibre, and fruit and vegetables, possibly related to their vitamin A or vitamin C content has also been studied.

There is thus a considerable body of evidence to suggest that dietary factors are interrelated with other factors in the aetiology of many of the diseases of affluence. These inter-relationships would appear to be very complex.

In addition, inter-relationships between different diseases also occur; coronary heart disease is associated with hypertension, and diabetes; obesity is also associated with coronary heart disease, and with hypertension and diabetes.

The various dietary factors also inter-relate; a diet high in fat is also a high energy diet; high fat diets are also often high in sugar; a diet high in fat and sugar is often also a diet low in dietary fibre. The picture is extremely complex and far from complete.

Whitehead (1979) discusses the difficulties of establishing a causal link between diet and disease, 'clearly the diseases of affluence are multifactorial, and even if one had identified all the relevant variables and could quantify them, the size of any epidemiological study necessary
to produce the data for complex multi-variant analysis would be enormous. It still will not provide absolute proof of a cause and effect relationship ... for this there is no real alternative but a direct intervention in which one particular aspect of the diet is varied and the effects on health measured. Quite apart from the organisational and ethical difficulties ... any study would probably have to be a long term one, for in many instances the link between the onset of a dietary habit and the appearance of indisputable pathology is a long term one'.

2.4.3 Suggested dietary modifications

Nevertheless, by the late 1970's the consensus of opinion among doctors and nutritionists, was that, on the basis of evidence so far available, dietary modifications should be recommended and that to wait for problem causal links between diet and disease would take too long. Whitehead (1979) probably expresses the feelings of many nutritionists when he suggests that 'if it is reasoned that we should not try to introduce nutritional policies until scientific proof has been established beyond any reasonable doubt, it must be recognised that we will be doing nothing for a long time. Personally I do not think that such a conservative approach is either desirable or would be acceptable'.

2.4.4 Dietary goals and guidelines in Europe and North America

This concern over the connection between dietary changes and the incidence of degenerative diseases was occurring in other countries also, and by the late 1970's many countries had officially published dietary guidelines or quantified dietary goals.

In 1975 the Swedish medical expert group made recommendations, for improvements in health, which included not only dietary recommendations, but advice on increasing exercise (the Swedish Diet and Exercise Programme).

In 1977 the United States Senate Select Committee on Nutrition and Human Needs produced quantified dietary goals in the McGovern Report. This was criticised as being unnecessarily hard, rigid and impractical, advising a reduction of fat intake to 30 per cent of total dietary energy. The report also made extensive proposals for health and nutrition education programmes, and advocated nutritional labelling of foods.

Further recommendations were made in the USA in 1980, both by the US Departments of Agriculture, and of Health, Education and Welfare,
entitled 'Nutrition and your health, dietary guidelines for America', and also by the Food and Nutrition Board of the National Research Council of the National Academy of Science, entitled 'Toward healthful diets'. Thus as Turner and Gray point out, in the USA there was a move away from stringent dietary goals to non-quantitative recommendations.

Table 2.22 shows the consensus of opinion among nutritionists working in Europe, USA and Canada.

2.4.5 Dietary goals and guidelines in the UK

In this country, in the late 1970's and early 1980's several papers by doctors and nutritionists were published, suggesting dietary modifications. These followed the publication, in 1978, by the DHSS, of a discussion booklet in the Prevention and Health series - 'Eating for Health'. Also during this period, Truswell (1977) examines the six dietary goals of the 1977 McGovern report, and considers 'which (of these) fit in with British needs and attitudes'.

In 1983 a discussion paper on 'Proposals for nutritional guidelines for health education in Britain' was prepared by an ad hoc working party for the National Advisory Committee on Nutrition Education (NACNE); and in 1984 the DHSS published a COMA report on Diet and Cardiovascular disease.

The suggestions for dietary modifications, made in these papers and reports will be examined. Their main recommendations are summarised in Table 2.23.

While this table shows the extent of the agreement in these various papers, a closer examination reveals differences in detail which will be discussed in the next section. These differences arise partly from differences in time - Truswell's paper being written in 1977, and the COMA report on 'Diet and Cardiovascular disease' in 1984, seven years during which a great deal more research had been carried out - and partly from the different purposes for which the papers and reports were written. These points will also be discussed. Firstly however, it is necessary to distinguish between dietary goals and dietary guidelines.

2.4.6 Dietary goals, Dietary guidelines - definitions and uses

Robbins (1983) in a paper 'National Dietary Goals a confused debate' suggests that 'in much of the discussion about dietary change there is confusion about the purpose of goals, how they should be specified to be effective and the practicalities of their implementation'. This author
Table 2.22. Summary of Recommendations Relating Food and Health. (from Turner and Gray, 1982).

<table>
<thead>
<tr>
<th>Study</th>
<th>Reduce Obesity</th>
<th>Increase Exercise</th>
<th>Reduce Total Fat</th>
<th>Increase PUFA</th>
<th>Reduce Cholesterol</th>
<th>Reduce Sugar</th>
<th>Increase Starch and/or Fibre</th>
<th>Reduce Salt</th>
<th>Moderate Alcohol</th>
<th>Encourage Breast-feeding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swedish Medical Expert Group (1975)</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>NS</td>
<td>Y</td>
<td>More fibre, bread, potatoes, fruits and vegetables</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
<td>Norway, Ministry of Agriculture (1976)</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>NS</td>
<td>Y</td>
<td>More fibre, bread, potatoes, fruits and vegetables</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
<td>Canada, Dept. of Health &amp; Welfare 2nd ed. (1977)</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>NS</td>
<td>Y</td>
<td>More fruits, vegetables and wholegrain</td>
<td>Y</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
<td>US Senate Select Committee 2nd ed. (1977)</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Increase fruits, vegetables and wholegrain</td>
<td>Y</td>
<td>Imp-</td>
<td>NS</td>
</tr>
<tr>
<td>Irish Agricultural Institute Health Advisory Comm (1977)</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>in order to reduce obesity</td>
<td>N</td>
<td>N</td>
<td>More fibre particularly from fruits and vegetables</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
<td>France, Ministry of Health, Family &amp; Social Security (1978)</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>NS</td>
<td>NS</td>
<td>Y</td>
<td>More bread and raw vegetables and fruits</td>
<td>Y</td>
<td>Y</td>
<td>NS</td>
</tr>
<tr>
<td>UK Dept Health and Social Security (1978)</td>
<td>Y</td>
<td>little mention</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
</tbody>
</table>

Notes: Y = Yes  N = No  NS = Not Stated
<table>
<thead>
<tr>
<th></th>
<th>Prevent Obesity</th>
<th>Reduce Fat</th>
<th>Reduce SFA</th>
<th>Increase PUFA</th>
<th>Increase Complex CHO</th>
<th>Increase Dietary Fibre</th>
<th>Reduce Sugar</th>
<th>Reduce Salt</th>
<th>Reduce Alcohol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Truswell 1977</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>C</td>
<td>to 55-60% of energy</td>
<td>NS</td>
<td>to 15% of energy</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>D H S S 1977</td>
<td>Y</td>
<td>Y</td>
<td>NS</td>
<td>NS</td>
<td>Y</td>
<td>NS</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Mann 1979</td>
<td>Y</td>
<td>to 30% of energy</td>
<td>Y</td>
<td>take as much of daily fat as possible as PUFA</td>
<td>Y</td>
<td>Y</td>
<td>of secondary importance after other recommendations.</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Whitehead 1979</td>
<td>Y</td>
<td>Y</td>
<td>C</td>
<td>C</td>
<td>NS</td>
<td>Y</td>
<td>Y</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
<td>Passmore et al. 1979</td>
<td>NS</td>
<td>not more than 35% of energy</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>Y</td>
<td>not more than 14% of energy</td>
<td>NS</td>
<td>to 4% of energy</td>
</tr>
<tr>
<td>Lewis 1980</td>
<td>Y</td>
<td>to 28 - 30% of energy</td>
<td>equal proportions of saturated, monounsaturated, polyunsaturated</td>
<td>NS</td>
<td>Y</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
<td>Hollingsworth 1979</td>
<td>Y</td>
<td>Y</td>
<td>NS</td>
<td>NS</td>
<td>Y</td>
<td>NS</td>
<td>Y</td>
<td>NS</td>
<td>Y</td>
</tr>
<tr>
<td>Darke 1979</td>
<td>Y</td>
<td>Y</td>
<td>NS</td>
<td>NS</td>
<td>Y</td>
<td>NS</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>N A C N E 1983</td>
<td>Y</td>
<td>to 34% of energy</td>
<td>to 10% of total energy</td>
<td>increase in P/S ratio</td>
<td>NS</td>
<td>to 30 gms. (25 gms.)</td>
<td>to 20kg/head per year, or 10kg from snacks</td>
<td>by 3g/head per day</td>
<td>to 4% of energy</td>
</tr>
<tr>
<td>C O M A 1984</td>
<td>Y</td>
<td>to 35% of food energy</td>
<td>to 15% of food energy</td>
<td>P/S ratio</td>
<td>NS</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
</tbody>
</table>

Key: Y = agree, NS = not specifically mentioned, C = controversial and further research needed.
defines the terms;

- Dietary goals - 'statements of desirable dietary composition for
  the whole population (or for subpopulations) of healthy people', and
  suggests 'that to be useful they must be quantified',

- Dietary Guidelines - 'express the goals in terms of foods (or
  combinations of foods) which are to be eaten by individuals or groups of
  consumers,' and 'need not be quantified but should be based on goals'.

Robbins recognises that many different dietary patterns can be
compatible with a given set of dietary goals.

This author also points out the difference between RDAs (eg DHSS,
1979) - 'which are a special type of dietary goal describing minimum safe
amounts of nutrients to prevent deficiencies in groups of individuals and
refer to specific age and sex groups'— and dietary goals as the term is
now used, which 'take account of RDAs but usually express upper limits of
dietary constituents and are directed at wider health risks from the diet,
and are usually not age/sex specific, but may include advice for specific
groups'.

Quantifying dietary goals and guidelines

It is in this area, probably, that most of the controversy surrounding
dietary goals arises. Firstly, over whether there is sufficient evidence to quantify a dietary goal, secondly over the level at
which the goal should be set, and thirdly over whether the goal should refer to a maximum (or in the case of dietary fibre, a minimum) intake of a nutrient or to the average intake for the population. Apparent
differences between the NACNE and COMA recommendations are at least partly due to differences in ways of quantifying goals.

The NACNE report uses a number of different ways of quantifying recommendations;

- an amount (in grams) of a nutrient or food component that the diet
  should contain

- as the percentage of total dietary energy to be provided by that
  nutrient,

- in terms of the size of the change in average intake expressed in
  grams or as a percentage,

Some differences in detail in the papers discussed below are due to
different ways of expressing quantitative goals.
Once a goal has been established, the next step is to suggest a way or ways in which this goal may be achieved. In order to achieve changes in nutrient intake, changes in food consumption are needed—dietary guidelines.

There can, as Robbins (1983) points out, be many different ways achieving dietary goals, thus dietary guidelines are also areas of controversy, unless they are expressed in terms that make it clear that they are only one way of probably several, of achieving a given goal.

Some of the papers discussed in the following section suggest changes in food consumption that would help towards achieving these goals. Some of these papers have quantified these changes in food consumption and thus are able to calculate the nutrient composition of the target diet (Passmore et al 1979) or the New British Diet (Walker 1983), as shown in Tables 2.24 and 2.25.

Quantified dietary guidelines are usually expressed in terms of the percentage change in average consumption of various groups of foods which would be required to achieve the goals. Passmore et al (1979) use the CLE figures (1973-77) as their baseline, and Walker (1983) uses the 1981 NFS figures. The use of these average figures as the basis for recommendations for dietary change was discussed above.

### Uses of dietary guidelines

In the case of either dietary goals or dietary guidelines, ways of expressing quantities of either nutrients or foods are related to the use to which the goals or guidelines are put.

A set of officially accepted dietary goals could be used for planning or evaluating diets of the population or large groups, or for monitoring changes in food consumption or nutrient intake towards the achievement of these goals; they could (and most would argue should) be used by the government for planning food supplies, and as the basis of food, agriculture and health education policy; they could also be used by the food industry for planning the marketing and production of new or reformulated food products.

For most of these purposes, expressing quantities in terms of the change in average intake of a food or nutrient (in grams or as a percentage) is useful.

As discussed above, there are suggestions that both recommendations and monitoring should be based on measurements of actual intake; also before the question of acceptability of the dietary changes needed to
Table 2.24. Nutrient content of national diet 1973-7 and target figures for better British diet (expressed in units/person/day) (from Passmore et al, 1979)

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>National diet 1973-7</th>
<th>Better British diet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy including alcohol MJ</td>
<td>12.9</td>
<td>12.6</td>
</tr>
<tr>
<td>Protein g</td>
<td>83</td>
<td>83</td>
</tr>
<tr>
<td>Fat g</td>
<td>130</td>
<td>117</td>
</tr>
<tr>
<td>Carbohydrate g</td>
<td>380</td>
<td>400</td>
</tr>
<tr>
<td>Calcium mg</td>
<td>1120</td>
<td>1180</td>
</tr>
<tr>
<td>Iron mg</td>
<td>13</td>
<td>14</td>
</tr>
<tr>
<td>Retinol equivalent ug</td>
<td>1320</td>
<td>1280</td>
</tr>
<tr>
<td>Thiamin mg</td>
<td>1.7</td>
<td>1.8</td>
</tr>
<tr>
<td>Riboflavin mg</td>
<td>1.9</td>
<td>1.9</td>
</tr>
<tr>
<td>Nicotinic acid equivalent mg</td>
<td>32</td>
<td>32</td>
</tr>
<tr>
<td>Vitamin C mg</td>
<td>100</td>
<td>113</td>
</tr>
<tr>
<td>Vitamin D mg</td>
<td>2.8</td>
<td>2.9</td>
</tr>
</tbody>
</table>

Table 2.25 National nutrient intake in the 1981 NFS and the New NACNE diet (from Walker, 1983)

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>1981</th>
<th>New NACNE</th>
<th>Percentage energy</th>
<th>1981</th>
<th>New NACNE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy g 100</td>
<td>9.29</td>
<td>9.12 MJ</td>
<td>12.9</td>
<td>15.8</td>
<td></td>
</tr>
<tr>
<td>Protein g</td>
<td>71.5</td>
<td>83.5 g</td>
<td>42.1</td>
<td>32.2</td>
<td></td>
</tr>
<tr>
<td>Fat g</td>
<td>103.5</td>
<td>78.0 g</td>
<td>42.1</td>
<td>32.2</td>
<td></td>
</tr>
<tr>
<td>Fatty acids</td>
<td></td>
<td></td>
<td>18.5</td>
<td>12.5</td>
<td></td>
</tr>
<tr>
<td>Saturated g</td>
<td>45.6</td>
<td>29.4 g</td>
<td>18.5</td>
<td>12.5</td>
<td></td>
</tr>
<tr>
<td>Monounsaturated g</td>
<td>38.9</td>
<td>25.6 g</td>
<td>15.8</td>
<td>10.9</td>
<td></td>
</tr>
<tr>
<td>Polyunsaturated g</td>
<td>11.4</td>
<td>15.8 g</td>
<td>4.6</td>
<td>6.7</td>
<td></td>
</tr>
<tr>
<td>Carbohydrate g</td>
<td>264.0</td>
<td>304.7 g</td>
<td>47.7</td>
<td>57.7</td>
<td></td>
</tr>
</tbody>
</table>
achieve dietary goals can be discussed realistically, the nutrient composition of actual diets will need to be compared with the dietary goals. For these purposes dietary goals need to be expressed in terms of an amount of a nutrient to be aimed for, or, as the amount of many nutrients in the diet is related to energy intake, either as the percentage of total energy to be provided by that nutrient, or as the amount of the nutrient/MJ of energy (nutrient density). Many dietary goals are already expressed in these terms; there is however, a need to consider further the ways in which dietary goals are quantified.

The justification for the use of quantified dietary goals and guidelines as the basis of both the evaluation of the nutritional composition of school meals in this study, and as the basis for suggested nutritional guidelines for school meals is discussed in Chapter Four.

Dietary goals and guidelines, are the basis of nutrition education. A more detailed discussion of their use for this purpose will be included in Chapter Six.

The ways in which these changes in food consumption (dietary guidelines) may be brought about to achieve the recommended changes in nutrient intake (dietary goals) are the subject of much discussion and some research. The implementation of dietary guidelines will be discussed in Chapter Six. Some of the papers and reports discussed below and others written during this period (1977-1984), recognise the need for research, discussion and action on various aspects of the implementation of dietary guidelines, and discuss the implications for agriculture and the food industry, also for government food, agricultural and health policies.

In order to establish a basis for the suggested 'Guidelines for the nutritional aspects of school meals', the following section will examine in more detail some of the papers and reports written between 1977 and 1984 in which dietary modifications are discussed. This section will compare the suggested dietary goals and guidelines and the justification for these suggestions.
Prevent or treat obesity

All the papers are unanimous on this point, on the grounds of the increased mortality and morbidity associated with obesity (section 2.3.4). All emphasise the importance of maintaining energy balance, by adjusting food intake to balance energy expenditure, in order to attain or maintain optimal body weight for height. Truswell (1977), Hollingsworth, (1979), NACNE (1983) and COMA (1984) emphasise the importance of adequate exercise. Only Hollingsworth (1977) specifically mentions how intake of specific foods should be adjusted to prevent or treat obesity, but since all papers also recommend a reduction in fat and sugar intake and most a reduction in alcohol intake, it is likely that these measures would make regulation of energy intake easier to achieve. Hollingsworth (1977) suggests that (the nation) should 'find a diet containing smaller quantities of 'empty calorie' foods, i.e. sugar, some fats, and alcohol'.

FATS

Reduce total fat.

All agree that total fat should be reduced; however where this reduction is quantified different goals are suggested; all are expressed in terms of the percentage of total dietary energy to be provided by fat.

Mann (1979) - 30% of total energy from fat.
Lewis (1980) - 28-30%
Passmore et al (1979) - Target diet - 34.9% (not more than 35%)
Truswell (1977) - questions whether or not level of 30% suggested by McGovern is too low.
NACNE (1983) - 30% (interim goal 34%)
COMA (1985) - 35%

Other authors do not quantify recommended changes in fat intake;
- 'people need to watch the amount of fats they eat' (Eating for Health, 1978),
- 'lower the proportion of fat in the diet' (Whitehead, 1978)
- 'find a diet which contains less fat than we have been accustomed to eating for some years' (Hollingsworth, 1979)

Reduce saturated fat; increase polyunsaturated and monounsaturated.
There is less agreement in this area, although most would agree that it is important to reduce the intake of saturated fatty acids, (SFA). The suggestion that the intake of polyunsaturated fatty acids should be increased is a more controversial issue, as there is a view that a high intake of polyunsaturated fatty acids (PUFA) may be harmful; however, as Mann (1979) points out, if total fat is reduced, intake of PUFA will not be high. In Britain it seems to be accepted that, while there does not seem to be sufficient evidence to specifically recommend an increase in the intake of PUFA, the recommendation to decrease intake of SFA will be facilitated by an increase in the ratio of PUFA to SFA (P/S ratio). In addition, the recommendations to reduce total fat usually suggest that the reduction is achieved by reducing the intake of foods which contribute most of the SFA to the diet, and this would, in effect, increase the P/S ratio. Mann (1978) suggests 'that it might be beneficial to take as much of the daily intake of fat in polyunsaturated rather than saturated form', but recognises that this is controversial. Some papers quantify this recommendation;

- Lewis (1980) suggests roughly equal proportions of saturated monounsaturated, and polyunsaturated fatty acids; since he recommends 30 per cent of energy from fat, this is the equivalent of the McGovern (1977) recommendation of 10 per cent of dietary energy from each of these types of fatty acid.

- Truswell (1977) discusses this (the McGovern) recommendation and suggests that more research would be needed before it could be accepted in Britain.

- NACNE (1983) suggests that 10 per cent of total energy should come from SFA (interim goal-15 per cent), but makes no recommendation on increasing PUFA, pointing out that other recommendations will ensure an appreciable increase in this ratio.

- COMA (1984) recommends that SFA should be reduced to 15 per cent of food energy, and suggests that while there are no specific recommendations to increase the consumption of PUFA or monounsaturated fatty acids the P/S ratio may be increased to 0.45 to facilitate the recommendation for SFA.

The above recommendations are based on studies which show strong positive correlation between the proportion of dietary energy derived from saturated fatty acids and mortality from coronary heart disease.
The CCMA (1984) report cites evidence from epidemiological, clinical and intervention studies, all of which have attempted to establish the relationship between the intake of the different types of dietary fat, plasma cholesterol levels, the development of atherosclerosis, and mortality from coronary heart disease. This report concludes that 'nine of the ten members of the panel have concluded individually that there is sufficient consistency in this evidence to make it more likely than not that the incidence of coronary heart disease will be reduced, or its age of onset delayed, by decreasing dietary intake of saturated fatty acids and total fat. We are all agreed that the evidence falls short of proof. The tenth member believes that this evidence is insufficient, but that benefit may accrue insofar as the recommended change in diet contributes to the avoidance of obesity'.

Whitehead (1981) also makes this point 'in terms of avoiding obesity, eating less fat definitely represents good general dietary advice'.

The NACNE report cites evidence to support the view that weight control is best achieved with a low fat diet.

Both Truswell (1977) and Passmore (1979) cite epidemiological evidence for the connection between fat intake and incidence of breast cancer and cancer of the colon.

Reduce dietary cholesterol

There is general agreement that no specific recommendations should be made concerning the intake of dietary cholesterol, on the grounds that 'current intake is not excessive ... and is likely to fall if the recommendation regarding intake of fatty acids is implemented'. In addition evidence for 'an influence of this level of intake on plasma cholesterol is inconclusive' (COMA, 1984).

There is, therefore, general agreement on the goals for fat intake (except on levels); many of these papers suggest dietary guidelines for the achievement of these goals.

'Eating for Health' (DHSS, 1978) suggests that many people will need to cut down their intake of;

- visible fats in the form of cream, butter, margarine, fat on meat, fried foods.

- invisible fats, in cakes, puddings, pastry, ice cream.

Whitehead (1978) suggests 'normally selecting less fatty meats, or cutting the fat from the meat or preparing foods in different ways'; also
the use of lower fat milks and milk products, and low fat spreads.

Neither of these authors quantify the changes in food consumption which would be necessary to achieve the goals. Whether recommendations (such as 'Eating for Health') intended for the general public need to be quantified is a matter for debate, and will be discussed in Chapter Six.

Passmore et al (1979) suggest that a diet providing less than 35 per cent of the energy from fat would be achieved by reducing consumption of fats and oils by 15 per cent and meat by 15 per cent, at the same time as increasing consumption of potatoes and cereals (see below).

COMA (1984) examines the main sources of saturated fatty acids in the average British diet:
- milk and cream 1/5 approximately
- meat and meat products 1/4
- butter, margarine and cheese 1/3
- cooking fats and oils 1/10

This report suggests various ways in which saturated fatty acids may be reduced:
- 40 per cent of the decrease could be achieved by avoiding cream, replacing whole milk with semi skimmed milk (half SFA content) and switching to lower fat cheeses (two thirds of SFA content), if skimmed milk was used 80 per cent of the decrease could be achieved.
- alternative meat products with lower fat and SFA contents are becoming more widely available as a result of changes in husbandry and manufacturing processes; until then, non fatty fish or poultry eg chicken could be substituted.
- a reduction by one quarter of all the following foods, all milk, cream, all meat, butter, margarine, other fats, and biscuits which are major sources of fat in the British diet.
- a more acceptable approach requires a smaller decrease in fat through an increase in PUFA; this will necessitate a shift from spreading fats and cooking fats with a high SFA content to those with a higher PUFA content, which are available.

Several authors (Truswell, 1977; Lewis, 1980; NACNE, 1983.) mention the traditional Mediterranean type of diet as one which contains appropriate proportions and types of fat, but none define this diet.

CARBOHYDRATES.

The NACNE report (1983) points to the need to clear up the confusion
in the minds of many people concerning the merits and disadvantages of dietary carbohydrate. This is largely due to confused terminology.

Finch (1983) suggests that this problem would be avoided if the use of the term 'carbohydrate' was discontinued, and the distinction was made between foods which contain complex carbohydrate mainly in the form of starch and dietary fibre, the consumption of which should be increased, and foods which contain refined sugars, usually in the form of sucrose, the consumption of which should be reduced.

This would be achieved by encouraging the consumption of cereals (emphasising the importance of whole grain cereals) vegetables, pulses, and fruit (fruits are usually included in this list even though much of the carbohydrates are in the form of sugars as it is thought to be important to encourage their consumption, and the total sugar content is usually not high). It is suggested that while possibly losing in strict scientific accuracy, the adoption of this distinction in nutrition education would help to clear up the confusion which has resulted from apparently contradictory advice.

**Increase complex carbohydrates/dietary fibre**

A study of papers written during this period provides a confusing picture, with some recommending a general increase in complex carbohydrates, and some specifically mentioning dietary fibre. Again if recommendations are translated into foods (as is usually the case) the problem is avoided. Here the use of the term 'available carbohydrate' (mainly starch or dextrins) and 'unavailable carbohydrate', (dietary fibre) would be helpful, to distinguish between the components in these foods which make a contribution to energy intake and those which do not.

Some authors (Truswell, 1977; Mann, 1978; Darke, 1979) suggest an increase in complex carbohydrates, with little or no specific mention of dietary fibre, on the grounds that, unless it is necessary to decrease total energy intake, energy from fat, sugar and alcohol will need to be replaced by that from other sources such as starch. This is additionally justified by the fact that many of the foods which naturally contain starch do not contain significant quantities of fat or sugar, but do often contribute protein valuable vitamins and mineral elements and also dietary fibre.

All these authors suggest increased consumption of foods such as cereals, (preferably whole grain or lightly refined) with the emphasis on
bread, and fruit and vegetables with the emphasis on potatoes; thus, while not specifically suggesting an increase in dietary fibre, this will be a natural consequence of implementing this recommendation.

The specific role of dietary fibre is controversial. On the basis, mainly of epidemiological studies, a long list of disorders has been attributed to lack of fibre in the diet.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constipation</td>
<td>Gallstones</td>
</tr>
<tr>
<td>Diverticular disease</td>
<td>Ischaemic heart disease</td>
</tr>
<tr>
<td>Polyps</td>
<td>Hiatus hernia</td>
</tr>
<tr>
<td>Cancer of the colon</td>
<td>Varicose veins</td>
</tr>
<tr>
<td>Appendicitis</td>
<td>Diabetes</td>
</tr>
<tr>
<td>Irritable bowel syndrome</td>
<td>Haemorrhoids</td>
</tr>
</tbody>
</table>

(from Stephen, 1981)

The evidence for the part played by a low dietary fibre intake in the aetiology of these diseases is reviewed by Stephen (1981) who concludes that 'the effect of fibre on faecal bulking is given as an experimental verification of epidemiological findings, which has led to the widespread use of fibre in treating diverticular disease and constipation. Evidence of beneficial effects for cancer of the colon and ischaemic heart disease are far less convincing'.

Whitehead (1979) reviews the evidence for the suggestion that dietary fibre has a protective role against cancer of the colon and suggests that more research is needed to strengthen the evidence for this connection. He also suggests that, while treatment of diverticular disease with a high fibre diet has been shown to be effective, this does not necessarily mean that a high fibre diet would protect against this disease. Evidence relating dietary fibre to these diseases was also reviewed by the NACNE working party.

COMA (1984) review the evidence relating lack of dietary fibre to the aetiology of coronary heart disease. They conclude that, while epidemiological studies suggest that high intakes of dietary fibre or complex carbohydrates are associated with a reduced incidence of coronary heart disease, it is not possible to establish that this effect is independent of all other dietary variables. The committee suggests that it is difficult to disentangle the separate effects of dietary fibre and complex carbohydrate as they are usually present together in foods (often in foods low in fat). They suggest that there is evidence that the effect may be related to the influence of dietary fibre on blood cholesterol and
glucose levels, which is shown most markedly by the gel types of dietary fibre (eg pectin). Epidemiological studies however, relate cereal fibre to protection against coronary heart disease.

Probably the least controversial justification for the recommendation to increase dietary fibre is the fact that foods naturally contributing fibre usually provide energy in the form of starch rather than fat or sugar, and also contribute protein, vitamins and minerals. It is suggested by both NACNE (1983) and COMA (1984) that this type of diet is less likely to contribute to obesity, and may also be of help in its treatment.

Few of the papers have quantified these recommendations.

Truswell (1977) supports the McGovern (1977) recommendation that 55-60 per cent of energy intake should come from complex carbohydrates. This is on the grounds that, to suggest an increase in consumption of foods containing carbohydrates to replace fats and sugars, is a positive recommendation among the many negative ones.

NACNE (1984) recommends that dietary fibre intakes should increase to 30 grams per day, with 25 grams as an interim goal. It is suggested that the increase should come mainly from increased consumption of whole grain cereals. The use of bran or bran products is not recommended on the grounds that these are unlikely to provide the other nutrients associated with fibre rich foods. A diet which would meet the NACNE interim targets would provide about 50 per cent of the energy from carbohydrate.

COMA (1984) does not quantify the recommendation for increased fibre 'the panel sees advantages in compensating for a reduced fat intake with increased fibre-rich carbohydrates (eg bread, cereals, fruit and vegetables) provided that this can be achieved without increasing total intake of common salt or simple sugars'.

Passmore (1979) recommended an increased consumption of;

- potatoes by 15%
- other vegetables by 15%
- fruit by 15%
- grain by 20%

The authors point out that this will result in an increase in dietary fibre and other nutrients, but do not calculate the fibre content of their target diet; in this diet just under 50 per cent of the energy comes from carbohydrate.

Reduce intake of sugar.
Most agree with this recommendation, on the grounds that sugars and foods that contain them are appreciable sources of energy and contribute to obesity, and that sugars provide little or no micronutrients (Truswell, 1977) while contributing to dental caries.

COMA (1984) recommends that intake of simple sugars (sucrose, glucose and fructose) should not be increased further.

The McGovern report (1977) discussed by Truswell (1977) would like to see a reduction of refined sugars added to foods during manufacture. This report suggests (supported by Truswell) that sugar should account for no more than 15 per cent of total energy intake.

The NACNE report discusses the evidence relating sucrose intake to the incidence of dental caries, and suggests that the emphasis should be on reducing sugar intake in the form of confectionery, soft drinks and snacks consumed in between meals; this report suggests a limit of 10 kg/year of sugar in this form and only a further 10 kgs/year should be contained in foods giving a total of 20 kgs. Cannon and Walker (1984) suggest that this is equivalent to 10 per cent of energy from sucrose.

Passmore et al (1979) suggest a reduction in sugar consumption of 5 per cent and propose that not more than 14 per cent of total energy should be provided by sugar.

DHSS (1978) gives dietary guidelines, suggesting that 'many people will need to cut down on their intake of sugar in sweets, chocolate, puddings, soft drinks, tea, coffee and other beverages.

Darke (1979) (also DHSS,1978) suggests that these foods should be thought of as 'party foods not everyday fare'.

Reduce salt intake

This recommendation also is controversial. It is made on the grounds of the epidemiological correlation between sodium intake and prevalence of hypertension. A mechanism whereby salt could lead to the development of hypertension has not been established, but it is felt that this measure could do no harm (Truswell 1977).

The NACNE report (1983) proposes that 'the present evidence is sufficient for the WHO Committee to suggest that exposure to a high sodium/low potassium intake may be a cause of hypertension in susceptible individuals. The proportion of individuals in the population is unknown but may be 20 per cent'.

COMA (1984) suggests that the intake of salt in the United Kingdom
(approximately 7-10 grams) is 'needlessly high' and recommends that it 'should not be increased further and that consideration should be given to ways and means of decreasing it'.

The NACNE report (1983) quantifies this recommendation. Depending on the exact level of intake a reduction of 3 grams per day would bring the intake nearer to the WHO recommendation of 5 grams per day, an interim reduction of 1 gram per day is recommended.

Truswell (1977) suggests that the level of 3gms/day recommended by the McGovern report falls into the category of moderate to low salt diet. This author suggests two separate recommendations, one for infants, where the harmful effects are well documented, and one for adults.

COMA (1984), DHSS, (1978) and Darke (1979) all suggest reducing salt intake.

Mann puts it on his list of secondary priority recommendations.

The other papers do not specifically mention salt.

The COMA panel suggest that 30 per cent of the dietary intake of salt comes from that added during cooking and at the table; this could be reduced immediately. However, as 70 per cent of salt comes from foods, much of it added in manufacture, it may be 'difficult for the public to effect an immediate and substantial change in intake'.

NACNE suggests that better labelling of manufactured foods would help the choice of products with a lower salt content.

OTHER RECOMMENDATIONS

The recommendations discussed above are likely to be the most important ones if the incidence of 'diseases of affluence' are to be reduced. The NACNE report, however, is setting out guidelines for overall nutrition education, therefore recommendations for protein, vitamins and minerals, and recommendations for special groups of the population are also discussed. While undernutrition is not the problem it was during the early part of this century, it is as well for those involved in planning food supplies and in nutrition education in this country to be aware of those nutrients for which there may be a risk of deficiency, and the specific population groups which are at risk.

Several other authors, writing during this period, (Truswell, 1977; Passmore et al, 1979; Darke, 1979; and DHSS, 1978) also made recommendations concerning other nutrients and groups with special needs. Other authors (COMA, 1984; Lewis, 1980; Mann, 1979) did not discuss these aspects, mainly because they were considering dietary recommendations to a
particular end, usually that of preventing coronary heart disease.

**Protein**

The DHSS publication, 'Eating for Health' (1978) suggests that 'it would do no harm for most people to eat a little less protein'.

NACNE (1983) suggests that protein intake should not be altered, but notes that the other recommendations will result in a decrease in protein from animal sources and an increase in protein from cereal and vegetable sources. This committee suggests that there is no evidence that this diet is not adequate for both adults and children.

**Minerals and Vitamins**

NACNE suggests that mineral and vitamin intake which match the recommended allowances listed by the DHSS (1979) would be appropriate, and stresses the importance of taking these into account when expressing nutritional guidelines in terms of food. This working party suggests that when the main recommendations are translated into the types of food consumed, the intake of minerals, vitamins, and essential fatty acids will increase. Passmore et al (1979) compare their 'Better British diet' with the national diet 1973-77 based on the NFS figures. This comparison supports this view. Walker (1983) however, does not calculate the vitamin and mineral content of the 'New NACNE diet', so no comparison can be made in this case.

DHSS (1978) and Darke (1979) both recommend that the diet should contain a mixture of different foods including cereals, fruit and vegetables, to ensure nutrient needs are met.

**Nutrient deficiencies**

Public health surveys in Britain have indicated that the principal nutritional deficiencies are of iron, calcium, vitamin C and folic acid. These are discussed in relation to the diets of schoolchildren in Chapter Three.

The NACNE report recommends;
- the increased consumption of fruit and vegetables, which would increase vitamin C and folic acid intakes, and would also promote the absorption of iron.
- it was felt that sufficient iron would be provided by the continued
ingestion of meat and of cereals, pulses, and vegetables.

- the need for advice on the correct methods of cooking vegetables to ensure maximum retention of both vitamin C and folic acid was noted, with particular reference to folic acid deficiency in the Asian community.

- the importance of adequate intake of calcium during growth is stressed, as is the importance of milk as a source of calcium. The working party acknowledges that this will only be compatible with a reduced fat intake, if fresh milk with a lower fat content is readily available for doorstep delivery.

Passmore et al (1979) also mention the importance of ensuring adequate intake of these nutrients.

Truswell (1977) includes measures to reduce iron deficiency in his dietary goals.

Recommendations for special groups in the population

The NACNE report identifies five groups within the population for whom special additional recommendations need to be made, babies, young children, adolescents, the elderly, and ethnic minorities.

Recommendations for babies and young children are not relevant to this thesis. It is perhaps important to note, however, that the COMA report specifically excludes children under five from the recommendations to reduce the consumption of saturated fatty acids as they 'usually obtain a substantial proportion of dietary energy from cow's milk'.

The NACNE report also suggests that the recommended diet, being bulkier, and thus less energy dense, may not satisfy all the nutritional requirements of a child eating to satisfy appetite and 'should not be pushed to extreme limits'. The concern felt by the paediatric group of the British Dietetic Association over the effects of 'over zealous' application of the NACNE recommendations on the growth of children is discussed in Chapter Three. This concern is however, unlikely to apply to many of the age group taking part in this study.

The NACNE recommendations for adolescents will be discussed in the section on nutrition of adolescents.

For ethnic minorities, the NACNE committee felt that 'there is no reason to suppose that the diet recommended will be unsuitable for UK ethnic minority groups. Indeed some of them are already consuming diets which have many features of the dietary patterns advocated'. The committee recommended, in addition that efforts should continue to be made to prevent the occurrence of rickets and osteomalacia in minority Asian
groups; the importance of vitamin D supplements for these groups is also stressed. Truswell also included measures to prevent rickets and osteomalacia in his dietary goals.

The final recommendation of the NACNE report was that 'fuller labelling of foods is long overdue, and its health-education as well as regulatory functions have to be recognised'. As this recommendation relates to measures which would facilitate the implementation of the other recommendations, this will be discussed in Chapter Six.

Thus it can be seen that a considerable consensus of opinion exists on the recommendations for dietary change.

The view that these recommendations should be expressed in terms of quantified dietary goals and have official government support, thus forming the basis of a national nutrition policy to facilitate their implementation, is discussed below.

It has been suggested by Sanderson (1983) and others that such a national nutrition policy should include the recommendation that quantified dietary goals and dietary guidelines arising from them should be used as the basis for planning and evaluation of meals in government and local authority catering establishments. The use of these dietary goals and dietary guidelines for this purpose in school meals is discussed in Chapter Four.

2.5 RECOGNITION OF THE NEED FOR RESEARCH AND DISCUSSION ON THE IMPLICATIONS OF, AND MEANS OF IMPLEMENTING DIETARY GOALS.

As discussed above, there will need to be a change in types or quantities of foods consumed in order to achieve dietary goals. Several of these papers and others written during the same period recognised that changes in food habits will involve, (and have implications for) the food industry, and the government, through its agricultural and food policy, its health policy and its food laws, and also involve nutrition educators.

As the purpose of this chapter is to establish whether there is sufficient consensus of opinion on the dietary changes needed to reduce the incidence of 'diseases of affluence', (and if so, whether the dietary goals recommended can be used as the basis for guidelines on the nutritional aspects of school meals), issues involved in the implementation of dietary guidelines will only be discussed briefly in this chapter. Some aspects will be discussed in more detail with special
reference to school meals in Chapter Six.

2.5.1 The need for a National Nutrition Policy

As the relationship between diet and 'diseases of affluence' became clearer, and the inter-relationships between the consumer and his choice of food, the government and the food and agricultural industry was recognised, several individuals and groups pointed out the need for a national nutrition policy.

The Centre for Agricultural Strategy (CAS; 1979) in a report 'National Food Policy in the UK' suggested that 'such a policy should not dictate the diet of the individual, but in the interest of health and well being would co-ordinate the activities of both farming and food industries with those concerned with public health policies, so that an adequate range of wholesome foods is available to the public'. The authors also suggest that such a policy would also help to give some stability in the planning of food production and supplies.

Darke (1979) puts forward another view of a food and nutrition policy, 'by nutrition is meant food production including farming, agriculture, and the food industry, the effect of food on health, the part food plays in disease and the social aspects of food and eating. A nutrition policy and food policy should cover all these aspects of the subject'.

Hollingsworth (1979) distinguishes between the terms food policy and nutrition policy;

- through a national food policy the government has the responsibility of ensuring a 'sufficient safe and wholesome food supply'. This is effected via the regulations made under the Food and Drugs Act 1955; in addition different foods are, from time to time, subsidised, 'but not usually for nutritional reasons'.

- a national nutrition policy may be defined as 'the measures taken to maintain a nutritious food supply'. So far, these include measures to ensure adequate intake of nutrients by such means as 'fortification of flour and margarine, and the provision of milk and vitamin drops for children in large and/or poor families'. Hollingsworth (1979) suggests that 'nutrition policy also includes recommendations made about the prevention of diseases of malnutrition'.

The role of the government in formulating such a nutrition policy is a controversial one, as the interaction between the consumer, health educator, food producer and government is very complex. This complex
interaction is discussed in a number of papers.

Sanderson (1983) examines the food chain from the importers and producers of the primary foodstuffs through to the consumer, via food processors, food manufacturers, wholesalers, and retailers. This author lists intermediaries 'including transporters, brokers, advertisers, and media (which) physically and psychologically facilitate the flow of food along the chain'. Government and international agencies also intervene in the food chain at all stages. Other groups concerned with food are pressure groups such as trade and professional associations, health and environmental groups, those who have to treat diseases resulting from diet, (doctors, dentists, dietitians) and health educators. Sanderson (1983) points out that the interaction along the chain moves in both directions; since patterns of consumption and related diseases are determined by this complex interaction of groups 'nutrition policy must move beyond education of individual consumers towards a balanced strategy involving all interested parties'. In the other direction 'changes in the national diet will have economic, social and political consequences along the chain'.

The interaction of all these groups was recognised by Turner and Gray (1982) in a BNF monograph 'Implementing Dietary Guidelines, Obstacles and Opportunities'. They also base their discussions on the interaction of various groups in the 'Food Chain' which is diagramatically described in Figure 2.17.

Payne and Thomson (1979) also discuss this complex interrelationship, expressing the relationship between the consumer (C), the producer and supplier of food (P), the government (G), and the scientific community (S) diagramatically in Figure 2.18. The thickness and direction of the arrows representing the direction and strengths of existing influences.

These authors stress that they have assigned 'these strengths and directions of influence according to our own conceptions of the relationships involved'. They feel, however, that it is 'essential to try and achieve a better understanding of the structure of interdependence that such a diagram reveals'.
Figure 2.17. A simplified illustration of the 'food chain' (excluding supplies to the catering industry)  
(from Turner and Gray, 1982)

Figure 2.18. Relationship between Consumers, Producers and Suppliers of food, the Scientific Community and the Government.  
(from Payne and Thomson, 1979).
Payne and Thomson (1979) examine what is probably one of the most crucial and almost certainly one of the most divisive issues in the area of implementation of dietary guidelines, that of whether the consumer determines food production through informed demand, or whether the consumers choice is directed for him by agencies over which he has little influence. There are papers expressing both views.

Darke (1979) expresses the view that 'in a democratic society, a nutrition policy must be one of sound education so that individuals make a wise choice of foods, in the long run public demand has the greatest influence on what foods are available, their choice creates demand and indirectly influences food production both from agricultural production and from the food industry. In a democracy there is only one way to ensure a sound nutrition policy and that is to create a demand for nutritious food. The creation of this demand depends on nutrition education and lies in the hands of the educators. The education which underlies choice should be based on scientific fact and sound physiological principles rather than fashionable hypotheses'.

The view expressed by Hollingsworth (1979) is very similar, 'we have enough knowledge to devise one ... the best way to implement a nutrition policy is likely to be through consumer demand for nutritious food and for information about its nutritional value. I hope that the greatest possible national effort will be put into enlightened nutrition education so that consumer demand will become increasingly sound and sensible'.

The other view is put forward in the CAS report (1979) which argues that 'it is unfair to place the responsibility for a safe and healthy diet entirely on the individual. The consumer does not have complete freedom of choice but in fact has his choice directed for him in a number of ways which are not fully appreciated. Thus the report takes the view that welfare, particularly as it relates to health, cannot be assured through market forces alone and challenges the belief that consumers determine the nature and range of foods supplied. So education on its own, so often advocated by government and industry, will not enable the individual to choose a healthier diet unless the food supply is modified accordingly' (BNF Bulletin, 1980).

Payne and Thomson (1979) conclude that 'the problem is not a simple one, and the issues raised are political and ethical, rather than technological'. Thus the views expressed by individuals and groups on the role and formulation of a national nutrition policy will depend on their stance on these issues. This question is discussed in more detail in Chapter Six.
Whitehead (1978) discusses the government view as set out in the form of recommendations made by the House of Commons Expenditure Committee on Preventative Medicine (1977), and the principle responses contained in a subsequent government white paper, 'Prevention and Health' (HMSO Command Paper 7074, 1977), (Tables 2.26 and 2.27)

Table 2.26 Dietary recommendations from House of Commons Expenditure Committee report (1977)
(from Whitehead, 1978)

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Dietary Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>41</td>
<td>More research into what is the desirable diet for different sectors of the population: important for ethical advertising</td>
</tr>
<tr>
<td>42,45</td>
<td>Information about fats and other dietary components likely to be hazardous to be made available to the public</td>
</tr>
<tr>
<td>43,44</td>
<td>Calorie content and amounts of saturated and unsaturated fats to be on food labels</td>
</tr>
<tr>
<td>46</td>
<td>Mothers to be encouraged to breast feed</td>
</tr>
<tr>
<td>47,51</td>
<td>Encourage exercise</td>
</tr>
</tbody>
</table>

Table 2.27. A brief summary of the food, diet and health section from Prevention and Health, HMSO Command Document 7074 (1977)
(from Whitehead, 1978)

<table>
<thead>
<tr>
<th>Number</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>133</td>
<td>Ensure safety of food in connection with additives, contaminants, toxicological components and nutrient content</td>
</tr>
<tr>
<td>134</td>
<td>Truthful, accurate and informative labelling and advertising</td>
</tr>
<tr>
<td>135</td>
<td>Government should assemble, assess and disseminate information about diet so that individuals can make their own choice</td>
</tr>
<tr>
<td>136</td>
<td>Continue to monitor food availability and purchases so that trends can be assessed</td>
</tr>
<tr>
<td>137</td>
<td>Comprehensive nutritional health surveillance</td>
</tr>
<tr>
<td>138</td>
<td>Encourage more research into causes of obesity, heart disease and dietary fibre related diseases</td>
</tr>
<tr>
<td>139-141</td>
<td>Educate the public about good nutrition</td>
</tr>
<tr>
<td>142</td>
<td>Provide Welfare Foods when necessary</td>
</tr>
</tbody>
</table>

Whitehead's paper interprets the government's view, 'the view stated in the White Paper seems to be that the total pattern of demand for food,
representing the sum of individual choices freely made by members of the public should determine the food policy. In other words a national food policy should not restrict the freedom of the public to choose for themselves what they want to eat. Government responsibility towards nutrition, as seen by the authors of the White Paper, should be directed primarily to assembling, assessing and disseminating information, based on scientific evidence, in the light of which individuals can form their own views and take their own decisions. If as a result, the public decide to change their dietary habits, the government policies towards food production and manufacture would theoretically alter as an automatic consequence of these changes in demand'.

Whitehead (1975), among others, expressed disappointment with the 'apparently luke-warm response to nutrition shown by the government White Paper'. He feels that the ideas expressed in that paper are 'clearly in keeping with our concepts of what constitutes a free society' and perhaps more to the point 'are not the sort of statements which will upset the farming and food industries'; at the same time, if these ideas are to be translated into a practical policy 'a truly adequate effort must be made to ensure that the British people really are in a position to make a choice, and if relevant, influence the sort of food made available to them'.

Whitehead therefore suggests the 're-institution of a national programme, the aim of which would be to inform people about present day nutritional issues, in terms that they can understand'. This author (also Whitehead, 1979) stresses the importance both of nutrition education, and also of co-operation between all those involved in the production and supply of food to the consumer. He suggested that there was a need for 'some sort of national advisory council representing joint interests of the health authorities, the food industries, the food industry, farming and the consumer, as well as the government departments'.

Whitehead also suggests that the key role played by a 'health educator on food', should recognise that 'scientific proof beyond any reasonable doubt' has not yet been established and it will not be for a long time - if ever. Nevertheless 'the general public are anxious to have greater guidance, even if it has to be provisional'.

Thus health education on food 'should not have to disguise the shortcomings of present knowledge, it would need to give positive guidance as to what would be the most judicious thing for people actually to do'.

So that other forces, such as commercial advertising practices, should not 'subvert the contents of the education programme, 'commercial
interests should be involved in policy debates and in the formulation of the ultimate plan of action ... it is not too much to hope that they would be able to adjust their publicity and marketing practices so that there were generally in line with public education policies'.

The need to co-ordinate the activities and interests of all those involved in the supply of food to the consumer with those involved in nutrition education is the main argument discussed in Chapter Six.

Following the same argument, the importance of liaison between the school caterer and those involved in nutrition education in schools for effective implementation of the guidelines on the nutritional aspects of school meals is also discussed in Chapter Six, as is the importance of seeing nutrition education in schools as one aspect of a community nutrition education programme involving parents, among others.

This is put forward as a strong argument for an overall government policy which would co-ordinate all the areas.

2.5.2 The first step towards a national nutrition policy - a set of officially accepted dietary goals

Whatever differences in view there may be over the role of, and the form which a national nutrition policy should take, most nutritionists would agree that the first step towards such a policy should be a set of officially accepted dietary goals. Robbins (1983) suggests that these should be quantified to be most useful.

As the first move towards disseminating information, 'Eating for Health (DHSS, 1978) was produced in the 'Prevention and Health' Series, as part of the government's initiative in preventative medicine, launched in 1976; its purpose was 'to present the facts (about what constitutes a healthy diet) so that people can make a well informed choice'. The foreword emphasises that it is not a handbook or text book on nutrition, but sets out 'what is known about food and its effect on the body'.

While fulfilling this purpose by giving non-quantitative dietary guidelines in terms of foods, it did not in any way satisfy the growing number of nutritionists who felt that the government should take a more positive role in the promotion of health through good nutrition. Many of these nutritionists felt that the first step towards this positive nutrition policy should be the setting down of officially recognised and accepted quantified dietary goals upon which those involved in nutrition education could base their message; and which all those involved in all
stages of the food chain could use as the basis of their planning.

Thus the eventual publication, in 1983, of the NACNE report represented that which nutritionists has been pressing for, for some years. As discussed below, there has been considerable controversy surrounding its publication as a discussion paper, rather than as an officially accepted report. Nevertheless, possibly its most important effect has been the considerable interest and debate that it has aroused among all those involved with food.

The NACNE report was followed in 1984 by the DHSS, COMA report on Diet and Cardiovascular disease; which also quantified some of the dietary goals recommended. This official report is more likely to lead to government involvement in measures by which its recommendations may be implemented.

The NACNE report was the eventual outcome of a move initiated by Sir Keith Joseph, then Secretary of State for Social Services, in 1973, when he pointed out the need to improve nutrition education. The Working Party set up as a result of this initiative concluded in their report in 1977 that 'there is an urgent need for a point of reference that would provide simple and accurate information on nutrition', and therefore that the Health Education Council (HEC) and British Nutrition Foundation (BNF) should set up a committee on nutrition education.

In 1979 'with government encouragement' (DHSS statement to British Dietetic Association - BDA newsletter October 1984) the 'BNF/HEC joint committee on nutrition education' was set up. This committee including representatives of 'practitioners of nutrition education, the food industry, DHSS, and MAFF, BNF, HEC and the Scottish Health Education Group, and the academic community'. Presumably the type of committee envisaged by Whitehead (1978 and 1979).

The terms of reference of this committee were 'to provide information on nutrition to the public, educators and the media'.

In June 1980 the title 'National Advisory Committee on Nutrition Education' (NACNE) was adopted. This committee soon discovered that there was much conflicting advice on what constituted a healthy diet, and thus the immediate priority of those involved in nutrition education should be to establish a consensus of opinion in this area.

As a result of this, in 1981 an ad hoc working party was established under the chairmanship of Professor James, who after examining 'major official, academic, and international reports produced a discussion paper entitled 'Nutritional Guidelines for Health Education in Britain'. This is
now known as the James Report or more usually the NACNE report. This
document attempted to 'propose a modest programme for the 1980's, for the
general population, which is scientifically based, feasible and
worthwhile, and would provide all concerned in nutrition education with
realistic and palatable guidelines for their work'.

Quite aside from the controversy surrounding its publication (to a
large extent media initiated), the report has stimulated considerable
debate. The combined effect of this and the COMA report published in 1984,
have been the establishment of many initiatives by those involved at
various stages in the food chain, some of which will be discussed in
Chapter Six.

Much of the debate, however, has emphasised the controversial aspects
and has been unhelpful both to consumers and to those professionally
involved in nutrition education. The role of the media in nutrition
education is discussed by Turner, (1984) and Whitehead (1981) who while
recognising the important channel for nutrition education provided by the
media, express concern over the unbalanced view that is sometimes put
forward and the resulting confusion; this they attribute to the media
needing 'exciting headlines', and 'thriving on controversy'(Whitehead,
1981) and 'being in the entertainment business rather than an extension of
the educational system' (Turner, 1984). The role of the media in
nutrition education is discussed in Chapter Six.

The NACNE report had a mixed reception from nutritionists. An
official British Dietetic Association policy statement suggested that the
NACNE report was the 'most important document on nutrition and nutrition
education since the second world war ... dietitians are working together
towards the interpretation and implementation of those proposals'.
Subsequent correspondence in the BDA newsletter indicated that by no means
all dietitians subscribed to this view.

Robbins (1983) highlights the reasons for the controversy in a paper
'National Dietary Goals: a confused debate', and recommends that as 'the
present lack of UK national goals both encourages the proliferation of
congfusing advice and discourages the more general adoption of
scientifically sound advice', the 'DHSS could provide the appropriate
authority to the NACNE goals ... and help co-ordinate their national
implementation'.

Objections to the NACNE report came from the 'health professions', on
three grounds.
Firstly, that the dietary goals suggested by NACNE are 'unrealistic', 'too severe', and 'unattainable' (translated by the media into 'draconian'). This view has been expressed by Marr (1983), indirectly by Moore (1984) and by Passmore (1984); Black et al (1984) suggest, on the basis of a comparison of the NACNE recommendations with the results of a dietary survey among dietitians (carried out in 1977), that 34 per cent of energy from fat was a more realistic goal. Remembering that the NACNE working party suggested that a time span of 15 years would be needed to achieve these goals and an interim target was set, it is perhaps too early to say whether or not the long term goals are attainable. It is suggested that surveys of actual intakes are needed before it can be ascertained whether proposed goals are consistent with a palatable diet, fitting in with modern lifestyles.

Secondly, objections are made on the grounds that the 'role of dietary fat as one cause of coronary heart disease is not yet established scientifically' (Passmore, 1984) and 'there are a considerable number of good scientists who feel that the importance of diet as an aetiological factor in heart disease has been exaggerated' (Neuberger, 1981). The difficulties of establishing cast iron proof for the role of diet in the aetiology of multifactorial diseases have already been discussed. Whitehead (1979) however puts forward the view held by most nutritionists, when he said that to wait for scientific proof before introducing national policies, 'is neither desirable nor acceptable'. He feels that the general public would rather have guidance even if it has to be provisional 'this is an area where judgement backed by a general consensus of opinion will have to dictate policy'.

Thirdly the objection was raised that this was not an official report, and therefore would require government acceptance before forming the basis of a national nutrition policy. The DHSS put the official view in a statement to the British Dietetic Association. This statement pointed out that NACNE 'was not set up to provide scientific advice about nutrition to the government ... the government is advised on medical aspects of food and nutrition by the chief medical officers committee on medical aspects of Food Policy (COMA) and not by NACNE ... it should be made clear that NACNE is not an official Government Committee as has been represented in the press, and has no remit to advise the government on nutrition standards'.

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2.5.3 COMA report on Diet and Cardiovascular disease

This committee reviewed the evidence relating diet and cardiovascular disease, reported their findings and made recommendations in 1984.

The correspondence in the BDA newsletter indicates that many dietitians feel that NACNE has been superceded by COMA and as this is an 'official' report, should be the basis of a national nutrition policy. Francis (1984) suggests that the 'COMA report proposals are a safer and more practical guide for those who wish to follow a diet in the hope of reducing the incidence of coronary heart disease in the population as a whole', and Marr (1984) suggests that 'the more realistic recommendations concerning fat intake that are given in the DHSS report should be the basis for action by dietitians in formulating dietary goals'.

Perhaps the most important recommendations of the COMA report are those concerning the implementation of the recommended dietary changes; the committee recognised that many groups are involved and made recommendations to those involved in health education; also to producers, manufacturers and distributors of food and drink and caterers, concerning the provision and labelling of foods which would give the consumers information on, and a choice of foods which would constitute a healthier diet.

COMA made recommendations to the government which would provide the basis for the formulation of a national nutrition policy (as discussed in Chapter Six). The Committee also recommended the establishment of 'machinery for ongoing review' of the various aspects of the role of diet in the aetiology of cardiovascular disease. This is a particularly important recommendation in view of the controversy still surrounding the issue.

The formation of the Joint Advisory Committee on Nutrition Education (JACNE) early in 1985, following the COMA (1984) report, perhaps goes some way towards fulfilling the suggestion made by Whitehead (1978) of a 'joint advisory council' (discussed above).

The need for such a committee (almost certainly government initiated) to co-ordinate the activities and interests of all those involved in the choice of food by the consumer - the various agencies and stages of the food supply chain, those involved in nutrition education and the consumers themselves - is discussed in Chapter Six.

The difficulties of operation of such a committee are clearly
recognised and well illustrated by the controversy following the publication of these recent reports.

It is hard not to feel, even some time after the NACNE report that the climate of controversy (partly media engendered, and partly due to the pronouncements of different groups with their own, often political, axe to grind) is hindering the genuine efforts of those professionally involved in nutrition education.

The current controversy is unhelpful to the consumer; on one hand leading to the dismissal of current dietary recommendations as 'just another food fad' on the other hand 'turning the whole population into patients, preoccupied with their diets' (Marr and Morris, 1982).

The need for moderation in advice is recognised by Black et al (1984) 'let us not go overboard in exhortations to achieve them (quantified dietary goals), and risk having our education rejected out of hand', and by Moore (1984) 'nutritionists should ... recognise ... the need for 'balance' in food advice and propaganda'.

Current controversy is also unhelpful to those involved in the food chain, for example caterers, who are interested in, and may require guidance from nutritionists. It is the argument of this thesis that caterers have an important part to play in implementing dietary recommendations; if, as seems to be the case, they are made well aware of the more controversial areas of this debate they are unlikely to take this role seriously, thus indirectly affecting the consumer also.

2.5.4 The use of NACNE and COMA recommendations as the basis of guidelines for nutritional aspects of school meals.

It is suggested in Chapter Four that there is a need for guidelines on nutritional aspects of school meals, and that quantified dietary goals should form the basis of these guidelines.

The present consensus of opinion among nutritionists would seem to be that, since the COMA report only quantifies recommendations for fat, for practical purposes, dietary goals will need to be based on the recommendations of both the NACNE and COMA reports.

Dietary goals derived in this way will be used as the basis of the suggested guidelines for school meals, discussed in Chapter Four. dietary goals.

In the light of the current controversy about quantifying dietary goals, it is recognised that until there has been further research and
discussion in this area, it is perhaps unwise to quantify dietary goals for use in school meals.

Nevertheless, the suggestions made in Chapter Four can be justified on two grounds.

Firstly, in this study there is a need for some quantitative basis on which to evaluate the nutritional content of school meals, (discussed in Chapter Five).

Secondly in order to assess the feasibility of quantified dietary goals for school meals, (which is the aim of this study) some suggestions must be put forward, even if only provisionally.
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3.1 INTRODUCTION

The argument is put forward in the next chapter that, given the importance of nutrition in the growth and health of children, the contribution made by the school meal should be seen as an important one for all school children but particularly for those children from families in lower socioeconomic groups. The importance of examining the school meal in the context of the child's overall nutritional intake is also emphasised. The purpose of this chapter is to examine in rather more detail various aspects of the relationship between nutrition and health in school children in order to provide the necessary context for the current study of school meals.

The first two chapters of this thesis discussed some of the social and economic changes and the developing knowledge of nutrition which have lead to the considerable improvements in the nutritional status of children in this country since the war. During the 1980's nutritional problems are rarely those of under-nutrition and most children are adequately fed. However, there are still some areas of concern, and areas where there is need for further research, or a need for surveillance or monitoring of nutritional status. These will be the areas discussed in this chapter.

In Chapter Two the evidence relating the increased incidence of certain diseases in the adult population to changes in food consumption and nutrient intake associated with increasing affluence was examined. One of the nutritional concerns of the 1980's must be the extent to which the foundations of these degenerative diseases of adulthood are laid down during adolescence and childhood. The evidence relating to this is, at present, scanty, and there is currently much debate on the justification for applying the recommendations of the NACNE and COMA reports to the diets of children and adolescents.

A number of studies carried out during the late 1960's and 1970's related socio-economic factors to nutritional intake of schoolchildren. While these studies revealed little, if any, overt clinical malnutrition there was some indication that children from families in certain socio-economic categories were at greater risk than others of suffering from the
effects of an inadequate nutritional intake.

In the late 1970's and 1980's socio-economic conditions have been changing. The combined effects of increasing unemployment and reduction in some welfare benefits, such as the changes in school meals provision discussed in Chapter Four, have resulted in decreased socio-economic status for some families. It has been suggested (Skinner 1981, Elwood 1981, Robert-Sargeant and Gray 1983) that there is a possibility that these changes will result in an increase in the number of children in the 'at risk categories'. It is important to ensure that the nutrition of schoolchildren is not adversely affected by such changes in socio-economic conditions.

This chapter is mainly concerned with nutrition in adolescence as the age range of the children in the current study includes adolescents. The physiological changes occurring at this time create particular nutritional demands; the social and psychological changes accompanying these physiological changes very often result in changed and erratic eating habits, making it more likely that these increased nutritional requirements may not be met.

During the discussion of these areas of concern and their implications for the school meals service, some of the studies on the relationship between nutrition and health in school children and adolescents will be examined. Any conclusions drawn from dietary studies must depend on the validity of the tables of recommended daily allowances for energy and nutrients (RDA tables) which are used to evaluate nutrient intake. Thus the first section (3.2) of this chapter examines both the evidence relating to energy and nutrient requirements of schoolchildren and adolescents, and also the basis of the nutrient and energy recommendations for these age groups, an area where more research is required.

The next section (3.3) examines the difficulties involved in drawing any conclusions concerning the nutritional status of a group from the results of dietary surveys alone. This section discusses the need to use information from a variety of sources and measurements in conjunction with data from dietary surveys in order to build up as complete a picture as possible of the nutritional status of schoolchildren and adolescents. The importance, in times of changing socio-economic conditions, and welfare benefits, of establishing and maintaining a comprehensive system to monitor any effects of these changes on the nutritional status of affected
groups is also discussed, as is the need to consider, when assessing nutritional status of schoolchildren and adolescents, conditions due to an excess or imbalance of nutrients, as well as those due to a deficiency of nutrients.

The final three sections (3.4; 3.5; and 3.6) examine various studies involving dietary surveys and other methods of assessing nutritional status of schoolchildren and adolescents. This examination supports the argument that in the three areas of concern outlined above there is need for further research and monitoring. The implications of those areas of concern for the school meals service is also discussed.

Throughout this chapter the emphasis is on nutrition and health in schoolchildren, particularly during adolescence. However the relationship between nutrition and health during the period of life when a child is of school age cannot be discussed in isolation; thus some of the studies used in the discussion include infants and pre-school children, and at the other end of the scale, school leavers and young adults. It is considered that the inclusion of these studies is legitimate on two grounds, firstly that one of the important factors determining nutritional requirements in childhood and adolescence is growth, a process which is continuous throughout this period; secondly food habits which lead to good nutrition or otherwise are formed long before a child goes to school. The formation of food habits and the role of nutrition education in changing them is discussed in Chapter Six.

3.2 NUTRITIONAL REQUIREMENTS AND RECOMMENDATIONS FOR SCHOOLCHILDREN AND ADOLESCENTS

3.2.1 Requirements and tables of recommended daily amounts of energy and nutrients

Many of the studies discussed in this chapter, also the current study of school meals, involve a comparison of energy and nutrient intakes with tables of recommended daily amounts of energy and nutrients (RDA tables). The validity of any conclusions drawn from such studies therefore depends on the basis upon which these tables are compiled. This section examines the evidence relating to nutritional requirements of schoolchildren and adolescents and the basis of recommendations for this group. The current school meals study includes adolescents, therefore the emphasis will be on nutritional requirements and recommendations for this group.
Definitions of requirements and recommended daily amounts

The terms 'requirements' and 'recommendations' need to be distinguished. The introduction to the DHSS (1979) RDA tables recognised this need, 'this report attempts to avoid any confusion between recommendations for groups of people and the requirements of an individual'.

Requirements for energy and nutrients relate to physiological needs of individuals which vary very considerably, and are defined as;

- 'the requirement of an individual for a nutrient is the amount needed daily to maintain health, and below which signs of deficiency might develop. Requirements differ from one individual to another, and moreover the requirements of an individual may change with alterations in the composition and nature of the diet as a whole, because such alterations may affect the efficiency with which nutrients are absorbed or utilised' (DHSS, 1979).

This report also defines the recommended daily amount - different definitions are given for energy and for nutrients;

- the recommended daily amount of food energy is equated with the estimated average requirement,
- the recommended daily amount for a nutrient is defined as the average amount of a nutrient which should be provided per head in a group of people if the needs of practically all members of the group are to be met (DHSS, 1979).

Estimates of requirements as the basis for RDA tables

Tables of recommended daily allowances are derived from estimates of energy and nutrient requirements of groups of people. Estimates of requirements, in turn, are derived from evidence from clinical and biochemical measurements, intakes associated with good health and growth, and work in experimental animals.

The DHSS (1979) report lists the information from which estimates of requirements have been derived;

- the minimum intake of a nutrient which is associated with the absence of any signs of deficiency disease within the community,
- the minimum intake of a nutrient needed to maintain the metabolic balance over a long period,
- the minimum intake of a nutrient needed to cure clinical signs of
deficiency,
- the minimum intake needed to maintain tissue saturation,

The differences in RDA tables used in different countries illustrates the variations in criteria used to establish requirements of a nutrient.

**Use of RDA tables for evaluating data from dietary surveys**

The introduction to the DHSS report discusses the use of RDA tables for interpretation of data for dietary surveys. The point is made that RDA tables have limited use in the evaluation of the results of surveys of individuals, 'since the distribution of requirements for nutrients is not known it is not possible to estimate the probability that an individual is undernourished by comparing his or her intake with the recommended amount. A particular individual may have a small requirement for the nutrient which can easily be met by an intake less than that recommended'.

As is discussed in the next section, comparison of nutrient intakes of a group with RDA tables gives only an indirect indication of nutritional status of that group. The DHSS (1979) report makes the following point, 'it would still be true to say that, on present knowledge, the greater (the) proportion of people with intakes below those recommended, the greater the possibility that some individuals may be undernourished with respect to the nutrient or nutrients in question'. Thus dietary surveys can highlight possible areas of concern, or areas that need further investigation.

The limitations of RDA tables for evaluating data from dietary surveys involving schoolchildren and adolescents are noted by Dwyer (1981). This author comments 'that it is surprising to realise how scanty (is) the data upon which the recommendations for adolescent nutrient needs are based'. Dwyer points out that recommendations for amounts of energy and nutrients for adolescents are based on inadequate information about actual requirements, noting that requirements have only been determined by experimental studies for a few nutrients and the usual approach is to fill in information by interpolation of nutrient requirements determined for adults and younger children. Dwyer concludes that more work needs to be done in order to put nutrient recommendations for adolescents on a formal basis.

In addition, growth is one of the important factors determining energy and nutrient requirements in childhood and adolescence and this is a continuous process throughout this period. However, increased growth
rates or growth spurts occur at specific times, and the nutritional needs of children, and particularly adolescents, vary greatly because the sequence of physical changes begins at different times in different individuals. The onset of adolescent growth also varies among populations and is strongly influenced by the population's nutritional state.

Dwyer (1981) points out that although increased needs for energy and nutrients are associated with physiological rather than chronological age, information on chronological age in a group of the population is more easily obtained; and therefore recommendations are based on this rather than physiological age. Thus 'it must be recognised that the coefficients of variation in estimates of nutrient requirements are very large'. The variation in energy requirements in schoolchildren and adolescents and its implication for the school meals service is discussed in the next section.

Dwyer (1981) also suggests that there has been little work to show how increased needs for certain nutrients may be met by, for example, increased absorption.

Elwood (1981) also discusses the use of RDA tables for interpretation of data from dietary surveys. He feels that 'their value for most nutrients is doubtful', and in some cases in view, of the assumptions that have to be made, RDA's can be 'frankly misleading'. He uses the RDA for iron as an example where an assumption has to be made about the proportion of iron absorbed, 'an FAO/WHO expert group (WHO, 1972) recommended average figure is often used, yet the evidence shows clearly that not only does the absorption of iron from different foodstuffs vary enormously but interactions between foodstuffs are so great that a meaningful single figure just cannot be derived'.

These limitations are discussed in relation to use of RDA tables for evaluating the data in the current school meals study in the Chapter Five.

3.2.2 Energy and nutrient requirements and recommendations in adolescents.

As Dwyer (1981) pointed out, the nutrient requirements in adolescents have been determined only for a minority of the nutrients for which there are recommended allowances. This author discusses in detail the energy recommendations for adolescents, also calcium and iron requirements. Greenwood and Richardson also discuss these nutrients, together with vitamin A and ascorbic acid requirements, and zinc nutrition in adolescence. Truswell (1981) suggests that low intakes of these nutrients
are commonly found in dietary surveys of this age group. This section will, therefore, concentrate on these nutrients, and their importance in school meals. The DHSS (1979) recommendations for these nutrients and others will be discussed.

Dwyer (1981) examines the basis of recommendations for adolescents. This author uses the work of McKigny and Munro (1975) and Forbes (1980) to illustrate the relationship between nutritional requirements and physiological changes related to growth during the second decade of life.

McKigny and Munro (1975) define two periods within this decade;
- 'pubescence is defined as the period of development which ends with the emergence of the capacity for sexual reproduction; it encompasses the years up to age 13 in females and 15 in males',
- 'adolescence is defined as the period of growth after the emergence of the capacity for sexual reproduction, which extends from approximately 13 - 19 years in females and 15 - 21 years in males'.

Forbes (1980) bases estimates of energy and nutrient requirements for these two periods on measurements of change in body composition. He calculated both the average daily increments in body content of each nutrient over this period; and also daily increments at the peak of the growth spurt; during the growth spurt, the daily increments almost double the daily average values for the decade. These values are shown in Table 3.1.

The period of pubescence is characterised by a very rapid rate of growth in body size, and it is during this period that differences in body composition and therefore nutrient needs between males and females emerge. In males there is a very rapid gain in lean body tissue and in the mineral skeleton; gains which result in increased needs for protein, iron, calcium and zinc, all of which are found in these tissues. The increases in body weight are earlier and less extensive in females; there is a smaller increase in lean body mass - thus needs for these nutrients are less - but greater increases in adipose tissue.

Energy needs for growth, therefore, at this time are high for both sexes, but particularly for males; even so they rarely exceed 10 per cent of energy requirements. During this period, if energy needs are not met, the growth spurt may be delayed or dampened (Dwyer, 1981).

During the second period of this decade, growth is slower, and needs for some nutrients remain high, but begin to resemble adult values.
Table 3.1: Average daily increments in body content due to growth for selected substances from 10 - 20 years. (From Dwyer, 1981)

<table>
<thead>
<tr>
<th>Substance</th>
<th>Body content with increment averaged over period 10-20 years</th>
<th>Daily increment at peak of growth spurt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium mg</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>210</td>
<td>400</td>
</tr>
<tr>
<td>Females</td>
<td>110</td>
<td>240</td>
</tr>
<tr>
<td>Iron mg</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>0.57</td>
<td>1.10</td>
</tr>
<tr>
<td>Females</td>
<td>0.23</td>
<td>0.90</td>
</tr>
<tr>
<td>Nitrogen mg</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>320</td>
<td>610</td>
</tr>
<tr>
<td></td>
<td>(1.98 gm protein)</td>
<td>(3.8 gm protein)</td>
</tr>
<tr>
<td>Females</td>
<td>160</td>
<td>360</td>
</tr>
<tr>
<td></td>
<td>(0.97 gm protein)</td>
<td>(2.2 gm protein)</td>
</tr>
<tr>
<td>Magnesium mg</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>4.4</td>
<td>8.4</td>
</tr>
<tr>
<td>Females</td>
<td>2.3</td>
<td>5.0</td>
</tr>
<tr>
<td>Zinc mg</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>0.27</td>
<td>0.50</td>
</tr>
<tr>
<td>Females</td>
<td>0.18</td>
<td>0.31</td>
</tr>
<tr>
<td>Lean Body Mass gm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>9.7</td>
<td>18.6</td>
</tr>
<tr>
<td>Females</td>
<td>5.0</td>
<td>11.1</td>
</tr>
<tr>
<td>Body Fat gm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>0.20</td>
<td>5.5</td>
</tr>
<tr>
<td>Females</td>
<td>0.33</td>
<td>13.8</td>
</tr>
<tr>
<td>Energy Cals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>13</td>
<td>66</td>
</tr>
<tr>
<td>Females</td>
<td>7</td>
<td>123</td>
</tr>
</tbody>
</table>

(source: Forbes, 1977, with addition of values for lean body mass and fat calculated from Baumeister and Bingert, 1967.)
Energy requirements and recommendations

Requirements

The observation made by Dwyer (1981) concerning the large coefficient of variation in estimates of nutrient requirements for adolescents applies probably most of all to energy requirements. This also applies to energy requirements throughout childhood (and also to a lesser extent in adults). This variation is perhaps not surprising given the individual variation, not only in the different components of energy requirements - energy for basal metabolism, for physical activity, and in childhood and adolescence for growth - but also in efficiency of energy utilisation.

Thus within a group there will be very wide variations from the recommended allowance which is intended to reflect average requirements. Given also, the relationships between nutrient requirements and physiological rather than chronological age, energy recommendations for adolescents, stated by chronological age can only be regarded as rough approximations (Dwyer, 1981).

In addition it must be borne in mind that recommendations for energy are almost invariably based on surveys of energy intakes of groups of the population, in this case adolescents.

Recommendations made on this basis, however, involve examining the relationship between energy intakes and parameters such as growth or obesity. In theory energy intakes should be clearly related to these parameters; however in practice a number of studies have shown that this clear relationship does not exist, almost certainly due to the variations in the components of energy requirements.

The variation in energy intakes in children and adolescents has been noted in several studies.

Morgan (1980) reviewing the relationship between diet, growth and obesity in pre-school children, cited a number of studies (Widdowson, 1947; Ministry of Health, 1968; Morgan and Mumford, 1977; DHSS, 1975; Black et al, 1976; Morgan, 1979) all of which showed a very wide variation in energy intake. All these studies also showed that there was no clear relationship between energy intake and body weight in this age group. Some of these authors speculated that the degree of activity was the determining factor in the variation in energy intake.

The study by Durnin (1974), of two groups of 14 year olds in Glasgow in 1964 and 1971, also showed little relationship between energy intake and body weight. Durnin found, firstly, that the percentage contribution
of fat to body weight was greater in the boys in the 1971 study than in the 1964 study, despite a decrease in mean energy intake. Secondly he found that the fattest girls in all social groups had a consistently lower energy intake (7.07 MJ/day) than the thinnest girls (9.23 MJ/day). Durnin also suggested differences in physical activity to account for these observations.

Morgan (1980) concludes that the relationship between the different components of energy expenditure is complex, and suggests that further studies are needed to analyse this relationship. This author reaches this conclusion after examining studies which estimate energy costs of growth in pre-school children; these studies indicate that although estimates vary, the energy cost of growth— even at its most rapid phase—does not exceed one third of total intake, the requirements for basal processes and activity taking precedence. This author also examines studies which show variation in basal metabolic rate (BMR) or resting metabolic rate (RMR), and variations in activity. While this paper (Morgan, 1981) concerned energy requirements of pre-school children, her conclusions almost certainly apply equally to school children and adolescents.

The work of Nelson (1980), examining the relationship dietary intake and growth (discussed in section 3.4) suggests that this relationship also involves environmental factors.

Thus the very great variation in energy requirements, and the lack a clear relationship between energy intakes and parameters such as growth or obesity, does indicate that energy recommendations made on the basis of energy intakes of groups are very approximate guides only. This must be borne in mind when using such recommendations for evaluating data on energy intakes in dietary surveys.

This also has very clear implications for recommendations for school meals. The suggestion by Bender (1979) that the introduction of the cash cafeteria service in schools gave children the opportunity to match their energy intake to their own individual requirement is discussed in Chapter Four, as is the suggestion that, to allow for variations in energy requirement, energy recommendations for school meals would be more appropriately expressed in terms of the proportion of total energy from the meal to be provided by fat, carbohydrate, and protein, rather than as a proportion of the recommended daily allowance for energy. Bender suggests that this variation would be met by the variation in the individuals appetite.
However the implications of this change in the nutritional standards for school meals need to be recognised. The consequence of children failing on a long term basis to match their energy intake to their requirements, is either undernutrition, resulting in reduced growth rate, or, which is far more likely, overnutrition resulting in obesity.

The incidence of obesity in school children and adolescents is discussed in section 3.5, where it is suggested that this is sufficiently high to be a cause for concern. While, as was recognised in the 'Nutrition in Schools' report (DES, 1975), the school meals service cannot be held wholly responsible for this incidence of obesity; it is suggested that this problem should be recognised when formulating nutritional guidelines for school meals. This emphasises particularly,

- the need to limit the provision of foods high in fat and sugar, (the association between a diet high in these foods and the increased likelihood of obesity is discussed in Chapter Two)
- the importance of nutrition education in helping the understanding of the concept of maintaining energy balance, by matching food intake and physical activity, stressing the importance of increased physical activity for some adolescents, (the relationship between physical inactivity and obesity in adolescents is discussed in section 3.5). This in turn requires further research into factors regulating energy balance, particularly during growth.

**Recommendations**

Energy recommendations for adolescents, given by DHSS (1979), World Health Organisation (WHO) (1974) and USA, National Research Council (NRC) (1974) are given in Tables 3.2, 3.3, and 3.4.

The DHSS (1979) recommendations for children of school age including adolescents, are based on studies by Cook et al (1973), and Jacoby et al (1975) on schoolchildren in Kent; by Durnin et al (1974) in Glasgow, and a DHSS survey (unpublished) in Newcastle-upon-Tyne. These studies showed lower energy intakes in schoolchildren than the recommendations made by the DHSS in 1969. On the grounds that medical assessment provided no evidence of malnutrition, and the evidence of obesity was present in a sufficient proportion of children to cause concern, recommendations made by the DHSS in 1979 were set at a lower level.
Table 3.2 Recommended Dietary Amounts for adolescents
(from DHSS, 1979)

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Age 12-14</th>
<th>Age 15-17</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boys</td>
<td>Girls</td>
</tr>
<tr>
<td>Energy (MJ)</td>
<td>11.0</td>
<td>9.0</td>
</tr>
<tr>
<td>Protein (g)</td>
<td>66</td>
<td>53</td>
</tr>
<tr>
<td>Thiamin (mg)</td>
<td>1.1</td>
<td>0.9</td>
</tr>
<tr>
<td>Riboflavin (mg)</td>
<td>1.4</td>
<td>1.4</td>
</tr>
<tr>
<td>Nicotinic acid (mg)</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>Total folate (ug)</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>Ascorbic acid (mg)</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Vitamin A (ug)</td>
<td>725</td>
<td>725</td>
</tr>
<tr>
<td>Vitamin D (ug)</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Calcium (mg)</td>
<td>700</td>
<td>700</td>
</tr>
<tr>
<td>Iron (mg)</td>
<td>12</td>
<td>12</td>
</tr>
</tbody>
</table>

* Vitamin D - a footnote indicates that no dietary sources may be necessary for children and adults who are sufficiently exposed to sunlight, but that during winter, children and adolescents should receive 10 ug daily by supplementation.
### Table 3.3 WHO recommended intakes of nutrients for adolescents

*(World Health Organisation, 1974)*

*(from Dwyer, 1981)*

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Boys, years of age</th>
<th>Girls, years of age</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10-12  13-15  16-19</td>
<td>10-12  13-15  16-19</td>
</tr>
<tr>
<td>Calories</td>
<td>2,600 2,900 3,070</td>
<td>2,350 2,490 2,310</td>
</tr>
<tr>
<td>Protein g</td>
<td>30     37     38</td>
<td>29     31     30</td>
</tr>
<tr>
<td>Vitamin A ug</td>
<td>575    725    750</td>
<td>575    725    750</td>
</tr>
<tr>
<td>Vitamin D ug</td>
<td>2.5    2.5    2.5</td>
<td>2.5    2.5    2.5</td>
</tr>
<tr>
<td>Ascorbic Acid mg</td>
<td>20    30    30</td>
<td>20     30     30</td>
</tr>
<tr>
<td>Folic Acid ug</td>
<td>100   200   200</td>
<td>100    200   200</td>
</tr>
<tr>
<td>Niacin mg</td>
<td>17.2   19.1   20.3</td>
<td>15.5   16.4   15.2</td>
</tr>
<tr>
<td>Riboflavin mg</td>
<td>1.6   1.7    1.8</td>
<td>1.4    1.5    1.4</td>
</tr>
<tr>
<td>Thiamin mg</td>
<td>1.0    1.2    1.2</td>
<td>0.9    1.0    0.9</td>
</tr>
<tr>
<td>Calcium g</td>
<td>0.6    0.6    0.5</td>
<td>0.6    0.6    0.5</td>
</tr>
<tr>
<td>Iron mg</td>
<td>to 0.7  0.7    0.6</td>
<td>0.7    0.7    0.6</td>
</tr>
</tbody>
</table>

---

130
Table 3.4 Recommended daily dietary allowances for adolescents in the USA (National Research Council, 1974) (from Dwyer, 1981)

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Boys, years of age</th>
<th>Girls, years of age</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>11-14</td>
<td>15-18</td>
</tr>
<tr>
<td>Calories Kcal</td>
<td>2,800</td>
<td>3,000</td>
</tr>
<tr>
<td>Protein g</td>
<td>44</td>
<td>54</td>
</tr>
<tr>
<td>Vitamin A iu</td>
<td>5,000</td>
<td>5,000</td>
</tr>
<tr>
<td>Vitamin D iu</td>
<td>400</td>
<td>400</td>
</tr>
<tr>
<td>Vitamin E iu</td>
<td>12</td>
<td>15</td>
</tr>
<tr>
<td>Ascorbic Acid mg</td>
<td>45</td>
<td>45</td>
</tr>
<tr>
<td>Folacin mg</td>
<td>0.4</td>
<td>0.4</td>
</tr>
<tr>
<td>Vitamin B12 ug</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Niacin mg</td>
<td>18</td>
<td>20</td>
</tr>
<tr>
<td>Riboflavin mg</td>
<td>1.5</td>
<td>1.8</td>
</tr>
<tr>
<td>Thiamin mg</td>
<td>1.4</td>
<td>1.5</td>
</tr>
<tr>
<td>Vitamin B6 mg</td>
<td>1.6</td>
<td>2.0</td>
</tr>
<tr>
<td>Calcium g</td>
<td>1.2</td>
<td>1.2</td>
</tr>
<tr>
<td>Phosphorus g</td>
<td>1.2</td>
<td>1.2</td>
</tr>
<tr>
<td>Iodine ug</td>
<td>130</td>
<td>150</td>
</tr>
<tr>
<td>Iron mg</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>Magnesium mg</td>
<td>350</td>
<td>400</td>
</tr>
<tr>
<td>Zinc mg</td>
<td>15</td>
<td>15</td>
</tr>
</tbody>
</table>

Dwyer (1981) discusses how the work on physiological changes associated with growth during the second decade of life helps in developing recommendations for nutrients, discussing separately the major components of energy requirements.

Firstly there is the energy required for maintenance of the body at rest, including the fraction of resting metabolic needs accounted for by growth - Dwyer points out that as the lean body mass increases dramatically during the pubertal growth spurt, resting metabolic rates increase accordingly. The energy cost of growth has been found from experimentally determined values for resting metabolism and body composition data, to be small in comparison to that required for maintenance. Payne and Waterlow (1977) also pointed out that the energy
requirements for adolescent growth constitute only a small percentage of total calorie intakes.

Secondly there is the highly variable component contributed by physical activity - Dwyer discusses studies which show variation in physical activity in adolescents, several of which show males expending a higher proportion of their energy intakes in physical activity than females. Dwyer also noted increasingly sedentary lifestyles as characteristic of most American adolescents. In this connection she notes the trend towards decreased values for energy recommendations in America since the war. Buss (1979) found that other highly industrialised countries also have adjusted their recommended energy allowances for adolescence downwards in the past few years.

Finally Dwyer (1981) points out that recommended allowances for energy are only about a thousand kilocalories over resting metabolism, and for females the mean energy intakes range from 300 - 700 kilocalories over the component for resting metabolism. She suggests that the decrease in energy intakes due to decreasing physical activity, ('the component of energy intake attributable to physical activity is quite small especially for females, and also for males over 15 years of age,' ) could cause practical nutritional problems in ensuring that requirements for other nutrients are met. This emphasises the importance of the current suggestion that an aspect of nutrition education should be to encourage an increase in physical activity.

Iron requirements and recommendations

Requirements

Both Greenwood and Richardson (1979) and Dwyer (1981) review the evidence relating to iron requirements in adolescents and the basis of recommendations for iron.

Iron requirements at this time are affected by the following factors,
- increases in lean body mass and blood volume associated with growth result increased iron needs for haemoglobin and myoglobin synthesis. As increases in lean body mass, proportionate to each kilogram of body weight gained during growth, are greater for boys than for girls, iron requirements dependent on this factor are greater for adolescent boys.
- iron losses from the body; the wide variability in menstrual blood loss is an important factor in assessing the iron needs of adolescent girls.
The amount of dietary iron that must be consumed in order for iron requirements to be met depends on the availability of iron in the foods. This is determined by a variety of factors including the form of iron in the food, accompanying presence of other dietary factors, and status of body stores of iron. Dwyer concludes that more studies of iron absorption on different types of diets, during adolescence, are required. Meanwhile, recommendations for iron have to be based on assumptions concerning the proportion absorbed.

In addition iron recommendations based on chronological age rather than physiological age, contribute further to the likely discrepancy between recommendations and actual requirements, which, as with energy, show very great variations between individuals.

Both Greenwood and Richardson (1979), and Dwyer (1981) express concern over the increasing number of pregnant adolescent girls who are particularly susceptible to iron deficiency anaemia when the nutritional burden of pregnancy is superimposed upon normal growth demands.

**Recommendations**

The DHSS (1979), NRC (1974) and WHO (1974) recommendations for iron are given in Tables 3.2, 3.3, 3.4. In the DHSS (1979) tables the recommendation for adolescent boys is greater than that for adult men to allow for growth. The recommendation for adolescent girls is the same as that for boys despite a smaller increase in lean body mass, to allow for menstrual losses. The WHO tables show a much wider range of recommended iron intakes so that they are applicable to many countries where the use of the higher figures would be unrealistic. Greenwood and Richardson (1979) comment that recommendation given by the NRC in America 'provides a greater margin of safety, but may well be beyond the reach of practical possibilities from a normal diet'.

Data on iron intakes and incidence of iron deficiency anaemia in adolescents and the implications for school meals are discussed in section 3.5.

**Calcium requirements and recommendations.**

**Requirements**

These also are reviewed both by Dwyer (1981) and Greenwood and Richardson (1979).
Again growth, this time mainly of the skeleton but also of lean body mass, is the main factor determining adolescent calcium requirements. These also vary with sex, physiological age, and body size. Greenwood and Richardson (1979) have shown very high calcium retentions at the peak of the adolescent growth spurt, on average 200 mg/day in girls and 300 mg/day in boys, but varying from 141 - 523 mg/day.

**Recommendations**

As with iron, calcium recommendations have to take into account the proportion of dietary calcium absorbed, which varies with age, amount of intake, and with the presence of other dietary components, including Vitamin D, lactose, protein, calcium: phosphate ratios and phytate (Dwyer, 1981).

Calcium recommendations are thus based on calculations of skeletal mass at various ages, together with information on efficiency of absorption, and rate of excretion of calcium. Estimates of calcium requirements of adolescents are based on balance studies, food intake measurements and estimates of calcium increments in the body during growth.

It can be seen from Tables 3.2, 3.3, 3.5, that again the NRC (1974) recommendation (1.2 g) is considerably higher than the DHSS (1979) recommendation (700 mgs, 9-15 years; 600 mgs, 15-18 years) Dwyer (1981) attributes this to the emphasis given to peak values for individuals during the growth spurt, the customary high calcium intakes, and also the extremely high protein intakes (likely to negatively effect calcium balance). This author does, however, point out that failure to meet the recommended allowances cannot be taken as evidence that calcium deficiency exists.

On the other hand, Richardson and Greenwood (1979) suggest with reference to the DHSS (1969) recommendations, 'that a higher recommended intake of calcium similar to those of the NRC (1974) would appear to be more appropriate during the peak adolescent years'. An editorial in the British Medical Journal (1977) supports the view that the recommended intakes in the UK, needed to preserve calcium balance in most of the normal population, should be raised. This however was not considered necessary by the DHSS committee in 1979, 'after careful consideration of the evidence'.

Data on calcium intakes and any evidence of calcium deficiency in adolescents, also the implications for school meals, will be discussed in
It can thus be seen that differences between RDA tables produced by the NRC in America (1974) and the DHSS (1979), for both iron and calcium, need to be borne in mind when these two sets of tables are used to evaluate data from dietary surveys. Differences are also found for other nutrients. This serves to emphasise the point made by Dwyer (1981) that further research is required to put recommendations for adolescents on a firmer basis.

**Retinol requirements and recommendations.**

On the grounds that low intakes of retinol are frequently found in surveys of adolescent diets, Greenwood and Richardson (1979) discuss adolescent requirements of vitamin A. Information on these is fragmentary due, largely, to the lack of convenient and sensitive criteria for evaluating vitamin A status.

Rodriguez and Irwin (1972) reviewed the literature and found no reports of controlled experiments on the retinol requirements of children, including adolescents; thus the recommended allowances for adolescents are largely interpolated from infant and male adult allowances.

Greenwood and Richardson (1979) point out that most of the present knowledge on retinol requirements has been obtained from dietary surveys with and without overt clinical and biochemical deficiency symptoms; These authors, however, suggest that recently developed methods of isolating and quantifying retinol binding protein in the plasma, and methods of identifying the urinary excretion products of retinoic acid metabolites may provide useful indices of vitamin A status.

**Ascorbic acid requirements and recommendations.**

Greenwood and Richardson (1979) discuss these on the grounds that 'there is considerable controversy as to how much vitamin C is required for optimal health over long periods of time'. Thus there are considerable differences in recommendations made by different authorities.

On one hand, there is the view that an amount of the vitamin sufficient to prevent signs of deficiency and with a margin to allow for individual variation, and for stresses of everyday life, can be recommended as a dietary intake. The DHSS (1979) recommendations are based on this view. The committee felt that 'the available data provide
no reason to alter this recommendation, or to make any change in it for sex, for differences in physical activity or increasing age'. This is also supported by Greenwood and Richardson (1979).

The other view is that upon which the NRC (1974) recommendations are based, that is, that ascorbic acid allowances should be set high enough to maintain tissue saturation.

Greenwood and Richardson (1979) suggest that 'it is impossible, with the present state of knowledge of ascorbic acid metabolism in human subjects, particularly adolescents, to properly define a requirement for this vitamin'. This is supported by Munro (1977) who suggests that there is still 'inadequate knowledge of ascorbic acid metabolism, frequency and epidemiology of deficiency states, and of the patterns of intakes within populations, including interactions with other nutrients'.

Greenwood and Richardson (1979) discuss the finding by Cook and Monsen (1977) that iron absorption increases progressively as ascorbic is added to a meal up to a high level and therefore conclude that 'attention must be paid to dietary patterns when interpreting needs and intake data in the population, particularly in the adolescent group'. This is discussed in section 3.5.

Zinc requirements and recommendations

Estimates of zinc requirements are included in the NRC (1974) USA tables of recommended daily allowances but not by the DHSS (1979) or WHO (1974).

Halsted et al (1974) found few studies of zinc requirements in man and no information on zinc requirements in adolescents. The dietary requirement for zinc depends on losses from the body and its availability in foods. The increase in zinc retention in both males and females at puberty, closely related to increase in lean body mass, indicates increased requirements at this time due to growth. With increasing concern about changing dietary patterns possibly leading to marginal zinc intakes by quite a large proportion of the adolescent population, it is suggested by Greenwood and Richardson (1979) that it becomes increasingly important to establish human zinc requirements.

Folate requirements and recommendations

Dwyer (1981) points out that very little information concerning total requirements in adolescents exists.
Bates et al (1982) drew attention to the fact that several surveys have shown very large differences between RDA for folate (DHSS, 1979) and folate intakes as calculated from food tables, suggesting widespread deficiency. However, these authors suggest that RDA levels, based on inadequate information on folate requirements, are set too high; also that methods used to determine folate content of foods have lead to an underestimate of these values. Thus the gap is not as wide as it would appear.

A recommended daily amount is given by both WHO (1974) and NRC (1974); the recommendation made originally by DHSS (1979) is no longer given in later editions.

Bates et al (1982) suggest, however, that in view of the important function of folate in the body, there should be further research in this area.

Other Nutrients

In the DHSS (1979) RDA tables, the recommendations for protein, thiamin, riboflavin, and nicotinic acid are based on recommendations for energy, for all groups; thus where energy recommendations in adolescence are higher so also will be the RDA's for these nutrients.

The recommendation for protein is set at the arbitrary figure of 10 per cent of food energy on the grounds that a diet providing less than 10 per cent of the total food energy as protein is 'likely to be unpalatable to most people in the United Kingdom', and may be 'deficient in other nutrients such as easily absorbable iron, vitamin B12, riboflavin, nicotinic acid, and trace elements such as zinc which are often found associated with protein'.

The DHSS (1979) report lists other vitamins and minerals, also trace minerals 'all of which are essential for human health', but do not set recommended amounts for these on the grounds that 'deficiency is either rare, associated with certain medical conditions or has not been described or confirmed in man in the United Kingdom'. The NRC (1974) does include recommendations for some of these nutrients such as vitamin E, phosphorous, iodine, magnesium, zinc, and vitamin B6.

Thus it can be seen that the process of growth which occurs throughout childhood and adolescence increases requirements for energy and most nutrients. This is particularly true during the periods of greatly increased growth rates (growth spurts). Recommended daily amounts for
these groups take this into account.

Dwyer (1981) compares the recommendations in the American tables for adolescents with those for adults and younger children. Recommendations for energy, protein, vitamin D, thiamin, riboflavin, niacin, calcium, phosphorous, magnesium, and iron were higher for adolescents, than for adults, and for younger children; as were those for vitamins A, B6, C and E in comparison with younger children. When recommendations are adjusted for differences in energy needs they remain higher for all nutrients except thiamin, niacin, and riboflavin.

The following sections examine studies in which dietary intakes of schoolchildren and adolescents are compared with RDA's. These must be viewed in the light of the basis on which the RDA tables were compiled. The very wide variation in requirements for energy and some nutrients, particularly in adolescents, where recommendations were based on chronological rather than physiological age, need to be borne in mind, as must the knowledge that recommendations made for many nutrients are based on somewhat scanty evidence on actual requirements during adolescence. It is necessary, in conjunction with dietary studies, to examine evidence relating to effects of low intakes.

3.3 ASSESSMENT OF NUTRITIONAL STATUS AND NUTRITIONAL SURVEILLANCE OF SCHOOLCHILDREN

In the previous section the uses and limitations of RDA tables for evaluating dietary intake data were discussed. However as Elwood (1981) emphasises, a dietary survey can only relate food eaten to recommendations and on its own cannot indicate nutritional status. In order to ascertain the effects of a diet apparently containing an excess or deficiency of certain nutrients other measurements and examinations have to be made.

The relationship between food intake, other non dietary factors and health is a complex one, and effects of deficiency, excess, or imbalance of nutrients may not be manifest for some time. This section discusses the importance of using a combination of different methods to obtain as complete a picture as possible of the nutritional status of a group - in this case school children and adolescents.

This section also discusses the need for surveillance and monitoring of the nutritional status of this group to provide the basis of welfare policy, also the importance of monitoring the effects of any changes in
welfare provision.

It is also emphasised that surveillance and monitoring of nutritional status must be concerned with the effects both of undernutrition, and of overnutrition, (most commonly manifest as obesity) also of an imbalance of nutrients. DHSS surveys of schoolchildren between 1968 - 1971 found that 'among the children there were no clinical signs of undernutrition but 4 per cent of the boys and 7 per cent of the girls were described as obese' (Darke et al 1980).

The main argument of this thesis is that insufficient consideration was given to the effects on children's health of the changes in school meals provision resulting from the 1980 Education Act. A further argument emerges in this section, that in addition, inadequate arrangements were made to monitor the effects of those changes, and that consideration should be given to the effects both of undernutrition and of over nutrition.

3.3.1 Definitions of nutritional status and nutritional surveillance


Skinner (1981) defines the following terms;
- 'nutritional status' - the condition of health of people that can be attributed to the foods they habitually consume and which can be affected for better or worse by changes in diet'. He points out that, although in this country 'there are very few conditions which would be considered as solely attributable to the foods habitually consumed ... nutritional status and health status are closely related'.
- 'surveillance' - 'a continuous process of information or data collection and subsequent processing and analysis'.
- 'running indices of nutrition' - statistics such as food supplies, food consumption, the cost of food, the purchasing power of the household, and health statistics collected regularly by different government departments, which supply information about those factors relevant to the nutritional status of the community.
- 'monitoring' - intermittent surveys of different groups of the population.

Such a system of monitoring or surveillance aims at 'allowing the detection of trends at an early stage and the implementation of appropriate food, social or welfare policy'.
Darke (1981) also defines some of these terms:

- 'to be of good nutritional status a person must be free from the diseases of malnutrition'.
- 'malnutrition' - 'any disturbance of form or function of the body which is due to either a deficiency or an excess of one or more essential nutrients or to an imbalance of nutrients, that is to say, a relative excess of some nutrients with a deficiency of others'.

3.3.2 Importance of surveillance as the basis of welfare policy.

Both Darke (1981) and Skinner (1981) emphasise the importance of surveillance (or monitoring) of the nutrition and health status of the population as the basis of government nutrition policy, "the government is concerned with the health and wellbeing of its people and therefore needs a sound scientific basis on which to base its welfare and food policy. Changes in welfare policy may have important effects on some groups of people, and while it is not possible to predict the effect of policy changes it is important to be able to monitor any effect that may occur" (Skinner, 1981).

Darke (1981) suggests that 'a nutrition policy is concerned with ... ensuring that all sections of the population can procure enough of a mixture of foods for health. If such policies are to be effective in maintaining the health of the nation they must be based on sound nutritional and economic evidence. Assessment of nutritional status thus becomes a matter of some importance. In addition, because nutritional effects may reveal themselves either in the short or long term, the collection of information should be a continuous process'.


Elwood suggests that 'there is a need for nutritional assessment, to identify inequalities between subgroups of our population, to detect differences between different parts of the country, and to monitor the effect of the introduction or the withdrawal of a nutritional welfare provision. Indeed the need for continuing nutritional assessment has probably never been greater in this country, with profound changes in the economic situation, reduction in welfare provision and growing unemployment, and this need seems likely to continue'. Elwood concludes that 'it is essential that there is greater activity in this field'.

Skinner relates changing socio-economic conditions to risks of both
undernutrition and overnutrition, 'nutritional surveillance has probably never been so important as it is today. The economy of the country is in a difficult state and unemployment has increased enormously in recent years. Consequently there are many groups of people who are likely to be at risk of undernutrition. On the other hand, there has been a general increase in affluence since the last war and real income has been rising. Conditions of overnutrition or conditions due to excess food consumption such as obesity, cardiovascular disease and diseases of the colon are therefore likely to become more important'.

In practice the distinction between undernutrition and 'diseases of affluence' and such clear cut relationships with socio-economic conditions are more complex than this; studies have shown that incidence of obesity and coronary heart disease are higher in lower socioeconomic groups.

Suggestions of increasing affluence do not weaken the argument for the need for nutritional surveillance. This is emphasised by the sub-committee on nutritional surveillance (DHSS, 1981) 'there are no grounds for complacency. A rapidly changing economic climate and general change in social conditions indicates a need for continuing vigilance'.

It is one of the arguments of this thesis that inadequate arrangements were made for monitoring the effects on the nutrition of schoolchildren, of the changes in school meals provision, proposed by the 1980 Education Act. Elwood (1981) also expresses this concern.

3.3.3 Methods of evaluating nutritional status.


Dietary surveys

These can only give an indirect indication of nutritional status, but they can provide supporting evidence or can establish a cause of malnutrition. The use of RDA tables for evaluating data in dietary surveys has been discussed in section 3.2.

Bender (1982) discusses different methods of collecting data, and stresses that 'all (methods of measuring dietary intake) are laborious and every abbreviation leads to a greater approximation. The method of choice depends on the facilities available and the use to which the figures are to be put. A balance has to be struck between the accuracy required, the co-operation and patience of the subjects, and the number of investigators
These practical problems are discussed in the methodology section in Chapter Five.

Clinical examination

This will reveal signs of deficiency, but not until the deficiency is relatively severe. Even in communities where malnutrition is common clinical deficiency signs are seen in only 2 - 3 per cent of the population, (Bender 1982). In well fed communities clinical signs of deficiency are rare.

When moderate deficiencies are encountered, any clinical signs observed are rarely specific, and poor diets usually result in multiple deficiencies, giving a confused clinical picture. Certain criteria are sometimes given to attempt to define a 'generally undernourished condition', but such criteria are difficult to define and are very subjective.

Biochemical Assessment

While signs of clinical deficiency do not appear until malnutrition is severe, many nutritionists emphasize that an absence of clinical signs does not necessarily indicate absence of malnutrition. This is well illustrated by Kemm (1980) with his 'ice-berg of malnutrition', (Figure 3.1); the hidden bulk of the problem can only be detected by biochemical tests.

These methods are the most objective, and capable of most precision; however, as pointed out by Elwood (1981) 'there is probably no biochemical or haematological test suitable for application to a community'.

In addition as with dietary surveys, problems of satisfactory standards for comparison arise, as do problems of interpretation, 'for very few (biochemical and haematological tests) is there adequate evidence on relationships with subsequent morbidity and mortality, and in those for which such evidence is available there are inconsistencies which make interpretation difficult in the context of nutritional assessment' (Elwood 1981).

Anthropometric measurements

These are used to detect and assess both undernutrition and over
Figure 3.1 The iceberg of malnutrition

(from Kemm, 1980)
nutrition. Measurements of height, weight, development of various parts of
the body, are particularly useful in assessing nutritional status of
children. Weight and height measurements in adults are used to assess
obesity. The most commonly used index is the Body Mass Index (BMI), or
Quetelets Index, given by weight
\[ \frac{\text{weight}}{\text{height}^2} \]
This has been found to correlate well with skinfold thickness.

Growth rates

Growth rates are frequently used to assess nutritional status in
children.

Bender (1982) points out that while 'it is by no means established
that maximum growth rates are optimal ... it is clear the good nutrition
is needed for growth and that poor nutrition results in stunting', and
'despite the fact that reduced growth rates may also be due to a variety
of medical, genetic, or environmental factors, growth rate of children is
a valuable index of nutritional status'.

Elwood (1981) discusses the use of anthropometry and feeding trials
for the assessment of nutritional status. Most surveillance and
monitoring studies involving schoolchildren use one or both of these
methods.

In the case of anthropometric measurements, their use is partly due
to the ease with which data can be collected 'anthropometric measurements
present no great difficulty and are readily accepted both by adults and by
children and their parents ... the Nutritional Surveillance subcommittee
on Medical Aspects of Food Policy (DHSS 1973) has agreed that the height
of children is the most sensitive measure of inadequate nutrition in our
community' (Elwood, 1981).

This is supported by a number of other researchers in this field,
with some reservations. Rona and Chinn (1981) suggest that 'although
anthropometric measurements will be taken as synonymous with nutritional
status in children ... there is very little evidence in developed
countries that variation in the amount of food intake among children is
related to the variation in height. The available evidence from two
studies carried out in England (Cook et al, 1973; Ministry of Health,
1968) is slight or indirect. Furthermore, obese children have not been
found to have greater food intake than other children (Durnin et al
1974).'

Rona and Chinn (1981) suggest therefore, that 'there is an urgent
need for nutritionists to develop and validate a simple and reliable method to measure food intake in large longitudinal studies; then we will be in a good position to study the association between food intake, social factors and their effects on individuals'.

In the meantime anthropometric measurements are the best available measure of nutritional status in the community in developed countries. This view is supported by both DHSS, (1973) and Tanner, (1976).

Growth rates of children in relation to socio-economic factors and nutrient intake are discussed below.

**Feeding Trials**

Elwood (1981) also discusses the 'unique contribution to the assessment of nutritional status' that can be made by feeding trials. This author suggests that 'these can be conducted in selected but carefully defined sections of the community, such as school children from large families, or elderly subjects living alone. They can test defined food supplements, and this can be either an actual supplement or 'entitlement' to a supplement'. The contribution made by feeding trials to surveillance and monitoring of nutritional status of school children is discussed below.

Darke (1981) stresses that the overall assessment of nutritional status of a population or group of a population is built up using information from a number of sources, 'nutritional status is inevitably bound up with health and well-being, but just as there is no easy way to measure health, there is also no simple or single measurement upon which an assessment of nutritional status can be made. Information must be gathered from a number of different sources'. This point is also emphasised by Bender (1982).

**3.3.4 Surveillance and monitoring of nutritional status of school children in the UK**

The following section examines the various surveys and surveillance studies which contribute to the overall picture of the current nutritional status of schoolchildren. The nature of this picture is best illustrated by Darke (1981), 'methods of assessing nutritional status are piece-meal and will continue to rely on food supply and health statistics, on in-
depth nutritional surveys and on ad hoc studies, unless, and until, some simpler assessment for large-scale use is found'.

The three areas of concern identified at the beginning of this chapter illustrate the two aspects of nutritional status which must be assessed in a developed country. On one hand is the possibility of inadequate nutrition in certain 'at risk groups', usually associated with adverse changes in socio-economic conditions. On the other hand, there are the so called 'diseases of affluence' due to over nutrition or an imbalance of nutrients.

While most of the surveys discussed in the following section are concerned with the former concern, any discussion of nutritional status of school children must include an awareness of both aspects. This point is also emphasised by Darke (1981), 'an assessment of nutritional status must include the diseases of overnutrition or an imbalance of nutrients ... until the economic recession of the past few years, obesity was thought to be the most common manifestation of malnutrition in the United Kingdom'.

Darke also suggests that 'the nutritional status of the United Kingdom is in general 'good' and where it is not, lack of knowledge and mismanagement are the 'cause' of the deficiency rather than true poverty or lack of available food'. The argument that education has a large part to play in modifying food habits in an attempt to reduce the incidence of 'diseases of affluence' is important to this thesis, however, a detailed discussion of Darke's view of the causes of inadequate nutrition is, while interesting, unfortunately beyond the scope of this study.

**DHSS Surveys**

The main responsibility for nutritional surveillance falls to the DHSS, who in the early 1960's set out a programme of nutrition surveys, (which has since been abandoned) to cover vulnerable groups. The surveys were either carried out by the DHSS themselves, or commissioned from others such as universities, medical schools, or MRC research groups. The setting up of this programme was under the direction of the Committee on Medical Aspects of Food Policy (COMA). A pilot survey on pre-school children tested the feasibility of the field methods. Table 3.5 gives details of the surveys carried out by the DHSS on schoolchildren.
Table 3.5 Department of Health and Social Security nutrition surveys.  
(from Darke, 1981)

<table>
<thead>
<tr>
<th>Year of survey</th>
<th>No.</th>
<th>Age in sample (years)</th>
<th>Information collected</th>
<th>Socio-economic</th>
<th>Dietary 7 days weighed</th>
<th>Medical assessment</th>
<th>Anthropometry</th>
</tr>
</thead>
<tbody>
<tr>
<td>1967 Pre-68 schoolchildren</td>
<td>1321</td>
<td>4 1/2</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>about</td>
<td>*</td>
</tr>
<tr>
<td>1971 schoolchildren</td>
<td>321</td>
<td>10-11</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>1969 One parent 70 families</td>
<td>178</td>
<td>14-15</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>1970 Schoolchildren</td>
<td>792</td>
<td>14-15</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>

All the above surveys included a socio-economic questionnaire, a seven day weighed food intake, a medical assessment and anthropometric measurements. Areas for the survey were chosen because a nutritional problem was thought to exist there, and also in some cases because local specialists within the National Health Service were willing to co-operate. Samples were usually biased in favour of those sections of the population who were more likely to be at risk of malnutrition. Darke (1981) summarises the findings of these three surveys:

- among all the children surveyed a medical examination revealed no clinical signs of nutritional deficiency
- the vast majority of children were categorised as of 'good' nutritional status, 1-4 per cent in the different surveys as of 'average' nutritional status, and none as of 'poor' status, (the subjective medical assessment of nutritional status was based on the criteria set out in the International Biological Programme (IBP) handbook - Weiner and Laurie 1969)
- by contrast 4-8 per cent of the children were assessed as obese
- average daily intakes of energy and most nutrients were not consistently less in children from large families or in those from Registrar General Social Classes IV and V
- vitamin C intakes did show a consistent decrease with increasing family size and fall in Registrar General Social Class, but there were no signs of deficiency in any of the children.
- Measurements of attained height and weight showed the family size and social class trends found to be characteristic of all school children taken from routine medical examinations of school children. That is, children from small families and Registrar General Social Classes I and II on average grow to be taller and heavier compared with children from large families and Registrar General Social Classes IV and V (Table 3.6 and 3.7).

Table 3.6 Mean heights and weights of school leavers from families of different sizes in Scotland*.

1970-1971 #: Scottish Home and Health Department (Personal communication).
(from Darke 1981)

<table>
<thead>
<tr>
<th>No. in family</th>
<th>Boys</th>
<th></th>
<th>Girls</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean ht</td>
<td>Mean wt</td>
<td>Mean ht</td>
<td>Mean wt</td>
</tr>
<tr>
<td>1</td>
<td>61.3</td>
<td>103.4</td>
<td>61.3</td>
<td>108.1</td>
</tr>
<tr>
<td>2</td>
<td>61.2</td>
<td>100.8</td>
<td>61.3</td>
<td>104.0</td>
</tr>
<tr>
<td>3</td>
<td>60.7</td>
<td>98.0</td>
<td>61.0</td>
<td>104.6</td>
</tr>
<tr>
<td>4</td>
<td>60.4</td>
<td>96.3</td>
<td>60.6</td>
<td>102.6</td>
</tr>
<tr>
<td>5</td>
<td>60.0</td>
<td>94.5</td>
<td>60.2</td>
<td>100.6</td>
</tr>
<tr>
<td>6</td>
<td>59.7</td>
<td>93.9</td>
<td>60.0</td>
<td>99.8</td>
</tr>
<tr>
<td>7+</td>
<td>59.4</td>
<td>92.5</td>
<td>59.5</td>
<td>97.6</td>
</tr>
</tbody>
</table>

* Excluding Aberdeen City and Aberdeen County.
# 10 per cent sample of records.

These differences and relationship with nutrition will be discussed in section 3.4. The findings of the DHSS survey on 14 - 15 year olds from one parent families in Newcastle Upon Tyne (Darke et al 1980) are discussed below, as are the findings of the study on 10 - 11 year old school children. The findings of the study on 14 - 15 year old school children carried out in Birmingham in 1969 - 1970 have not been published, which is regrettable as they would have formed a useful comparison for current nutritional studies of school children.
Table 3.7 Mean heights and weights of school leavers from families of different social class in Scotland*, 1970-1971 #: Scottish Home and Health Department (Personal communication).

<table>
<thead>
<tr>
<th>Social class</th>
<th>Boys Mean ht (in)</th>
<th>Mean wt (lb)</th>
<th>Girls Mean ht (in)</th>
<th>Mean wt (lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>61.8</td>
<td>101.8</td>
<td>61.4</td>
<td>103.3</td>
</tr>
<tr>
<td>2</td>
<td>61.5</td>
<td>102.2</td>
<td>61.2</td>
<td>106.1</td>
</tr>
<tr>
<td>3</td>
<td>60.5</td>
<td>97.2</td>
<td>60.7</td>
<td>103.0</td>
</tr>
<tr>
<td>4</td>
<td>60.2</td>
<td>95.4</td>
<td>60.5</td>
<td>102.6</td>
</tr>
<tr>
<td>5</td>
<td>59.6</td>
<td>94.3</td>
<td>59.7</td>
<td>100.7</td>
</tr>
</tbody>
</table>

* Excluding Aberdeen City and Aberdeen County.
# 10 per cent sample of records.

National Study of Health and Growth (NSHG)

On the recommendation of the first Report of the Subcommittee on Nutritional Surveillance (DHSS, 1973) the DHSS commissioned Professor Holland of St. Thomas's Hospital to carry out a National Study of Health and Growth (NSHG), the objective of which was 'to assess the influence of changes in social circumstances or social policy on growth in primary schoolchildren' (Holland et al, 1981). This study monitored the growth of over 8000 schoolchildren in England and Scotland aged 5 - 11 years. The effect of a number of socio-economic and nutritional factors is assessed and the study has also contributed to the evaluation of the nutritional role of school milk (Cook et al, 1979) and of school meals (Rona, Chinn and Smith, 1979). Some of the findings of this study are discussed in section 3.4.

Skinner (1981) describes the NSHG, as 'an ongoing study and it is proposed that it be extended to include more groups, particularly ethnic minority groups and those living in inner city areas'. Some of the data on school meals will be discussed in Chapter Four.

Monitoring effects of change in welfare provision

A good example of the use of surveillance and studies of nutritional
status to monitor the effects of a change in welfare benefits has been provided by the series of studies relating to the change in welfare provision which occurred in 1971. In October 1970 proposals for changes in the provision of welfare and school milk (referred to by Turner (1976) as 'The Great Milk Robbery') and in the prices of school meals were announced, to be effective from April 1971. The committee on Medical Aspects of Food Policy (COMA) was concerned that these changes might have an adverse effect on the nutritional status of groups previously entitled to welfare and school milk, and of those children for whom the school meal made an important contribution to nutritional intake. The COMA Committee set up a sub-committee on Nutritional Surveillance whose terms of reference were:

- to advise COMA on the steps that should be taken to detect any effects on the nutritional state of the community, of the changes, made in 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 were likely to be mild and reversible.

- 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 (Skinner 1981).

The surveillance studies carried out as a result of these 1971 changes in welfare provision are shown in Table 3.8 and discussed below.

- the surveillance sub-committee felt that 'the measurement of growth would provide the most objective measure of nutritional status'. The National Study of Health and Growth was designed as a surveillance study to monitor the effects, if any, of the change in the provision of school milk, on the nutritional status of school children. Antropometric surveys were made of pre-school children and primary schoolchildren aged 5-11 years. Cook et al (1979) concluded that 'the availability of school milk has no real effect on group well-being when drinking milk at home is almost universal. It is possible, however, that particularly deprived children benefit from free school milk'.

- the National Food Survey was modified to provide information on milk consumption by individuals within the household.

- two randomized controlled feeding trials were carried out by the Medical Research Council Epidemiology Unit. In this trial (Baker et al, 1980) a milk supplement of one third of a pint per school day was supplied to half of a selected group of 590 children aged 7 and 8 years, all from families of four or more children, from schools in which a high proportion
of pupils had free school meals. At the end of two years there was a significant excess growth in the 'fed' group (Elwood 1981). Mean difference in height gain after 21 months was 3 per cent (2.9mm) in favour of the children given extra milk. Elwood uses this feeding trial as an example of the value of feeding trials in assessing nutritional status. Baker et al (1980) point out that the methods used to identify a group for the feeding trial did select a sub-group of the population which was at distinct social, economic, and growth disadvantage compared with the general population of children of the same age in the same area, 'thus the effect of selection will have to be taken into account in drawing conclusions of possible relevance to the whole school child population'.

Table 3.8 Surveillance carried out as a result of 1971 legislation changes in provision of welfare and school milk.
(from Skinner 1981)

<table>
<thead>
<tr>
<th>Survey</th>
<th>Responsible body *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preschool children</td>
<td>London School of Hygiene and Tropical Medicine</td>
</tr>
<tr>
<td>Primary school children 5-11 years.</td>
<td>St Thomas' Hospital (London)</td>
</tr>
<tr>
<td>NFS Milk survey</td>
<td>MAFF</td>
</tr>
<tr>
<td>Randomized controlled trial of entitlement to welfare milk in pregnant women and children born to them.</td>
<td>MRC Epidemiology Unit (Cardiff)</td>
</tr>
<tr>
<td>Randomized controlled trial of free school milk</td>
<td>MRC Epidemiology Unit (Cardiff)</td>
</tr>
<tr>
<td>Vital statistics</td>
<td>OPCS</td>
</tr>
<tr>
<td>Nutrition study of primary school children 10-11 years</td>
<td>DHSS</td>
</tr>
</tbody>
</table>

These surveillance studies to monitor the effects of a change in welfare provision have been discussed in this section in order to contrast with the apparent lack of concern over the effects of the changes in school meal provision resulting from the 1980 Education Act. It is suggested that this is particularly regrettable on two grounds. Firstly, that there is, currently, renewed interest in the role of nutrition in health generally, and in particular in the role of diet as an aetiological factor in many of the diseases common in the adult population. Secondly on the grounds that in times of increasing unemployment, there is evidence to suggest that the school meal is of particular nutritional importance. Chapter Four examines the effects of the 1980 Education Act on the school meals provision, and discusses the important role of school meals in the nutrition of children from families in lower socio-economic groups. The next section of this chapter discusses differences in growth and health of children in families from different socio-economic groups.

It is therefore suggested that in the current nutritional and economic climate it is indefensible to, in effect, reduce the provision of school meals without making adequate arrangements to monitor the effects of such changes.

3.4 SOCIOECONOMIC FACTORS AND RELATIONSHIP TO NUTRIENT INTAKE, HEALTH AND GROWTH

There is some concern amongst nutritionists that the adverse changes in socio-economic conditions occurring during the 1980s may result in an increased and increasing number of children who are at risk of suffering the effects of an inadequate diet.

The importance of monitoring the effects of welfare policy changes on the nutritional status of children was discussed above. This section emphasised the point that dietary surveys, in which measurements of food consumption and nutrient intake are compared with tables of recommended daily allowances, give only an indirect indication of nutritional status, and in most surveillance studies monitoring the nutritional status of children 'growth is taken as synonymous with health'.

Nelson (1980), however, points out two anomalies which are persistently found when attempts are made to relate quality of diet to growth in British children; firstly that 'workers have found no consistent relationship between individual intake and growth; the biggest eaters are not necessarily the biggest individuals'. This lack of relationship has been noted for some years. Nelson quotes Widdowson (1947) 'the present
study has been unable to bring to light the laws which relate the height, weight, size and surface area of any one person.

Secondly, Nelson, (citing the work of Widdowson, 1947; Bransby and Fothergill, 1954; DHSS, 1975; Black et al, 1976; Durnin et al, 1974), points out the anomaly which has been persistently found when results of surveys involving groups from different social classes are compared, 'the average energy and nutrient intakes amongst children from the manual social classes (III manual, IV and V) tends to be higher than that of the children from non-manual classes (I, II, and III non-manual) while at the same time manual workers' children are on average shorter than non-manual workers' children.

The hypothesis put forward by Nelson (1980) as the possible explanation of this latter anomaly and its relevance to this thesis will be examined in this section.

3.4.1 Factors affecting growth and health

Social class differences not only in height and growth, but also in health status have been observed by many workers. It has been assumed until recently (as was almost certainly true before the Second World War) that differences in nutrient intake between groups in different socio-economic circumstances accounted for these differences. However recent dietary surveys of schoolchildren have not shown the differences in nutrient intake which would explain this, thus leading Nelson (1980) to suggest a more complex relationship between socio-economic factors, diet and growth.

Nelson (1980) compares the results of two surveys of diet and growth in children from different social classes in Newcastle (Black et al, 1976) and London (Nelson and Naismith, 1979) and suggests that 'on the basis of the limited amount of information available that the quality of the social and physical environment mediates the effectiveness of diet in promoting growth and health'.

While the current chapter is concerned with nutrition and nutritional status of school children, nutritional status and health status are closely related. The work of Nelson and others emphasizes that nutrition is but one of the many inter-related factors - genetic and environmental, dietary and non-dietary - which affect height, health and growth in children, and a study of the nutrition and growth of schoolchildren must recognise the inter-relationship of all these factors.

Darke (1981), citing the work of Sosa et al (1976), discusses the
factors, genetic and environmental (other than dietary) which may contribute to differences in growth in children, including the 'relationship between the child and the mother (of special importance immediately after birth and in early childhood) and with other members of the family and the amount of stimulation from the environment'.

Nelson (1980) lists non-dietary factors which are correlated with growth - 'parental height, sibling number, household density (persons per room) health and sanitation as well as social class', and suggests that these non-dietary factors which negatively correlate with growth (large families, poor health, poor sanitation, overcrowding) constitute an 'environmental handicap' mediating the effect of diet in promoting growth. He thus implies that 'a diet adequate to promote growth in children where such environmental factors do not operate, is inadequate for children, who are 'environmentally handicapped' in this way'. This hypothesis emphasizes the particular importance of the school meal to such children.

In order to examine this hypothesis more closely and its relevance to the current study of school meals it is necessary firstly to examine the evidence relating to social class differences in growth and health, and secondly, the relationship of socio-economic factors to nutrient intake in schoolchildren.

3.4.2 Social class differences in height growth and health.

The observation that manual workers' children are on average shorter than non-manual workers' children has already been noted. Figure 3.2 shows the height distribution between the two groups of children compared by Nelson (1980).

Nelson and Paul (1981) quote the work of Goldstein (1971) in the National Child Development Study which found 2 – 3 centimetre differences in height between 7 year olds from social class I and those from social class V.

Baker et al (1979) in a study of Welsh children where proportion of children receiving free school meals was used as an index of environmental quality in different schools found differences in height related both to social class and environmental quality (Table 3.9). Rona et al. (1978) found similar differences in children living in England and Scotland.
Figure 3.2 Height distribution of two groups of white, British children, by percentile groups (based on Tanner et al. 1966)

(from Nelson, 1980)

(a) Newcastle preschool children; non-manual 
(b) London children (1-12 years); manual

■ indicates mean
Nelson and Naismith (1979) screened 1000 households in London between 1973 - 1976 for 'at risk children'; 231 children from 112 families qualified on one or more of the following grounds:
- single parent family
- 4 or more dependant children
- overcrowded
- supplementary benefit recipient

Of the 136 white children 21 per cent fell below the 10th percentile for height (Tanner et al, 1966).

Rona et al (1978) investigated the relationship between height and various social factors in English and Scottish primary schoolchildren, and found that (as expected) height of mother and father had the strongest association with attained height. Birthweight, number of siblings, and mother's age showed a significant but less strong association; social class was significant only in England, and unemployment only in Scotland.

Rona and Chinn (1981), examining data from the NSHG, also found differences in height related to social class and number of siblings; these differences did not seem to be diminishing over the period of time of the study (1972 - 1979). These authors emphasise the importance of this observation, 'published works on the nutritional status of children in the community have consistently shown that those groups of children living in more disadvantageous social circumstances are shorter and have more illnesses than more prosperous groups. The egalitarian aim that the variation in disease and nutritional status in the community should be dependent only on the genetic variability of individuals has been an ambitious and idealistic objective in terms of welfare targets'.

Rona and Chinn quote Swedish studies (Sondelin and Vuille, 1974;
Lindgren, 1976) to indicate that this aim is not unattainable. Recent Swedish data have shown that in a country with high economic standard and well developed welfare institutions the difference in health status between socioeconomic strata can be eliminated almost completely. Furthermore, social class of the parents is not associated with height and certain pubertal characteristics in Swedish adolescents.

Rona and Chinn (1981) also quote a number of studies which have shown consistent associations between the height of children in the United Kingdom and socioeconomic variables. Several national studies (Douglas and Blamfield, 1958; Douglas and Simpson, 1964; Goldstein, 1971; Fox, Elston and Waterlow, 1981; Holland et al., 1981; Rona, Swan and Altman, 1978) have found that the number of children in the family, father's social class and employment status (whether gainfully employed), mother's educational background, family income, region of the country, population density and overcrowding at home, are significantly correlated with children's height.

Relationships between incidence of obesity in children and socioeconomic variables is less clear cut. A number of authors (Whitelaw, 1971; Stunkard et al., 1972; Silverstone, 1974) have reported higher weights and skinfold thicknesses in lower social class children. Others (Nelson and Naismith, 1979; Durnin et al., 1974; Topp et al., 1970) have reported lower weights and skinfold thicknesses in the lower social classes. Rona and Chinn (1981) suggest that from the NSHG data there was an increased trend towards obesity in children from social class IV between 1972 - 1979, but that investigation with larger numbers of children in subgroups would be needed to confirm this trend.

Health

Socio-economic variables have also been shown to be associated with other aspects of health; again it could be argued that these associations are due to differences in nutrient intake. Donnet et al. (1982) compared diet, growth and health of a group of infants in a disadvantaged inner city environment in Glasgow with a control group also in Glasgow. The former group suffered a much higher rate of morbidity from diarrhoeal illness and respiratory infections than the control group (Tables 3.10 and 3.11). These authors suggest that 'pockets of disadvantage characterised by adverse statistics over a whole range of health and socio-economic conditions are still found in the
Table 3.10 Comparison of morbidity in Blackhill (B) and Carntyne (C) - diarrhoea.
(from Donnet et al., 1982)

<table>
<thead>
<tr>
<th>Age Cohort</th>
<th>Number of episodes</th>
<th>Number of hospital admissions</th>
<th>Mean days ill</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-3 months C</td>
<td>13</td>
<td>4</td>
<td>0.6</td>
</tr>
<tr>
<td>3-6 months C</td>
<td>16</td>
<td>0</td>
<td>0.5</td>
</tr>
<tr>
<td>6-9 months C</td>
<td>17</td>
<td>1</td>
<td>0.6</td>
</tr>
<tr>
<td>9-12 months C</td>
<td>25</td>
<td>0</td>
<td>0.7</td>
</tr>
<tr>
<td>0-3 months B</td>
<td>27</td>
<td>7</td>
<td>0.6</td>
</tr>
<tr>
<td>3-6 months B</td>
<td>36</td>
<td>12</td>
<td>1.6</td>
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<tr>
<td>6-9 months B</td>
<td>27</td>
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<td>0.9</td>
</tr>
<tr>
<td>9-12 months B</td>
<td>26</td>
<td>2</td>
<td>1.1</td>
</tr>
</tbody>
</table>

Table 3.11 Comparison of morbidity in Blackhill (B) and Carntyne (C) - respiratory infection.
(from Donnet et al, 1982)

<table>
<thead>
<tr>
<th>Age Cohort</th>
<th>Number of episodes</th>
<th>Number of hospital admissions</th>
<th>Mean days ill</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-3 months C</td>
<td>27</td>
<td>0</td>
<td>1.2</td>
</tr>
<tr>
<td>3-6 months C</td>
<td>59</td>
<td>0</td>
<td>1.9</td>
</tr>
<tr>
<td>6-9 months C</td>
<td>62</td>
<td>0</td>
<td>3.1</td>
</tr>
<tr>
<td>9-12 months C</td>
<td>66</td>
<td>7</td>
<td>4.4</td>
</tr>
<tr>
<td>0-3 months B</td>
<td>70</td>
<td>1</td>
<td>2.1</td>
</tr>
<tr>
<td>3-6 months B</td>
<td>66</td>
<td>1</td>
<td>4.5</td>
</tr>
<tr>
<td>6-9 months B</td>
<td>92</td>
<td>4</td>
<td>4.9</td>
</tr>
<tr>
<td>9-12 months B</td>
<td>66</td>
<td>7</td>
<td>4.4</td>
</tr>
</tbody>
</table>

Table 3.12 Health indices by social class (from Morris, 1979)
(from Nelson and Paul, 1981)

<table>
<thead>
<tr>
<th>Social class</th>
<th>Social class</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>V</td>
</tr>
<tr>
<td>Standardised mortality ratio (all causes, men 16-54 years)</td>
<td>77</td>
</tr>
<tr>
<td>Infant mortality (post natal deaths per 1000 live births)</td>
<td>2.8</td>
</tr>
<tr>
<td>Chronic sickness (children 0-14 years, rates per 1000)</td>
<td>92</td>
</tr>
</tbody>
</table>
centres or around the edges of industrial cities'. They suggest that the association of these conditions, which have been extensively studied in Glasgow, form 'contours of disadvantage', 'very clear relationships were demonstrated between the type and quality of housing, and measurements of disadvantage such as infant mortality, overcrowding, unemployment, social work demand and rapid mobility in families. The city could be mapped on the basis of several of these indices; the contours overlapped almost exactly'.

Morris (1979) showed social class differences in health indices such as mortality rates for men aged 15 - 64 years, infant mortality, and chronic sickness in children 0 - 14 years (Table 3.12).

Nelson and Naismith (1979) reported that rates for reduction in normal levels of activity due to illness, for visits to doctors, and for treatment of chronic complaints, were two or three times higher amongst poor children than amongst children in the general population (Table 3.13).

Table 3.13 Prevalence rates of health parameters, all races.
(from Nelson and Naismith, 1979)

<table>
<thead>
<tr>
<th>Health parameter</th>
<th>0-5 years (%)</th>
<th>6-12 years (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Habitual morning cough</td>
<td>4.1</td>
<td>1.1</td>
</tr>
<tr>
<td>Habitual day or night cough</td>
<td>14.3</td>
<td>6.6</td>
</tr>
<tr>
<td>Colds go to chest</td>
<td>63.4</td>
<td>28.6</td>
</tr>
<tr>
<td>Earache in last 12 months</td>
<td>24.5</td>
<td>12.1</td>
</tr>
<tr>
<td>Asthma in last 12 months</td>
<td>2.0</td>
<td>1.1</td>
</tr>
<tr>
<td>Bronchitis in last 12 months</td>
<td>6.1</td>
<td>2.2</td>
</tr>
<tr>
<td>Pneumonia in last 12 months</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Seen doctor in last 2 weeks</td>
<td>28.6</td>
<td>9.9</td>
</tr>
<tr>
<td>Receiving long-term medical treatment</td>
<td>20.4</td>
<td>19.8</td>
</tr>
<tr>
<td>Hospitalised overnight or longer in last 12 months</td>
<td>10.2</td>
<td>3.3</td>
</tr>
</tbody>
</table>

| Reduction in normal activity over last 2 weeks | 19.4 (6.8)* | 9.6 (5.8)* |
| Seen doctor in last 2 weeks                | 30.6 (15.3)* | 11.5 (6.9)* |
| Receiving long-term medical treatment      | 25.0 (3.9)* | 18.3 (8.1)* |

* Figures in parentheses are prevalence rates from the General Household Survey 1971 (Office of Population Censuses and Surveys, 1973)
These social class, socio-economic and environmental differences in child health and development have concerned nutritionists recently; Nelson and Paul (1981) suggest 'that we should be investigating whether these social class differences in development are dietary in origin, or if they are due to non-nutritional environmental influences'.

Rona and Chinn (1981) emphasise the present inadequate understanding of the role of food intake in these associations, 'a reliable, simple, and inexpensive method to measure dietary intake over time in the community should be developed. This would contribute to understanding how food intake influences the association we consistently find between social circumstances and nutritional status in terms of anthropometric measurements'.

At the same time there is concern that increasing unemployment, and reduction in welfare benefits may well result in increased numbers of children in these disadvantaged categories. In view of this, it is suggested that further work should be a matter of priority, to increase understanding of the relationship between nutritional intake and social, economic and environmental circumstances in the growth and health of children in this country; also that any further government policy decision involving, in particular school meals, should be made on the basis of this increased knowledge.

3.4.3 Socio-economic variables and nutrient intake

While, as described above, consistent social class differences in height and growth of school children have been shown, no such clear-cut differences in nutrient intake have been found.

Cook et al (1973) and Jacoby et al (1975) both examined the relationship between socio-economic and environmental factors and nutrient intake in a group of Kent schoolchildren aged 8 - 11 years, 13 - 15 years between 1968 and 1970.

The socio-economic variables (social class, number of siblings, and mother's work status) examined by Cook et al (1973) were not in general found to be associated with highly significant differences in average daily nutrient intake, except for animal protein and riboflavin, intakes of which fell from the higher to the lower social classes, and from smaller to larger families. However, when these results were expressed in terms of the quality of the diet (that is, nutrient intake per thousand kilocalories) significant differences were found between social classes, and different family size, but mother's work status seemed to make little
difference. Children from larger families, and lower social classes had a lower intake of nutrients per 1000 kilocalories; this was true of all nutrients except for carbohydrate and added sugar. In the case of family size, the differences were significant for about half the nutrients.

Jacoby et al (1975) examining nutrient intake and nutritional status in relation to family structure, fatherless children, family income and mother's education and country of origin found the following differences;
- only children had higher mean daily intakes of all nutrients except carbohydrate and added sugar, the differences being significant for animal protein, vitamin A, riboflavin, vitamin C and pyridoxine,
- only children also had significantly greater intakes of most nutrients per 1000 kilocalories,
- a higher proportion of only children were obese, as also were a higher proportion of fatherless children, particularly those whose mothers were widowed.

Cook et al (1973) found that fatherless children had a higher intake of all nutrients per 1000 kilocalories, except for carbohydrates and added sugars, but lower average daily intake of energy and nutrients. Mother's country of origin, level of mother's education, and disposable income, were found to have little influence on nutrient intake or quality of diet (in terms of nutrients per 1000 kilocalories). This lack of relationship between income and nutrient intake was also found in other surveys - Babcock et al, 1955; NFS figures, 1970-71; MAFF, 1973.

Darke and Disselduff (1981) studied 10 - 11 year old schoolchildren in Bristol, Sheffield and Croydon in 1971, and found the following;
- no differences in nutrient intake with social class (Registrar General), income of head of household, family size, or whether mother was working or not, except for ascorbic acid in children from small families (one or two children),
- mother's education beyond the age of 16 years was found to influence nutrient intake; children whose mothers had continued their full time education beyond the age of sixteen had larger mean daily intakes of protein, fat, calcium, ascorbic acid, and smaller mean intakes of carbohydrates and of added sugar than those children whose mothers finished full time education at or before 16 years.
Darke and Disselduff did not compare nutritional quality of the childrens' diets.
Durnin et al (1974) examined nutrient intake of 14 year olds in Glasgow in 1964 and 1971, and found that only the boys in the poorest social group (group 4 - on the basis of occupation of the wage-earning parent) showed lower intakes of nutrients (protein, energy, calcium, and iron) than the other groups. There were almost no differences between the girls from the different socio-economic groups. These authors point out that 'all intake values satisfied the UK and international recommendations, except for energy, in the 1971 study'.

Nelson and Paul (1981) contrast the differences in nutrient intake in different socio-economic groups found in pre-war and recent surveys, 'more recent studies carried out between 1963 and 1971 have shown only small and inconsistent differences in intakes between social classes'. The authors support this with data from a study in Glasgow (Durnin et al, 1976) and a survey of pre-school children (DHSS, 1975), both of which found that average energy, calcium, and iron intakes were higher in children from social classes IV and V than in children from social classes I and II.

The findings of a study by Nelson et al (1980) in Cambridge also indicates that children's nutrient intake did not vary consistently by social class, 'the children's energy and iron intakes expressed as a percentage of RDA (DHSS 1979) were fairly uniform by social class ... only dietary fibre intakes showed consistent social class trends, being higher in children from social classes I and II than in children from social classes IV and V'. These findings are shown in Figures 3.3, 3.4, 3.5.

Nelson (1980) compares mean nutrient intakes of a group of Newcastle pre-school children from non-manual social class families, with a group of London children aged 1 - 12 years from very poor families. Table 3.14 shows the figures for four nutrients and Nelson (1980) concludes that 'superficially the adequacy of the two diets is similar'. This author does, however, point out that the coefficients of variation are much greater in the group from manual families, indicating both a greater number of children with low intakes in this group, and a greater number with high intakes. Nelson and Naismith (1979) showed that, of the London children from poor families, the mean energy intake of the shortest children (below the 10th percentile) was 72 per cent of the RDA.
Figure 3.3 Energy intakes in adults and children in 66 Cambridge families expressed as a percentage of RDA (DHSS, 1979), by sex, age-group, and social class: □ I & II, □□ IV & V
(from Nelson, 1980)

Figure 3.4 Iron intakes in adults and children in 66 Cambridge families expressed as a percentage of RDA (DHSS, 1979), by sex, age-group, and social class: □ I & II □□ IV & V
(from Nelson, 1980)

Figure 3.5 Fibre intakes in adults and children in 66 Cambridge families, grams per day, by age, sex, and social class: □ I & II □□ IV & V
(from Nelson, 1980)
Table 3.14 Mean nutrient intakes expressed as a percentage of the Recommended Daily Amount and proportion of children falling at or below the 25th percentile for height (from Nelson, 1980)

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>London manual</th>
<th>Newcastle non-manual</th>
<th>Newcastle manual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy</td>
<td>86</td>
<td>86</td>
<td>103</td>
</tr>
<tr>
<td>Protein</td>
<td>116</td>
<td>111</td>
<td>120</td>
</tr>
<tr>
<td>Iron</td>
<td>98</td>
<td>82</td>
<td>94</td>
</tr>
<tr>
<td>Thiamin</td>
<td>114</td>
<td>113</td>
<td>122</td>
</tr>
<tr>
<td>Proportion of children &lt;25th percentile for height (%)</td>
<td>32</td>
<td>15</td>
<td>21</td>
</tr>
</tbody>
</table>

Black et al (1976) studied pre-school children, and concluded 'tentatively that the energy intake of children from 'manual' families was on average about 0.54 MJ (130 kcals) higher than that for children from non-manual families at three ages up to 3 years. Different ages accounted for the slight differences in nutrient intake. These authors point out that their findings (an inverse relationship between energy intake and both socio-economic status and family size) are similar to those of the DHSS (1975) and Bransby and Fothergill (1954). Black et al suggest that the explanation can be found in differences in energy expenditure which in turn are related to differences in social environment. This is not inconsistent with the hypothesis suggested by Nelson (1980).

Donnet et al (1982), in a study on infants in Glasgow (discussed above), also found this inverse relationship, 'the daily mean energy, protein, and fat intakes were considerably greater in the Blackhill (disadvantaged group) from the third month onwards' (Tables 3.15; 3.16; 3.17). The distribution of intakes was also greater; mean calcium and iron intakes were also higher, but intakes of vitamin A, D and C lower. The range of vitamin intakes was especially high.
Table 3.15  Mean energy intake (MJ)
(from Donnet et al, 1982)

<table>
<thead>
<tr>
<th>Age</th>
<th>RDA*</th>
<th>X-section (n)</th>
<th>Blackhill as % of X-section (n)</th>
<th>Carntyne as % of X-section (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 weeks</td>
<td>2.2</td>
<td>2.22 (113)</td>
<td>96.5% (206)</td>
<td>90.7% (192)</td>
</tr>
<tr>
<td>3 months</td>
<td>2.2</td>
<td>2.75 (152)</td>
<td>123.0% (132)</td>
<td>100.0% (141)</td>
</tr>
<tr>
<td>6 months</td>
<td>2.9</td>
<td>3.12 (112)</td>
<td>139.7% (121)</td>
<td>99.7% (131)</td>
</tr>
<tr>
<td>9 months</td>
<td>3.6</td>
<td>3.85 (116)</td>
<td>135.2% (88)</td>
<td>104.7% (100)</td>
</tr>
<tr>
<td>12 months</td>
<td>4.0</td>
<td>4.22 (106)</td>
<td>96.5% (206)</td>
<td>90.7% (192)</td>
</tr>
</tbody>
</table>

* Recommended Daily Amount (DHSS 1979).

Table 3.16  Mean protein intake (g)
(from Donnet et al, 1982)

<table>
<thead>
<tr>
<th>Age</th>
<th>RDA*</th>
<th>X-section (n)</th>
<th>Blackhill as % of X-section (n)</th>
<th>Carntyne as % of X-section (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 weeks</td>
<td>13</td>
<td>16 (113)</td>
<td>121% (206)</td>
<td>115% (192)</td>
</tr>
<tr>
<td>3 months</td>
<td>13</td>
<td>24 (152)</td>
<td>126% (132)</td>
<td>108% (141)</td>
</tr>
<tr>
<td>6 months</td>
<td>18</td>
<td>30 (112)</td>
<td>124% (121)</td>
<td>103% (131)</td>
</tr>
<tr>
<td>9 months</td>
<td>21</td>
<td>37 (116)</td>
<td>119% (88)</td>
<td>105% (100)</td>
</tr>
<tr>
<td>12 months</td>
<td>24</td>
<td>40 (116)</td>
<td>97% (206)</td>
<td>92% (192)</td>
</tr>
</tbody>
</table>

* Recommended Daily Amount (DHSS 1979)

Table 3.17  Mean fat intake (g)
(from Donnet et al 1982)

<table>
<thead>
<tr>
<th>Age</th>
<th>X-section (n)</th>
<th>Blackhill as % of X-section (n)</th>
<th>Carntyne as % of X-section (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 months</td>
<td>30.3 (152)</td>
<td>97% (206)</td>
<td>92% (192)</td>
</tr>
<tr>
<td>6 months</td>
<td>33.8 (112)</td>
<td>124% (132)</td>
<td>97% (141)</td>
</tr>
<tr>
<td>9 months</td>
<td>41.7 (116)</td>
<td>129% (121)</td>
<td>96% (131)</td>
</tr>
<tr>
<td>12 months</td>
<td>46.9 (106)</td>
<td>129% (88)</td>
<td>100% (100)</td>
</tr>
</tbody>
</table>
3.4.4 Relationship between nutrient intake, 'environmental handicap' and growth.

It can be seen from the evidence outlined above that, while differences in height, growth and health of children from different socio-economic groups persist, there is no such clear-cut relationship between socio-economic factors and nutrient intake.

Nelson and Paul (1981) therefore pose the question 'does this mean that, with the exception of dietary fibre, there are no longer any significant social class differences in nutrient intake, and that the observed social class differences in growth and health are attributable only to non-nutritional environmental factors? Or does it mean that poor children in fact need more food and a better diet than their richer contemporaries in order to help them overcome some of the stresses imposed by a poor environment?'

In an attempt to answer this question, Nelson (1980) compared the results of two surveys in which the methods of determination of diet were comparable - children from non-manual families in Newcastle (Black et al, 1976) and children from manual families in London (Nelson and Naismith, 1979) - and found that, while intake went up when moving down the social scale, mean height decreased. Nelson and Paul (1981) thus conclude from results of these and other studies that 'the diets of children from lower social classes may need to be not simply as good as the diets of children from higher social classes, but actually better than the higher social class diets in order to confer the same nutritional benefits'.

The authors suggest a corollary to this conclusion, which is of particular relevance to this thesis, 'where children from lower social classes have poor nutrient intakes, health and growth are likely to be much worse than in higher social class children with similarly poor diets'.

In times of increasing unemployment and reduced welfare benefits, the socio-economic circumstances of some families are going to change adversely. In such circumstances, not only is there an increased risk of an inadequate dietary intake, but it is also likely that the factors contributing to 'environmental handicap' are also going to increase, thus increasing the mediating effect of such handicap on the growth-promoting dietary factors. If, at the same time welfare benefits such as school meals are reduced, children in such circumstances are doubly penalised.

Chapter Four examines the effects of the 1980 Education Act on the provision of school meals. It is suggested that, in a number of ways,
children in families from the lower socio-economic groups are more likely to be adversely affected by changes in school meals provision.

Nelson (1980) suggests that the use of standard RDA tables to assess dietary adequacy does not take into account differences in dietary effectiveness under different environmental conditions. He suggests that a standard which is sensitive to 'environmental handicap' is required; this could be achieved by grouping together children from similar social or environmental backgrounds and assessing diet and growth in the two groups independently.

Nelson and Paul (1981) suggest that assumptions that no further improvements could be made in the diets of poor children, were based on studies which revealed few differences in nutrient intake with social class. A comparison of dietary adequacy using two different standards as suggested might have revealed a different picture. These authors suggest that the results of the Headstart Program in the USA indicate that there is still room for improvement; about 30 per cent of the poorest children have achieved better health and educational development through improvements in their diets (Levin 1977). Nelson and Paul (1981) cite UK studies which suggest that there are substantial numbers of poor children from broken or overcrowded homes or from families on long term Supplementary Benefit who would benefit from a nutrition intervention programme. They also suggest that 'this is the only way in which to test whether or not we have reached the limits of nutritional improvements which would be of specific benefit to children in the lower social class'.

This is obviously an area in which further research is needed, the results of which should form the basis of future government welfare policy decisions.

3.5 NUTRITION IN ADOLESCENCE

3.5.1 Importance of Nutrition in Adolescence.

It is suggested that nutrition in adolescence is an area of nutritional concern on several grounds.

Firstly, the physiological changes occurring during adolescence create particular nutritional demands; the social and psychological changes, occurring at the same time, very often result in changed and erratic eating habits, making it more likely that these increased
nutritional needs may not be met.

Secondly, the current rapidly changing socio-economic situation, affecting the nutrition of children in some groups (discussed above) will also affect adolescents, possibly having particularly adverse effects during the period of rapid growth which occurs at this time.

Finally, the question of whether the foundations of the so called 'diseases of affluence', now prevalent in Western Countries, are laid down by childhood diets, is discussed in the following section (3.6) of this chapter; this area is also of particular concern during adolescence.

An additional justification for the following discussion is that it provides the necessary nutritional context for the results of the current study of school meals, which included adolescents.

The idea that nutrition in adolescence is an area of concern is supported by several nutritionists. Greenwood and Richardson (1979) emphasise the need to be aware of the possibilities of problems, in this age group, of both undernutrition during growth, and overnutrition, 'undernutrition or malnutrition during the period of rapid growth remain largely undefined problems in the case of many adolescent children throughout the world. Unlike developing nations, extensive nutritional deficiencies are probably uncommon in highly developed societies ... it may well be complacent to believe that teenagers and young people in the industrialised nations are healthier, fitter, and better fed than ever before. For example there is increasing evidence that young people habitually skip meals and satisfy their appetite by eating certain food items which could lead to a seriously imbalanced diet. Increased mechanisation has also resulted in a fall in physical activity among the adolescent age group, and disorders of overnutrition are replacing those of undernutrition ... the new freedom and opportunities which are created by youthful independence and mobility can contribute to increased vulnerability resulting in poor health'.

On the other hand, Truswell and Darnton Hill (1981) suggest that there is little evidence of either short term and or future harmful effects of erratic eating habits in adolescence, and 'disapproval of adolescent food choice ... expressed as nutritional concern ... (is) based on anxiety that they appear to reject some of the values of the preceding generation'. These authors suggest that 'we should criticize and worry less about food habits in adolescence but somehow work out how to bring about more advice on healthy food habits for adult life at the stage that young men and women start living together and building up the food habits
of their own new generation'.

A detailed discussion of the formation of food habits and the optimal stage in life for nutrition education is beyond the scope of this thesis; however it is argued in Chapter Six that unless sound nutrition education is part of the early school curriculum, the chances that the erratic food habits of adolescence will be abandoned in favour of healthier alternatives with the onset of adulthood is slight.

This section therefore examines briefly some of the physiological and behavioural changes which occur in adolescence, and discusses some of the features of adolescent food habits as revealed by surveys of this group. Surveys of dietary intakes, and other evidence relating to nutritional status are examined in order to identify areas of concern, and thus implications for school meals and priorities for nutrition education. Studies of adolescent attitudes to food and health are also discussed as relevant to nutrition education.

3.5.2 Physiological and behavioural changes

Physiologically, adolescence is a time of completion of growth and sexual maturation, 'it is an intensely anabolic period influenced by a marked rise in hormone activity, which results in a number of physical changes that characterise adolescence' (Greenwood and Richardson, 1979). The variation in extent and timing of this phase and its effects on nutrient requirements have been discussed. The onset of the adolescent growth spurt varies both within and between populations and is strongly influenced by the nutritional state of the population.

At the same time as these physiological changes are taking place, there also are behavioural changes which have important effects on food habits of this group.

Truswell and Darnton Hill (1981) suggest that 'the food habits of adolescents reflect the weakening influence of the parental family, the young person's increasing social involvement with his other peers, his or her concern about appearance, and his high needs for energy'.

Dwyer (1981) suggested that 'adolescence is a time of emotional, physical and educational transition, when adolescents medical and nutritional needs have to be seen in the context of children seeking to establish their identity in a changing adult world. Their self-awareness and search for an adult identity often leads to a lability of mood and a
fluctuating attitude to society, conventions of behaviour, including food patterns'.

It is thus a time when more meals are taken away from the home or school environment.

Bull and Buss (1983) suggest that 'although adolescence may be basically a biological phenomenon, it is also the time when control over what is eaten largely passes from the parent to the child'.

These changes have important implications for nutrition education.

3.5.3 Features of adolescent food habits and possible effects on nutrient intake.

Recently there have been several qualitative studies which have indicated that erratic, and often poor, eating habits are frequently a feature of adolescence.

Corry (1981), from a market research survey, suggested that adolescents appear to eat a succession of snack meals or snacks, and very few traditional meals; also that consumption of food and meals away from home appears to be becoming more widespread. This author also suggests that it is difficult to assess whether the changes in the type of food consumed will affect the nutritional status of these children in the long term.

The National Dairy Council and the British Nutrition Foundation (NDC, BNF, 1982) commissioned another market research survey of children aged 5 - 18 years, after concern had been expressed that changes in eating patterns might affect childrens' food intake. The main changes in meal patterns and types of meal consumed identified were,

- family meals becoming less formal, with greater use of ready prepared foods,
- a greater number of meals eaten away from home or purchased from take-away outlets for consumption in or out of the home,
- major changes in the school catering service,
- more individual control over food choices.

This survey found that eating habits of 14 - 18 year olds were erratic; it was suggested that a further survey of this age group should be carried out, involving a weeks weighed intake and growth measurements, also that, in view of the major and rapid social and economic changes which had taken place recently and which are likely to continue, this survey should be repeated in a few years time.
Another survey, commissioned by Woman Magazine and Quaker Harvest Crunch Bars (1983), showed high intakes of sweet snack foods and very low intakes of fruit and, particularly, vegetables among children aged 5 - 16 years. This survey concluded that over half the children were not eating 'a particularly healthy' diet, and one in five was existing on 'a very poor diet indeed'.

Cresswell et al (1983) investigated the dietary pattern of a group of 14 - 16 year old schoolgirls in Glasgow, using a 24 hour recall and questionnaire. This survey found that most of the group were eating at normal meal times, but also that there was 'frequent snacking' in addition, particularly in the late afternoon and evening. 'A distinct lack of fruit and vegetables' was also found, and the role of and sources of fibre in the diet were not well recognised'.

Clearly, conclusions concerning the nutritional value of a diet, where only qualitative information is available, must be very carefully drawn. The surveys discussed above (and others) would seem to indicate that there is a need for studies involving quantitative records of food eaten by adolescents.

This view is supported by Turner (1982) who suggested that the NDC survey (1982) revealed the need for a more detailed survey of adolescents to evaluate nutritional risk.

Truswell (1979) also pointed out that 'there was not enough information on the range and variation in food intakes of adolescents, especially those living in permissive affluent societies'.

Recent quantitative surveys of this age group in this country are few. Even given quantitative data, the limitations of RDA tables for comparing nutrient intake with recommendations (discussed above) need to be borne in mind, as must the need for other, more direct, methods to assess nutritional status.

There is, however, enough information to indicate areas of concern in this age group, and thus discuss the implications for school meals and priorities for nutrition education.

Truswell (1981) discusses a number of features of food habits of adolescents, found in surveys in Northern Europe, North America and Australia. Many of these features can be seen in the qualitative surveys discussed above, and others carried out recently in this country; the possible implications, of these eating habits, for nutrient intake and nutritional status of this age group, will be examined.
Missing meals

Truswell (1981) cites a number of surveys which indicate the frequency with which meals are missed; Heuneman et al (1968) found that 'lunch was skipped slightly more often than breakfast, except in obese children, and meal regularity tended to increase with rise of socio-economic classification'.

In this country the main concern seems to be over the proportion of the population, particularly children, who do not eat breakfast; this concern arises from the findings of a number of surveys;
- Bermingham (1977) - 17 per cent of the population and 27 per cent of adults (21-44 years) omitted breakfast,
- Bender et al (1972) - 13.6 per cent of the senior school children sampled had no breakfast,
- Bender et al (1977) - 21 per cent had no breakfast
- Lynch (1969) - 25 per cent of a sample of 10-11 year old boys regularly fasted for 18 hours each school day eating nothing between the evening meal as early as 18.30 hours and lunch the following day.
- Kelloggs Breakfast Surveys (1977 & 1981) - the tendency to omit breakfast increases as children get older (Table 3.18)
- NDC (1982) also found this tendency - 13 per cent of 11-14 year olds and 20 per cent of 15-18 year olds had nothing except perhaps a drink (not a milk drink) for breakfast; in this survey, in all age groups, girls were more likely than boys to have no breakfast - 15 per cent and 11 per cent respectively.
- Cresswell (1983) - 17 per cent of the girls had either a beverage (tea or coffee) only, or nothing.
- Golding et al (1984) in the Child Health and Education Study - 'four fifths of the sample claimed to eat breakfast every day; 2.6 per cent said that they never had breakfast and almost 19 per cent said they sometimes ate breakfast. In this study children in the manual social classes were slightly less likely to have breakfast than those children whose fathers were classed as 'non-manual' workers'.

It is suggested that these figures are consistent enough to cause concern.
Evidence, however, of adverse effects is slight. Golding et al (1984) suggest that 'there was no evidence to suggest that those not eating breakfast were less well nourished than the rest'.

Dickie and Bender (1982a;1982b) carried out two studies to ascertain the effect of missing breakfast on mental performance in schoolchildren. These authors also review other studies relating to breakfast and performance, and conclude that there 'does not appear to be any good evidence to support what has become the nutritionist's dictum that 'breakfast is the most important meal of the day'.

It has been suggested that the validity of such studies are questionable since it is extremely difficult to isolate one factor, (such as the consumption of breakfast) from the many other factors which affect performance on such tests. In addition, as Dickie and Bender suggest, there is anecdotal evidence to support the view that children's attention, concentration and general behaviour is improved when food is given midmorning; this is, however, impossible to quantify.

Most nutritionists would therefore continue to give the advice that, since many children's energy and nutrient needs are high, breakfast can help to meet these needs as part of a balanced diet. This is supported by Steele et al (1952) who found, in a study in the USA, that breakfasts provided about 20 per cent of the total energy intake, and that children who ate them were more likely to meet the RDA for all nutrients.

Recent surveys in this country indicate that a proportion of children are missing lunch;
- Richardson and Lawson (1972), in a survey of 565 children in a London comprehensive school, found that 4 per cent of children went without food at lunchtime,
- Bender et al (1977) in a survey of 12 schools in one London borough found that 2 per cent of senior schoolchildren 'regularly ate no lunch'.

Table 3.18 Children not having breakfast
(Kelloggs Breakfast Surveys, 1977 and 1981)
(from Robert-Sargeant and Gray, 1982)

<table>
<thead>
<tr>
<th>Age</th>
<th>0-12 years</th>
<th>13-20 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>1976</td>
<td>5</td>
<td>17</td>
</tr>
<tr>
<td>1980</td>
<td>5</td>
<td>15</td>
</tr>
</tbody>
</table>
- The NDC survey (1982) found that 5 per cent of children 'apparently did not eat anything at lunch time'.

While the proportion of children, apparently eating nothing at midday, at least on some days, is small, the number of children involved are large enough to be a cause for concern, particularly when considered in addition to those children who replace lunch with snacks or snack meals, often high in fat or sugar or both (discussed below).

The current study of school meals compares the nutrient intake at midday of children consuming school lunches, packed lunches, and those eating off the school premises; this is discussed in Chapter Five, as is the contribution of school meals to nutrient intake.

Snacking, consumption of sweets and soft drinks

Truswell (1981) observes that 'standard meals, sometimes omitted, are made up for with snacks. Adolescents are seen as eating more of their food as snacks than adults do'.

A number of authors have attempted to define terms in this area. Truswell suggests that the dividing line between snacks and 'fast, and take-away or carry-out foods', is a fine one, 'snacks merge on the smaller side into confectionery, and on the other side into fast and take-away meals'. Truswell, in effect, defines a snack as containing items from only one food group. The consumption of 'fast foods' and 'take-away foods' by adolescents is discussed below.

The National Dairy Council (1982) gives the following definition, 'the term 'snack' indicates the consumption of a single food item, for example a piece of cheese, packet of crisps, sweets, a piece of fruit, a milk drink'.

Hackett et al (1984) defined the term 'snack' as 'an intake having at least one of the following properties;
- thought to make a minor contribution to the day's intake
- eaten whilst engaged in some other activity
- not eaten at recognised mealtimes or places

None of these definitions is particularly helpful nutritionally, as the authors do not distinguish between foods of high nutrient density, and those which are of low nutrient density due to their high sugar and/or fat content. This is important if one is to assess the validity of the concern that has been expressed over this feature of adolescent food habits.
Truswell argues that there is less cause for concern about snacking than is generally accepted and cites a number of surveys (mostly carried out in America), based on the above definition, to support this argument. This author does however suggest that 'the quality of snack foods can be altered if candies, chocolate etc. are counted with or excluded from snacks'.

On the other hand, it is suggested that there is sufficient evidence from recent British studies to indicate that the intake of low nutrient density or 'empty calorie' foods by schoolchildren and adolescents is high enough to cause concern among nutritionists. Both arguments will be examined.

Truswell cites a number of studies on snacking;
- Steele et al (1952) reported that between-meal foods provided, on average, 11-19 per cent of the energy intake of adolescent children in three American states, their percentage daily intake of other nutrients from snacks was rather less than this.
- Thomas and Call (1973) examined the data from the Ten-State Nutrition Survey in the USA, where 78 per cent of the teenagers reported eating between meals on the day of the 24 hour recall, with approximately 23 per cent of the daily energy intake of these teenagers, on this day, coming from items eaten between meals. A comparison of the nutrient density and the appropriate RDAs showed that the mean nutrient intake from between meal foods, met or exceeded the RDA for protein, riboflavin, and ascorbic acid, but was slightly below for thiamin, and considerably below for Vitamin A, calcium and iron.
- Frank (1977) found that 96 per cent of children reported eating snacks which on average supplied almost one quarter of their daily energy intake, and apparently replaced a meal for some children.

It is perhaps this last finding that gives most cause for concern; unfortunately, few recent British surveys give any indication of the extent to which snacks of low nutrient density replace meals. Cresswell, however, reported that 23 per cent of a sample of 14-16 year old girls in Glasgow bought their lunch outside school, and this most often consisted of chips and rolls or pies, chips alone or confectionery. This area will be discussed in more detail in Chapter Four; the findings of the current study of meals consumed by schoolchildren at midday (discussed in Chapter Five) support the need for concern in this area.

A number of recent British surveys, provide data which indicate that patterns of snack consumption by adolescents may possibly be a cause for
concern. It is the snacks consisting of low nutrient density foods (including soft drinks) eaten instead of meals, or as part of meals, or more usually in between meals, which are the concern of many nutritionists. This concern is due to the high sugar and/or high fat, and thus high energy content of these snacks; some of those snacks are also high in salt.

The study by Cresswell (1983) of 14-16 year olds in Glasgow yields qualitative information on snacks;
- Table 3.19 shows when snacks are most frequently eaten,
- Table 3.20 indicates the type of snacks eaten,
- the average amount spent on snacks by all subjects was 40 pence,
- the 23 per cent of subjects who bought a replacement meal spent an average of 58 pence in addition to snacks.

This illustrates the extent to which this age group can exercise choice over the foods they eat by virtue of their purchasing power.

While this survey did not yield quantitative information, 'a likely high intake' of fat and sugar was inferred from the consumption of snacks; 'a distinct lack of fruit and vegetables' was also noted, as was 'a poor knowledge of the role of sugar, fat and fibre in the diet, and a lack of knowledge of the sources of fibre'. Cresswell also suggests that 'the quantity of crisps deserves specific attention owing to their high fat and salt content ... we should not be so ready to advocate their consumption as an alternative to sweets in relation to dental health (as is suggested by Lauder and Valentine, 1980, and Health Education Council, 1981).

Table 3.19  Snacking times
(from Cresswell et al, 1983)

<table>
<thead>
<tr>
<th>Snacking time or place</th>
<th>Percentage reporting this</th>
</tr>
</thead>
<tbody>
<tr>
<td>On the way to school</td>
<td>19</td>
</tr>
<tr>
<td>Mid-morning</td>
<td>31</td>
</tr>
<tr>
<td>Mid-afternoon</td>
<td>18</td>
</tr>
<tr>
<td>On the way home from school</td>
<td>17</td>
</tr>
<tr>
<td>At home before evening meal</td>
<td>42</td>
</tr>
<tr>
<td>Evening at home</td>
<td>53</td>
</tr>
<tr>
<td>Evening outside</td>
<td>47</td>
</tr>
<tr>
<td>Bedtime</td>
<td>65</td>
</tr>
</tbody>
</table>
Table 3.20  Snacks Purchased  
(from Cresswell et al, 1983)

<table>
<thead>
<tr>
<th>Type of snack purchased</th>
<th>Percentage reporting this</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crisps or similar savoury snacks*</td>
<td>56</td>
</tr>
<tr>
<td>Soft drinks</td>
<td>50</td>
</tr>
<tr>
<td>Chocolate confectionery</td>
<td>39</td>
</tr>
<tr>
<td>Sweets or ice lollies</td>
<td>31</td>
</tr>
<tr>
<td>Chewing gum</td>
<td>15</td>
</tr>
<tr>
<td>Chips</td>
<td>12</td>
</tr>
<tr>
<td>Ice cream</td>
<td>7</td>
</tr>
<tr>
<td>Cakes</td>
<td>6</td>
</tr>
<tr>
<td>Chocolate biscuits</td>
<td>5</td>
</tr>
<tr>
<td>Biscuits</td>
<td>2</td>
</tr>
<tr>
<td>Fresh fruit</td>
<td>&gt;1</td>
</tr>
</tbody>
</table>

* 12 per cent of subjects bought three or more packets per day.

A survey of 15-25 year olds, conducted by MAFF, (Bull and Buss, 1983) quantifies intake of fat and sugar containing foods. Table 3.21 shows the intake of certain foods by 15-18 year old boys and girls in this survey.

In addition a number of recent British surveys have provided data on sugar intakes by this age group; concern has been expressed over the relationship between these findings and the possibility of poor dental health.

Hackett et al (1984) measured sugar intakes from various foods in the diets of 405 11-14 year old children in Northumberland and found that;
- confectionery (including boiled sweets, pastilles, gums, chewing gum, toffees, popcorn, ice-lollies, ice-cream, pure chocolate bars, filled chocolates and bars, and full-coated chocolate biscuits) was the largest single source of sugar in these childrens' diets (Table 3.22),
- the average total sugars intake was 118 grams per day (Figure 3.6 shows the frequency distribution) or 21 per cent of energy intake, and 43 per cent of carbohydrate intake,
- the percentages were similar for both sexes and all social classes,
- both boys and girls in the 'low' social class category consumed a higher percentage of sugar from confectionery and table sugar but a lower percentage from soft drinks.
Figure 3.6 Frequency distribution of sugars intake/day for 405 children

(from Hackett et al, 1984)
- the high sugar eaters ate more sugar from all categories.
- sugars were fairly evenly consumed over the day, but with a high amount from foods eaten between meals.
- snacks accounted for 46 per cent of the energy intake and 65 per cent of the sugars intake, (the contribution of snacks to mean daily intake of macronutrients is shown in Table 3.23.)

Table 3.21 Average intake of selected foods by 15-18 year olds in Britain (g/day, to nearest 5g).
(from Bull and Buss, 1983)

<table>
<thead>
<tr>
<th></th>
<th>Boys</th>
<th>Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breakfast cereals</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>Meat and meat products</td>
<td>125</td>
<td>90</td>
</tr>
<tr>
<td>Carcass meat and poultry</td>
<td>45</td>
<td>35</td>
</tr>
<tr>
<td>Sausages, pies etc</td>
<td>80</td>
<td>55</td>
</tr>
<tr>
<td>Vegetables</td>
<td>215</td>
<td>170</td>
</tr>
<tr>
<td>Potatoes</td>
<td>115</td>
<td>80</td>
</tr>
<tr>
<td>Chips</td>
<td>65</td>
<td>40</td>
</tr>
<tr>
<td>Crisps</td>
<td>20</td>
<td>15</td>
</tr>
<tr>
<td>Fruit</td>
<td>70</td>
<td>80</td>
</tr>
<tr>
<td>Fruit juices</td>
<td>30</td>
<td>35</td>
</tr>
<tr>
<td>Bread and rolls</td>
<td>130</td>
<td>90</td>
</tr>
<tr>
<td>Cakes</td>
<td>35</td>
<td>25</td>
</tr>
<tr>
<td>Biscuits</td>
<td>20</td>
<td>15</td>
</tr>
<tr>
<td>Pizza</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>Yogurt</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Chocolate</td>
<td>35</td>
<td>30</td>
</tr>
<tr>
<td>Other sweets</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Carbonated soft drinks</td>
<td>160</td>
<td>145</td>
</tr>
<tr>
<td>Squashes</td>
<td>85</td>
<td>60</td>
</tr>
<tr>
<td>Tea</td>
<td>350</td>
<td>265</td>
</tr>
<tr>
<td>Coffee</td>
<td>230</td>
<td>240</td>
</tr>
<tr>
<td>Beer</td>
<td>190</td>
<td>65</td>
</tr>
</tbody>
</table>
Table 3.22: Mean daily total sugars intake (%) from each of eight food categories (from Hackett et al, 1984)

<table>
<thead>
<tr>
<th>Sex</th>
<th>Boys</th>
<th>Girls</th>
<th>high sugars all eaters* subjects (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High</td>
<td>Middle</td>
<td>Low</td>
</tr>
<tr>
<td>Food Category</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Confectionery</td>
<td>13</td>
<td>16</td>
<td>19</td>
</tr>
<tr>
<td>Table sugars</td>
<td>14</td>
<td>18</td>
<td>21</td>
</tr>
<tr>
<td>Softdrinks</td>
<td>14</td>
<td>14</td>
<td>11</td>
</tr>
<tr>
<td>Lactose</td>
<td>15</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>Biscuits and cakes</td>
<td>13</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Puddings</td>
<td>10</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>Fruit</td>
<td>4</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Syrups and preserves</td>
<td>6</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Breakfast cereals</td>
<td>3</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Other foods</td>
<td>8</td>
<td>7</td>
<td>7</td>
</tr>
</tbody>
</table>

* 10% of subjects (plus 'ties') with the highest sugars intake (>159.5g/d).

Table 3.23: Mean daily intake (%) of macronutrients and total sugars consumed as snacks*, according to sex. (from Hackett et al, 1984)

<table>
<thead>
<tr>
<th></th>
<th>Boys</th>
<th>Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy</td>
<td>42(4.0 MJ)</td>
<td>46(3.9 MJ)</td>
</tr>
<tr>
<td>Protein</td>
<td>34</td>
<td>37</td>
</tr>
<tr>
<td>Fat</td>
<td>38</td>
<td>43</td>
</tr>
<tr>
<td>Carbohydrate</td>
<td>47</td>
<td>52</td>
</tr>
<tr>
<td>Sugars</td>
<td>62</td>
<td>65</td>
</tr>
</tbody>
</table>

* Defined as an intake having at least one of the following properties:
(a) thought to make a minor contribution to the day's intake,
(b) eaten whilst engaged in some other activity,
(c) not eaten at recognized mealtimes or places.

The figures in this survey do not distinguish between added sugars and natural sugars on the grounds that 'it is unlikely that sugars occurring naturally have different cariogenicities from added sugars'.

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Hackett et al conclude that sugar intake and snacking 'seemed to have been major components of the eating habits of these children' and suggest that the high sugar intake in the form of snacks is 'dentally undesirable'.

These authors also suggest that 'since this tendency to snack is a feature, possibly an increasing feature, of changing dietary habits associated with other changing patterns of behaviour such as working mothers, less formal intra-family relationships, greater independence of children, there is a need for safe snacks to be developed'. Hackett et al suggest that a discussion of the criteria which define a safe snack is beyond the scope of his paper, but should include foods of low sugars content. Most nutritionists would suggest that a safe snack would also be low in fat, possibly low in salt and energy as well, but high in fibre.

McKenzie (1976) would probably include snacks in his category of fun foods - they should therefore also 'be fun to look at, have a nice taste, and a good image'. Does such a snack exist?

The NACNE (1983) report also suggested that 'since adolescents seem to prefer to eat more of their food as snacks than as meals, they need to have access to snacks which are low in sugar, fat and salt'.

Richardson and Lawson (1972) found high sugar intakes at lunch time in children at a London comprehensive school,
- for children eating the school meal, sugar provided 11 per cent of the energy,
- the children who bought food obtained 17 per cent of their energy from sugar,
- in the 25 (of 565) children eating mostly sweets, sugar supplied 61 per cent of their energy.

Richardson and Greenwood (1979) cite World Health Organisation Papers (1972) and work by Carlos (1973) as evidence of concern about the problems of dental caries in adolescents and its probable relationship with excessive consumption of sugar. The incidence of dental caries in adolescents will be discussed in a later section.

Truswell (1981) discusses the consumption of soft drinks by this age group separately; British studies indicate that they would seem to make a considerable contribution to sugar intake, and they are therefore included in this section, with other snacks.

This author again questions 'the common position of nutritionists that soft drinks are undesirable and should be discouraged'. He quotes the British Food Standards committee, 'soft drinks, with a few exceptions,
are of nutritional significance mainly as flavouring for dietary water. They serve a useful function by encouraging adequate intake of this essential substance'. Truswell does not see their sugar content as harmful, 'for mature people worried about their weight they may provide too much energy from sucrose, but energetic and growing teenagers can, as a rule, use this sugar ... there is no evidence, as far as I know, that sucrose in soft drinks (as opposed to sticky toffees) contributes to dental caries'. Truswell does however point out the dangerous effect to the teeth of phosphoric acid in these drinks, and also the allergenic properties of some flavourings and colourings used (for some children).

Since this discussion of soft drinks follows that of alcohol consumption in adolescents perhaps this is a question of relative effects, 'except for these additives, I believe a moderate intake of soft drinks is more healthy than the alternatives, alcoholic drinks, coffee or large amounts of milk' (Truswell, 1981); this author cites McKenzie (1976) suggesting that soft drinks are a good example of 'fun foods'- to be distinguished from foods for nourishment'. Truswell does not, however, quantify 'moderate' and while quantified data from recent British Surveys is limited, it is suggested that the intake of soft drinks by some children in this age group falls outside most definitions of moderate.

In addition to the relationship between the sugar content of snack foods, (particularly those eaten between meals) and dental caries, other aspects of snack consumption by adolescents are causing concern to nutritionists.

There is concern that the consumption of attractive, palatable, easily available snacks which are high in fat and sugar, in addition to meals will contribute to energy intakes in adolescents which are greater than energy requirements, possibly contributing to obesity, if continued over a period of time. The incidence and problem of obesity in adolescents is discussed in a later section.

If such snacks are eaten instead of meals, there is concern that they may be replacing foods of higher nutrient density. This may, over a period of time, lead to nutrient needs of adolescents, (which has been shown to be relatively high), not being met.

There has been little recent research in this country to indicate whether the snacks are eaten in addition to, or instead of, meals, and if the former, what the effect is on amounts of food eaten at meal times.

A recent survey of diets of British schoolchildren (OPCS/DHSS, 1986) reported that 'because of the large quantity of chips, cakes and biscuits
consumed by these schoolchildren, the consumption of most other food items was correspondingly reduced'.

Also, there is little quantified data from recent British surveys to indicate the contribution of snacks to vitamin and mineral intake, or to fat, fibre, and salt intake; however low intakes of certain nutrients have been found in several surveys of adolescents, and it is suggested that a high intake of low nutrient density snack foods replacing meals may contribute to this. The authors of the above report suggest, however, that 'further analysis of actual food intake is necessary' before these findings can be properly related to nutrient intake.

The incidence and effect of nutrient deficiencies in adolescents is discussed in a later section.

'Fast' and 'take-away' or 'carry out' foods

As Truswell (1981) points out snacks merge on the larger side into this category, which he defines separately as containing 'components from two or more food groups, but the items can be prepared quickly and eaten in an informal way without plates or cutlery ... such meals can be just as easily taken away and eaten outside or at bare tables or shelves in the place where they are prepared'. Again this definition is too broad to be of much value nutritionally, and seems to relate more to where the food is eaten, than what is eaten. Here also, the nutritional relevance of this feature of adolescent eating habits depends largely in whether these foods are eaten instead of, or as well as main meals.

The popularity of such foods with adolescents can be attributed to a number of factors.

Greenwood and Richardson suggest that 'young people want to seek and develop their own identity, and one form of independence is reflected in the number of meals the adolescent, particularly the older teenager eats away from home and 'outside the the school environment'.

Truswell (1981) lists a number of features that a chain like McDonalds has to offer to fit in with adolescent lifestyles and attitudes;
- food that is inexpensive, yet microbiologically safe and familiar
- foods the adolescent likes
- foods that can be eaten when they feel like it, and quickly if they are in a hurry
- there are plenty of fellow adolescents buying from or eating in these establishments
Many writers have commented on the increased purchasing power of adolescents and have attributed the increasing popularity of 'fast foods' (also snacks) to this. There is however little recent data on the extent of such purchasing power, particularly in times and areas of high unemployment; a discussion of this aspect is beyond the scope of this thesis.

Once again there is little quantitative evidence to support the nutritional concern that is expressed over this trend.

The nutritional implications of the increased consumption of 'fast foods' have been the subject of much media attention, based frequently more on emotion than scientific fact, particularly in view of the development of the cash cafeteria service in schools, and the appearance of many so-called 'fast' food items on these menus. The variety of foods available from such 'fast' food and take away outlets is fairly large, and in the absence of quantified data on the contribution of such foods to the diet of adolescents, it is probably true to say, as with school meals, that if wise choice is exercised it is possible to consume a nutritionally sound meal.

As Truswell (1981) has pointed out 'any changes in food consumption and food preparation certainly needs critical and continuing examination by nutritional scientists'. This authors cites McDonald's claim that a combination of a 'Big Mac', a serving of 'French Fries' and a chocolate milk shake provides

- 40 per cent of daily energy requirements
- a higher percentage than this of protein, vitamin C, thiamin, riboflavin, niacin, calcium, and iron,
- only vitamin A is low at 10 per cent of daily requirements.

Table 3.24 shows an analysis of a similar meal using figures provided by McDonald's (1984), compared with RDAs for boys and girls aged 15-17 (DHSS, 1979) with rather different results. The percentage energy from fat, and the sucrose content of the meal were high by the standards used to evaluate school meals in the current study (discussed in Chapter Five). The sodium content of the meal is also high. Nevertheless it can be seen that, compared with the energy content, this meal provides adequate or more than adequate intakes of most nutrients, except vitamin C, and riboflavin.
Table 3.24 Nutritional Value of typical meal consumed at McDonalds

<table>
<thead>
<tr>
<th></th>
<th>Big Mac.</th>
<th>French fries</th>
<th>Chocolate milk shake</th>
<th>Total</th>
<th>% RDA boys 15-17</th>
<th>% RDA girls 15-17</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy k.cals.</td>
<td>554</td>
<td>290</td>
<td>389</td>
<td>1233</td>
<td>42.8</td>
<td>57.3</td>
</tr>
<tr>
<td>Fat g.</td>
<td>27.9</td>
<td>15.9</td>
<td>11.0</td>
<td>54.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% energy as fat</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>Sucrose g.</td>
<td>2.1</td>
<td></td>
<td>36.4</td>
<td>38.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protein g.</td>
<td>26.3</td>
<td>3.7</td>
<td>11.7</td>
<td>41.7</td>
<td>57.9</td>
<td>78.6</td>
</tr>
<tr>
<td>Calcium mg.</td>
<td>177</td>
<td>16</td>
<td>515</td>
<td>708</td>
<td>118</td>
<td>118</td>
</tr>
<tr>
<td>Iron mg.</td>
<td>2.0</td>
<td>0.8</td>
<td>1.8</td>
<td>4.6</td>
<td>38.3</td>
<td>38.3</td>
</tr>
<tr>
<td>Vitamin C mg.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vitamin A µg.</td>
<td>107</td>
<td></td>
<td>358</td>
<td>465</td>
<td>62</td>
<td>62</td>
</tr>
<tr>
<td>Thiamin mg.</td>
<td>0.27</td>
<td>0.09</td>
<td>0.09</td>
<td>0.45</td>
<td>37.5</td>
<td>50</td>
</tr>
<tr>
<td>Riboflavin mg.</td>
<td>0.15</td>
<td>0.04</td>
<td>0.26</td>
<td>0.45</td>
<td>26.4</td>
<td>26.4</td>
</tr>
<tr>
<td>Nicotinic acid mg.</td>
<td>7.8</td>
<td>2.3</td>
<td>0.28</td>
<td>10.38</td>
<td>54.6</td>
<td>54.6</td>
</tr>
<tr>
<td>Dietary fibre g.</td>
<td>15.9</td>
<td>12.7</td>
<td></td>
<td>28.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sodium mg.</td>
<td>946</td>
<td>289</td>
<td>347</td>
<td>1582</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

If, however a different combination of items was chosen, the nutritional value would have been different, for example, without the milk shake, calcium, vitamin A and riboflavin would have been considerably lower. In addition some of the items are very high in fat and a 'Quarter Pounder with cheese' provides 55 per cent of the energy as fat. Also, the figures given (McDonalds 1984) indicate a high proportion of saturated fatty acids. Only the addition of fresh orange juice (available only with the breakfast menu) would have contributed any appreciable amount of vitamin C.

While the increasing popularity of 'fast food' outlets serving items such as pizzas, stuffed baked potatoes, is nutritionally encouraging, many 'fast food' establishments serve food of the type discussed above.

Truswell cites work by Greecher and Shannon (1977) who suggest that 'if one or more nutrients are found to be low in what people mostly choose, then the best solution is to co-operate with the fast food firms, to advise some change in the ingredients or to advertise the more nutritious combinations'.

The situation is analogous to that in school meals (discussed in
Chapters Five and Six) where it is suggested that suitable foods to meet nutritional recommendations should be available and nutrition education should be directed at ensuring a wise choice from available items. It is suggested that material currently available at McDonald's indicates an increasing involvement by caterers in nutrition education or nutritional marketing. This area is discussed in Chapter Six.

Unconventional Meals

Truswell (1981) also discusses, as a separate feature of adolescent food habits, what he describes as 'unconventional meals', resulting from the tendency for family meals to become less important. It is suggested that the term 'unconventional meal' is too broad to be of much use in a nutritional context, and should be seen as a feature of behaviour characteristic of adolescent lifestyles along with missed meals, snacks and fast foods. Without data on the extent and definition of unconventional eating it is not possible to discuss the nutritional implications of this.

Alcohol

Truswell (1981) also suggests that alcohol consumption starts in adolescence. The extent of alcohol consumption in adolescence and the social and health implications, while serious, are beyond the scope of this thesis. Truswell suggests that alcohol abuse is one of the major health problems of adolescence, intrinsically more serious than say inadequate intake of calcium and there are many who would agree. The nutritional implications of alcohol consumption are much the same as those of the consumption of any other low nutrient density food (discussed above).

Truswell also discusses other features of good habits and nutrition in adolescence;
- food likes and dislikes - these are discussed below as an aspect of attitudes to food and also in relation to nutrition education in Chapter Six.
- high energy intakes
- adolescent dieters - these aspects are discussed below, in the context of energy balance, incidence of obesity and the problem of anorexia nervosa in adolescents.
low intakes of nutrients - these are discussed below, in relation to any evidence of the effects of these low intakes.

3.5.4 Low Nutrient Intakes and evidence of deficiency in adolescents

Several dietary surveys have indicated that low intakes of some nutrients (notably calcium, iron, retinol and ascorbic acid) are common in adolescents. Each of these nutrients are discussed below.

As was discussed in section 3.2.1, nutrient intakes are compared with RDA tables, and different countries use different criteria to establish RDA's - the value given in the NRC (1974) USA tables are frequently higher than those given in the DHSS (1979) tables. Thus it is important to note the country in which the survey was carried out.

In addition, as was also pointed out, dietary surveys only give an indirect assessment of nutritional status; in order to establish deficiency of a nutrient, data from clinical, biochemical and anthropometric examinations and measurements must be examined also. There is little such data to indicate deficiency of the above nutrients in adolescents. It is suggested, however, that there is enough to indicate possible areas of concern, and thus provide the basis for nutritional guidelines for school meals, and give guidance on priorities for nutrition education and indicate areas where further research is needed.

Greenwood and Richardson (1979) feel that zinc nutrition in adolescence is also an area of concern, and although there is no RDA for zinc given by the DHSS, this nutrient will be discussed. Surveys have also indicated low intakes of riboflavin in adolescents.

Calcium and Vitamin D

Truswell (1981) cites several USA studies which found between 20 per cent (Huenemann et al, 1968) and 60 per cent (Lee, 1978) of adolescents with low calcium intake (defined as less than 2/3 of RDA). This author, however, states that 'evidence of deficiency of calcium in adolescents is virtually non-existent in prosperous countries'.

Hackett et al (1984) report from a study of 11-14 year olds in Northumberland that 'mean calcium intakes were above those currently recommended for children of this age'.

Food intake studies reviewed by Irwin and Kienholz (1973) indicate that the calcium intake of boys tends to be higher than in girls; this was also found by Hackett et al (1984), and is probably due to the larger
overall food intake of boys.

Greenwood and Richardson (1979) point out that the interpretation of dietary data is complicated by the variation in calcium recommendations, and the lack of knowledge concerning the extent of the body's adaptation to calcium intake. These authors also discuss the relationship between calcium and other dietary components – vitamin D supply being the most important factor; here interpretation of data on dietary intakes of vitamin D is complicated by the unknown contribution from synthesis, in sunlight.

Greenwood and Richardson (1979) comment that there is increasing concern over vitamin D intakes below the RDA, and cite the study by Cooke et al (1973) which found that adolescent girls had mean intakes of vitamin D of only 87 per cent of the RDA. They also cite Nordin (1973) who reported that there was no evidence of vitamin D deficiency among a sample of school children in the UK.

Recent work by Lawson et al (1979) and Poskett et al (1979) indicates that serum vitamin D levels, even in winter, correlate more closely with sunlight than with vitamin D. Nevertheless, DHSS (1979) recommends that during the winter children and adolescents should receive supplements of 10 micrograms.

Greenwood and Richardson (1979) note that in USA 90 per cent of the pasteurised milk sold is fortified with vitamin D. The contribution of fortification to vitamin D intake in the UK has not been assessed. However with some low fat milks, yogourts, and breakfast cereals being fortified with vitamin D this may well be increasing.

The NACNE report indicated that the only groups for whom there was concern over vitamin D intakes were those from ethnic minorities, in which case supplements should be made available.

Both calcium and vitamin D are involved in bone metabolism; Greenwood and Richardson (1979) suggest that while dietary calcium is probably not limiting for bone growth in the adolescent population as a whole, it may prove so during peak adolescent growth. In addition these authors cite evidence to suggest that inadequate intake of calcium during adolescence may well lead to reduced bone density which in turn may predispose an individual to osteoporosis in later life. This point is made also by Hackett et al (1984) and by Widdowson (1979). Greenwood and Richardson conclude that further research is required in these areas.
Greenwood and Richardson suggest that low intakes of calcium (and riboflavin) are associated with low levels of milk consumption.

Hackett et al (1984) discuss the contribution made by fortified flour to calcium intakes in adolescents, and suggest that as, without fortification, the percentage of children with intakes below the RDA would more than double, the recommendation to stop fortifying flour with calcium carbonate should be reviewed, (this has now been withdrawn). In this survey (Hackett et al, 1984) the fortification of flour supplied 16 per cent of total calcium intakes; and without fortification the mean calcium intake of the girls in Social Classes III, IV and V would have fallen below the RDA. Milk, fortified flour and cheese provided nearly three quarters of the total daily calcium intake in this study.

The NACNE report (1983) suggests that 'there is a continuing need to advocate the consumption of milk to ensure adequate calcium intakes to meet the estimated calcium requirements of children'. It is also suggested that milk of a lower fat content 'should be readily available for doorstep delivery'. The availability and consumption of cheeses with a lower fat content would also contribute to an adequate calcium intake without increasing fat intake.

Iron

A number of studies have found low iron intakes in schoolchildren and adolescents.

Truswell (1981) cites studies carried out in the USA which found that between 20 per cent and 94 per cent of adolescent girls and between 10 per cent and 50 per cent of adolescent boys had low iron intakes (less than two thirds of the RDA).

Greenwood and Richardson (1979) cite USA studies by Frank et al (1977) in which 92 per cent of the children had low iron intakes; and the Ten State Nutrition Survey (1973) in which 80 per cent of 10-16 year old girls were having less than the RDA.

UK studies on iron intake are few, but Widdowson (1974) found iron intakes of 12.5-14.2 mgs/day and 13.6-18.0 mgs/day in 13-18 year old girls and boys respectively.

Cooke et al (1973) found that iron intakes of teenage girls fell below the daily recommendations.

Darke et al (1980) found mean intakes of iron of 10.1 and 10.9 mgs/day and 12.4 and 13.4 mgs/day in girls and boys respectively in studies of 14-15 years olds in Newcastle and Birmingham. These were
compared with RDAs of 14 mgs/day.

The most recent survey in the UK is reported by Barber et al (1985) which found mean iron intakes well below the RDA in women aged 15-25. This was particularly evident in those who were 'on a diet', or 'watching their weight'. Mean daily iron intakes of 15-18 year olds in this survey are shown in Table 3.25. This table shows the relationship between iron and energy intakes; but Barber et al suggest that the low iron intakes were also due to low iron concentrations of 1.15 mg/MJ, compared with 1.27 mg/MJ in the studies of Darke et al (1980) and a recommendation of 1.34 mg/MJ, (DHSS, 1979).

Table 3.25 Mean daily iron intakes of 15-18 year olds
(From Barber et al, 1985)

<table>
<thead>
<tr>
<th></th>
<th>no.</th>
<th>Iron (mg)</th>
<th>% RDA</th>
</tr>
</thead>
<tbody>
<tr>
<td>'not on a diet'</td>
<td>38</td>
<td>8.8</td>
<td>73</td>
</tr>
<tr>
<td>'watching weight'</td>
<td>34</td>
<td>8.0</td>
<td>67</td>
</tr>
<tr>
<td>'on a diet'</td>
<td>10</td>
<td>6.9</td>
<td>58</td>
</tr>
</tbody>
</table>

On the effects of low dietary iron intakes, Truswell (1981) suggests that 'anaemia is uncommon or rare in prosperous countries'; Cooke et al (1973) found 'no overt clinical manifestation of nutritional deficiency', nor did Darke et al (1980).

However data from biochemical measurements of haemoglobin, haematoctit and ferritin levels in USA studies, cited by Greenwood and Richardson (1979), suggest that a significant number of adolescents are at risk of iron deficiency. These authors also cite studies which suggest that moderate iron deficiency is associated with impaired school performance, inflammatory peridontal disease, fatigue, and behavioural and immunological changes.

Barber et al (1985) suggest that further research is needed to establish whether 'this population (15 - 25 year old women) is compromised or whether the current recommended daily allowances are unnecessarily high'. These authors also make the point that absorption of iron increases with deficiency, so that it is possible that this group with low intakes will absorb more than the 6-7 per cent estimated to be absorbed from food by the nation as a whole (Bull and Buss, 1980).
Greenwood and Richardson (1979) conclude that since adolescence is a period when there is an increased need for iron, and when it would appear that iron consumption does not increase, 'one of the most important nutritional modifications to be made during adolescence is an increase in the intake of iron containing foods'.

This is also implied by Barber et al (1985), particularly where energy intake is either restricted deliberately or is not high due to low levels of physical activity, in which case the iron concentration of the diet should be increased.

The NACNE (1983) report takes a different approach to the problem of ensuring adequate iron intake; this committee does not feel that to advocate an increase in meat consumption which would increase intake of haem iron, the most readily absorbed form of iron, is justified in the light of the main recommendations of the report. The authors of the report suggest that 'the principal dietary change which could lead to an improved iron status is the more widespread consumption of fruit and vegetables since vitamin C is proving to be one of the chief promoters of iron absorption in the complex interactions between nutrients and iron in the intestine ... sufficient iron will be provided by the continued ingestion of meat, and the provision of cereals, pulses and vegetables'.

Vitamin A (retinol)

Truswell (1981) cites USA studies showing low intakes of vitamin A among adolescents (varying from 20 per cent to 50 per cent having intakes less than two thirds of the RDA), but states that 'evidence of deficiency of vitamin A is virtually non-existent'.

Greenwood and Richardson (1979) cite surveys, on one hand, indicating intakes well above recommended allowances (the US average diet providing 200 per cent of RDA, and the UK diet 180 per cent), on the other hand, over one third of the adolescents in the Texas Nutrition survey giving dietary histories indicating a vitamin A intake 50 per cent below the standard; in addition one fifth of the children never ate vitamin A rich fruit and vegetables, and in a food preference study, none of the food items, described as well liked, was a rich source of vitamin A.

Greenwood and Richardson cite biochemical evidence of vitamin A deficiency; about one third of the children in the Texas nutrition survey were found to have low serum vitamin A concentrations and clinical vitamin A deficiency (follicular keratosis) was found in about 7-9 per cent of the...
adolescent group. However, these authors suggest that the real extent of vitamin A deficiency is very difficult to assess because of the lack of convenient and sensitive criteria for evaluating vitamin A status.

In the UK about one quarter of the dietary vitamin A is derived from the provitamins in fruit and vegetables, so again the increase in the consumption of fruit and vegetables advocated by the NACNE committee would increase vitamin A intakes.

**Ascorbic acid (Vitamin C)**

Truswell cites studies in which low intakes of ascorbic acid (less than two-thirds of the RDA) were found in from 25 per cent to 50 per cent of adolescents, but again states that evidence of deficiency is virtually non-existent.

Average intakes in the UK are 150 per cent of the RDA. Both MAFF (1977) and Cooke et al (1973) found vitamin C intakes well above recommended levels. Greenwood and Richardson (1979), however, cite evidence to suggest that 'average' intakes of vitamin C in the UK did not reflect the true vitamin C status of up to 10 per cent of the population, (a point also made in the NACNE report) and that an even greater proportion had intakes permanently below 30 mg/day. This is perhaps not surprising, given the distribution of vitamin C in foods. Greenwood and Richardson (1979) suggest that there is some concern that changing patterns of food selection (as discussed earlier in this section) in adolescents may affect daily intakes of vitamin C, particularly when storage, processing and preparation losses are taken into account. In addition there is evidence (as discussed below) that teenagers do not have a high preference for fruit, vegetables or salads.

There is little evidence however, of any effects of inadequate vitamin C intake. Greenwood and Richardson (1979) cite evidence from studies in the USA to suggest that the incidence of clinical manifestations of vitamin C deficiency may be as high as 9 per cent in the adolescent population; these authors point out, however, that even though most of the nutritional evidence demonstrates that the average daily intakes of vitamin C are sufficient to prevent clinical signs of scurvy, there is considerable controversy as to how much vitamin C is required for optimal health over long periods of time.
The NACNE report (1983) mentions the value of an increased vitamin C intake through an increased consumption of potatoes, fresh fruits and vegetables, to promote iron absorption. The suggestion that soft drinks might be fortified with vitamin C to increase intake in adolescents on the grounds of the high levels of consumption of soft drinks by this group (Truswell, 1981) is a pragmatic approach, but is difficult to justify on any other nutritional grounds.

Zinc

The NRC (USA) have set a recommended daily allowance for zinc, but WHO, and the DHSS (1979) in the UK have not. Average UK intakes of zinc have been estimated at 11 mg/day (Davies 1977) and 9.1 mg/day (Spring et al 1979). Kay (1981) suggests that this may not be enough to meet requirements. Lyon et al (1979) suggest, as a result of a survey, in Glasgow that subclinical zinc deficiency may exist in this population. The concern is particularly for adolescents as zinc requirements are increased during growth (Section 3.2).

There is some evidence relating to the effects of an inadequate zinc intake. Zinc responsive growth failure has been recognised in adolescent boys in the Middle East for some time, partly due to inadequate zinc in the diet, and partly to reduced absorption due to the presence of factors which render the zinc unavailable.

Greenwood and Richardson cite evidence to suggest that some children from middle and upper income groups with poor growth have low hair concentrations of zinc, which has been found to be a useful index of zinc status. Poor eating habits in these children was suggested to have been the cause. These authors suggest that a significant number of adolescents may consume marginal amounts of zinc; and thus research is necessary to establish both requirements for zinc, and the factors which affect the bioavailability of zinc.

It is known that dietary fibre reduces the absorption of zinc (and iron) and that zinc is more readily available from foods of animal origin; since current dietary recommendations suggest increasing the intake of dietary fibre, and a reduction of foods from animal sources, this research is particularly important.

Folate

The suggestion that the existence of folate deficiency is not as
widespread as recent surveys indicate has been discussed (3.2), but given the importance of folate in the body, and particularly the importance of good folate status at the beginning of pregnancy, it is suggested that particular attention be paid to sources of this nutrient in the adolescent diet, and its retention during food preparation. Again the advocated increase in fruit and vegetable consumption would contribute to folate intake.

Riboflavin

Three studies in America (Ten States Nutritional Survey, 1971; Hinton et al, 1963; Lopez et al, 1980) have reported low intakes of riboflavin in adolescents due, it is suggested, to erratic eating habits. While clinical manifestations of deficiency were rare, a number of adolescents in the survey by Lopez were shown, by biochemical tests, to be suffering from sub-clinical deficiency.

Low intakes of riboflavin were associated with low milk consumption. It is suggested that if the foods which contain riboflavin, mainly meat, milk and cheese, are not eaten it is likely that there will be a deficiency of other nutrients also, and that biochemical estimation of riboflavin status may therefore be a useful indicator of overall nutritional status in adolescents. These foods are clearly important sources of nutrients and thus should be consumed, preferably in low fat forms.

It is clear from the above surveys, that while clinical symptoms of nutrient deficiency are now rare in adolescents in westernised countries, there is some evidence that subclinical deficiencies of a few nutrients may exist, and there are some nutrients to which particular attention should be paid in the diet of adolescents. It is likely, however, (it has been suggested) that the changes in food consumption needed to meet the recommendations of the NACNE (1983) and COMA (1984) reports will result in increased intakes or availability of many of these nutrients. There is clearly a need for surveys of dietary intakes to determine whether or not this is so.

A recent survey of British schoolchildren (DHSS/OPCS, 1986) found some children, particularly girls, with low intakes of iron, calcium and riboflavin.
3.5.5 Other nutritional problems in Adolescence

There is therefore concern that certain features of adolescent eating habits, which may or may not be temporary, may lead to malnutrition. Possible effects of deficiency of nutrients have been discussed above.

Far more common, however, are problems of overnutrition, and the incidence of obesity in this group is causing concern, as is the incidence of anorexia nervosa. While not a problem of overnutrition, this latter condition is, like obesity, related to an imbalance of energy. This was pointed out in the NACNE (1983) report, 'abnormalities of appetite, which have a behavioural basis, are believed to be common during adolescence, and can lead to obesity and anorexia nervosa'. Greenwood and Richardson (1979) also suggest that while 'the majority of adolescents maintain energy balance ... stress and emotional upsets can often seriously affect the energy balance in adolescents resulting in the consumption of too little or too much food.'

Obesity

Figures for the incidence of obesity in a population depend on the definition used.

An OPCS (1981) survey used a Body Mass Index (BMI) of 25 as the upper limit of the acceptable weight range for both males and females. On this definition 15 per cent of males and females in the 16-19 age group were overweight.

In the National Study of Health and Development (Stark et al 1981) the average weight for height for each age group was taken as the basis, and 'overweight' was defined as a weight of 20 per cent above the mean (or mean + 2 standard deviation); on this basis 6.5 per cent of males, and 9.6 per cent of females aged 14 years were overweight.

In a DHSS survey of 10-11 year olds (Darke and Disselduff, 1981) in three areas of Britain 5.4 per cent of the children taking part were assessed as obese, with a further 11 per cent 'tending towards obesity'. Greenwood and Richardson (1979) also cite several studies to support their statement that 'it is apparent that there is a high prevalence of obesity among adolescents, and that it is an increasing public health problem in developed nations'.

The effects on health of obesity were discussed in Chapter Two. In addition, Greenwood and Richardson suggest that 'developing adolescents
are particularly concerned about their body image and excessive weight can have as profound effects on their emotional well-being as on their physical health'.

The complexity and multifactorial nature of the aetiology of obesity was also discussed in Chapter Two. Simply, this condition is caused by an excessive energy intake compared with expenditure. In a few adolescents very high energy intakes are responsible, in others a low level of physical activity, but in the majority of cases a combination of the two is the main contributory cause.

Truswell (1981) cites examples of very high energy intakes in adolescents, both from large meals and from high consumption of in-between meal snacks. This author does comment, however, that none of the surveys correlate the peak of the energy intake with the peak of the growth spurt. Other surveys (Durnin, 1974) which indicate that the fattest adolescents are not those that eat the most were also discussed (section 3.2).

The very large variation in all components of energy requirements in adolescence has been discussed (section 3.2). Probably the most variable is that required for physical activity, and it is certainly this component that can be adjusted to balance energy intake. Dwyer (1981) suggests that it is the reduced level of physical activity, commonly associated with the increasingly sedentary lifestyles of many adolescents in westernised countries, that is causing concern.

Greenwood and Richardson (1979) also suggest that 'lack of activity undoubtedly plays an important role in the development, progression and perpetuation of obesity in adolescence'. These authors cite several studies indicating that many obese adolescents are less active than their thinner peers, thus emphasising that the problem was not so much overeating as under-exercise.

Clearly, if reduced physical activity is not balanced by a lower energy intake obesity is likely to result; on the other hand a low energy intake to balance a sedentary lifestyle may result in intakes of some of the nutrients barely adequate to meet requirements increased by growth. This therefore stresses the importance of encouraging an increase in physical activity in adolescents, (as in all groups). This was emphasised both by the Royal College of Physicians Report on obesity (1983) and the NACNE Report (1983) and is a feature of most current health education campaigns.

This implies that an important aspect of nutrition education is an understanding of the concept of energy balance in the individual, which in
turn depends on assessing the effects of energy imbalance. In adolescents the development of a distorted idea of body image, often promoted by the popular press, may lead to an excessive restriction of energy intake, among adolescent girls, and thus to the condition of anorexia nervosa.

**Anorexia Nervosa**

The increased incidence of this condition amongst adolescent girls is causing concern. The NACNE report (1983) cites a study of schoolgirls by Crisp et al (1979) which found that 1 in 100 girls over the age of 16 years has severe anorexia nervosa, and that many other girls at some time during adolescence exhibited anorexic type behaviour, i.e. severe slimming, weight loss, and vomiting after eating. While the treatment of this condition is a medical matter, those involved in nutrition education with adolescents should be aware of the problem, and the attitudes and behaviour associated with it.

Thus nutrition education aimed at adolescents should attempt to direct attention away from 'an obsession with ectomorphic body forms', common in adolescent girls (Dwyer 1981), towards a discussion of the ideal body weight compatible with health, and the balancing of energy intake and expenditure to maintain this body weight. The current view is an increase in physical activity should be stressed and there should be a emphasis on the type of foods which have been shown to be more compatible with maintenance of energy balance (i.e. those in which most of the energy is in the form of complex carbohydrates, including dietary fibre, rather than as fat and sugar). The NACNE report (1983) recognised the difficulties which will arise when advising weight conscious adolescents to increase their intake of 'starchy carbohydrate-rich' foods, so long regarded as particularly fattening. It is suggested in Chapter Six that the first task of the nutrition education is correcting misconceptions.

**3.5.6 Attitudes to food and health in adolescence**

The effects of erratic eating habits in adolescence are clearly causing concern. The argument that nutrition education is not only an important aspect of the school curriculum, but is a community concern is discussed in Chapter Six, as is the suggestion that a knowledge of attitudes towards food and health, how these attitudes are formed and how they may be changed is the basis of nutrition education. There are however, few recent studies of the attitudes to food and health of
adolescents in the UK and it is therefore suggested that further research in this area is needed.

Bull and Buss (1983) reporting the preliminary results of a MAFF study in 1000 15-25 year olds, suggest 'that it is important that any such guidelines (dietary guidelines) or advice be broadly related to adolescents' current dietary habits and to bear in mind the attitudes that they have to their food and what they expect from it'. So far only the preliminary results of this aspect of the survey have been published. These findings give some indication of the sorts of foods adolescents eat, of their food preferences and dislikes and perhaps more importantly some indications of why foods were disliked, also some of the attitudes to health common among this age group.

Hamblin (1980) in a study of 200 14-15 year olds in an urban area discussed adolescent attitudes to food under five headings;
- traditional or changing attitudes and values
- emotional significance of food
- weight and appearance
- the importance given to food
- preferences and dislikes

While a detailed discussion of all these areas is beyond the scope of this thesis, some will be discussed in relation to nutrition education in Chapter Six. In this section adolescent food preferences and dislikes will be discussed, also nutritional knowledge of, and attitudes to health of this group and their awareness of the relationship between food and health.

**Food preferences and dislikes**

The importance of determining adolescent food preferences and dislikes, as the starting point for nutrition education is discussed in Chapter Six.

Bull and Buss (1983) list foods that are 'particularly liked' by adolescents;
- chips (many young people ate them nearly every day)
- hamburgers
- sausages
- pickles and sauces (e.g. ketchup)
- breakfast cereals
- yogourt
Foods that were 'particularly disliked' included:
- 'soggy' and 'slimy' things such as many vegetables (badly cooked?)
- fish and shell fish
- offal
- meals with gravy or custard
- 'artificial tasting' foods, such as instant desserts, many canned foods including canned fruit.

Both Truswell (1981) and Greenwood and Richardson (1979) cite studies carried out mainly in USA, which list food preferences and dislikes of adolescents. These lists are remarkably similar to those given above; a strong liking for milk and dairy products is an additional feature found in these studies; however, a reluctance to eat salads and green leafy vegetables seems to be universal among adolescents.

Krehl (1979) found a general dislike of casserole dishes particularly if the contents cannot be easily identified. The fact that such dislikes are rarely if ever included in lists of food preferences, suggests that this finding is also common to most adolescents, meals such as steak, roast beef, hamburgers, almost always with chips being strongly preferred.

This is supported by the study carried out by Hamblin (1980) where the favourite foods most frequently mentioned by boys were steak and chips, the cooked meal served at Sunday dinner, fish and chips and sausages and chips. Girls, however would seem to be more adventurous, with items such as spaghetti, pasta, pizza, mentioned more frequently as favourite foods. In this group also, green vegetables were a frequently mentioned disliked food, as were, but less frequently, root vegetables.

Bull and Buss (1983) conclude that taste and texture appeared to be the main factor influencing what was eaten. Texture would appear to be an important, but perhaps often underestimated, factor affecting the palatability of food. The implications of such studies, for nutrition education are fairly clear.

Adolescent attitudes to health

Bull and Buss (1983) suggest that among the adolescents that they studied 'health, was not, in general, considered relevant'. The authors, quoting one response 'if you believe every thing they say, you'd never eat
anything. I eat all the wrong stuff, and I smoke and drink quite a bit as well. It just doesn't worry me because I know I'm fit and healthy', conclude that 'advice aimed at changing his diet in order to reduce the possibility of a heart attack in 30 or 40 years time seems doomed to failure'. It was suggested in Chapter Two that such an attitude, and other similar ones could be partly attributed to media-publicised disagreements between those who are presented as 'experts in the field of nutrition'.

On the other hand, Bull and Buss (1981) did find a few, particularly vegetarians who were 'already trying to eat what may be called a 'prudent diet' for health as well as for ethical reasons'.

**Attitudes to obesity and slimming**

It was suggested above that obesity can have profound effects on emotional well-being in adolescents. Richardson et al (1981) suggested that for the adolescent, obesity is the least desirable form of physical handicap; it seems that it is perceived as a marked social handicap.

Hamblin (1980) discusses the conflicts that many adolescents find between their ideals of body image promoted by the media, and their food preferences, 'even a casual inspection of advertisements on television or newspapers and magazines suggests that they overtly reinforce an ideal body type. Adolescents may well respond to this, experiencing a discrepancy between their preference for certain foods and the desire for slimness in the females and muscularity in the males'.

Hamblin cites the findings of Livesley and Bromley (1973) who found that more statements about appearance occurred at the age of fifteen than at other ages and concluded that 'this seemed to reflect concern about the impact made by the bodily self of the adolescent on others'.

This is supported by the findings of Hamblin's own study; when asked whether they would like to gain or lose weight or remain the same for a year or so, 66 per cent of girls and 33 per cent of boys stated that they would like to lose some weight, but 29 per cent of boys would like to gain some weight. This author found, at the same time, an almost equally strong endorsement by girls as by boys of chips as a favourite food and a strong rejection of salads. He suggests that this places them in the difficult position of wishing to lose weight but with food tastes which run counter to this objective. Hamblin suggests that more research could be carried out in the area of contradicting attitudes; this is discussed in Chapter Six.
Bull and Buss (1983) found equally uninformed attitudes to slimming, 'slimming tended to be a haphazard affair in general, with some girls saying that it was easier simply to give up eating altogether from time to time'.

**Nutritional knowledge and awareness of relationship between nutrition and health in adolescents.**

The relationship between knowledge about food and eating behaviour, and the importance of changing attitudes to food and health is discussed in relation to nutrition education in Chapter Six. Thomas (1977) suggests that 'it is well known that knowledge in itself is not sufficient to encourage the adoption of the development of habits which will prevent obesity'.

Even though current nutrition education is mainly directed at providing knowledge, studies indicate that knowledge of nutrition and awareness of the relationship between nutrition and health in adolescents is very variable.

Cresswell et al (1983) examined perceptions of a group of 14-16 year olds in Glasgow, of the roles of fat, sugar and fibre in relation to health, and knowledge of the dietary sources of these. The following findings are of interest;

- 86% of subjects were aware that a high fat diet is not necessary for health.
- 75% were aware that a high fat diet is associated with risk of coronary heart disease.
- 40% thought that being thin justified a high fat intake.
- 87% knew that sugar-containing foods eaten between meals was the main cause of tooth decay.
- 40% of subjects thought that sugar was required for energy.
- 30% thought that lack of sugar induced listlessness and tiredness.
- 86% acknowledged the fact that fibre gave regular bowel movements.
- 43% thought that this became a factor of importance only in later life.
- 55% thought that fibre provided energy for active life.

Table 3.26 shows the comparative knowledge of the dietary sources of fat, fibre and sugar.
Table 3.26 Comparative knowledge of sources of fat, sugar and fibre
(from Cresswell et al, 1983)

<table>
<thead>
<tr>
<th>Knowledge of source of</th>
<th>Percentage scoring</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Good</td>
</tr>
<tr>
<td>Fat</td>
<td>38</td>
</tr>
<tr>
<td>Fibre</td>
<td>19</td>
</tr>
<tr>
<td>Sugar</td>
<td>60</td>
</tr>
</tbody>
</table>

Cresswell et al (1983) conclude that 'although most subjects were aware of the main causal relationships between fat and heart disease, sugar and dental caries, and lack of fibre and constipation, the misunderstanding of other related aspects could adversely influence their interpretation of these'. The authors also point out the difficulty that some of the subjects would have in increasing their intake of dietary fibre, even if they should wish to, as many were unable to identify good sources of fibre.

Bull and Buss (1983) found little awareness of the relationship between food and health, 'allergies, spots, tooth decay, fitness (in boys) and overweight', were the only health-related factors mentioned.

These authors also found that 'many adolescents said that greasy foods, sweets, biscuits, butter and potatoes caused spots or were fattening but ate them regularly none-the-less', and concluded that 'adolescents already appear to be well aware of the need to reduce fat and sugar intakes from what they term 'junk' or 'fattening' foods, but not for the purpose of avoiding possible heart attacks in the seemingly distant future', but 'for minimising spots or for reducing weight'. On the other hand, they also found that adolescents were taking advantage of some of the reduced fat and sugar, and high fibre products increasingly available, such as oven-ready chips, sugar-free soft drinks, and higher fibre breads and breakfast cereals. They do however need to be encouraged 'to eat more of the improved range of fruit and vegetables'.

Bull and Buss (1983) examined sources of information about food and diet (Table 3.27), showing clearly the important channels for promoting dietary guidelines to adolescents.
Table 3.27 Claimed sources of information about food and diet
(% of total mentions).
(from Bull and Buss, 1983)

<table>
<thead>
<tr>
<th>Source</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Television</td>
<td>39</td>
</tr>
<tr>
<td>Parents</td>
<td>38</td>
</tr>
<tr>
<td>Friends</td>
<td>33</td>
</tr>
<tr>
<td>Specialist (eg slimming) magazines</td>
<td>11</td>
</tr>
<tr>
<td>Other magazines</td>
<td>28</td>
</tr>
<tr>
<td>Newspapers</td>
<td>22</td>
</tr>
<tr>
<td>School or College</td>
<td>20</td>
</tr>
<tr>
<td>Radio</td>
<td>7</td>
</tr>
</tbody>
</table>

Both those involved in the provision of school meals and those
involved in nutrition education need to take account of the findings of
these studies. The implications of these studies and others for nutrition
education will be discussed in Chapter Six.

3.6 THE DIETS OF SCHOOLCHILDREN AND ADOLESCENTS AND THE 'DISEASES OF
AFFLUENCE'

A third area in which there is need for further research was
identified at the beginning of this chapter. This concerns the question of
whether, or to what extent the foundations of the diseases of affluence,
which are common in adults, are laid by diet in childhood and adolescence.
Upon this further research depends the justification of applying the
current dietary to the diets of children.

The evidence available so far in this area relates mainly to the
development of coronary heart disease and obesity.

3.6.1 Obesity

As has been previously discussed the incidence of obesity in
schoolchildren and adolescents is high enough to cause concern in itself.
The main question, however, in this section is the likelihood, or
otherwise, of obese children and adolescents becoming obese adults and
thus increasing the risk of other diseases associated with obesity
(discussed in Chapter Two).
Relationship between childhood obesity and development of adult obesity

The Royal College of Physicians Report (1983) reviews the evidence relating to this question. The authors of this report cite evidence to suggest 'that it is clearly wrong to consider that the presence of obesity in infancy inevitably leads to adult obesity' (Poskett and Cole, 1977), but, at the same time provide evidence to suggest 'there is little doubt that overweight children are at an increased risk of becoming overweight adults'.

The National Survey of Health and Development (Stark et al, 1981) provides an analysis of the relationship between childhood and adult weights. This study found that the risk of being overweight in adulthood was related to the degree of overweight in childhood; but also that less than half of those overweight at seven years old became overweight adults.

Evidence which suggests reasons for these findings is also discussed by RCP (1983), based on the relationship between genetic and environmental factors in the aetiology of obesity.

The environmental factors which have been most researched, are early infant feeding patterns, and their relationship to growth of adipose tissue during childhood. This area, though possibly particularly relevant to community prevention of obesity, will only be discussed briefly as infant feeding is outside the scope of this thesis.

Another area of research examines the relationship between physiological and behavioural factors which control food intake, and therefore affect short and long term maintenance of energy balance and body weight. This relationship may also be affected by early feeding patterns, and thus may have important implications for the prevention of obesity.

Genetic versus environmental factors in obesity

The RCP report (1983) cites studies in America, which show familial aggregation of obesity; these findings are supported by clinical observations in British studies.

It is suggested also, from both American and British epidemiological studies, that environmental factors are important in determining the body weight of both children and adults.

The RCP report cites studies which suggest that 'social factors interact with genetic factors in determining body fatness', and conclude
that 'it seems more likely that those individuals who are constitutionally prone to weight gain will respond in childhood or adulthood to the prevailing environmental conditions and gain excess weight'. They also suggest that the observed familial aggregation of obesity had clear implications for prevention of obesity in young children and adults.

Greenwood and Richardson (1979) cite the study of Garn and Clark (1976) and suggest that 'it is difficult to separate the effects of a purely genetic influence from purely environmental factors such as family eating habits, and exercise patterns'; these authors conclude that this study 'emphasises that control and prevention of obesity should be considered in the context of the family as a whole ... one can be genetically susceptible to obesity, but an excessive energy intake and under-exercise have to accompany it'.

**Growth of adipose tissue**

Another area of obesity research attempts to relate early infant feeding practices, differing patterns of adipose tissue growth, and the likelihood of overweight infants becoming overweight school children and adults.

A number of studies have shown that growth of adipose tissue can occur by increasing the number of fat cells (hyperplasia or hyperplastic growth), or by increasing the size of existing fat cells, hypertrophy or hypertrophic growth).

In the early 1970's what became known as the 'fat - cell hypothesis' was put forward which suggested 'firstly that over feeding in early life causes the production of 'excess' fat cells and secondly that the possession of excess fat cells confers on that individual a predisposition to obesity' (Ashwell et al, 1981).

Recent research, however, has provided considerable contrary evidence, and Ashwell et al (1981) cite studies to indicate that the severity of obesity is a much more important determinant of total fat cell number than the age of onset of obesity. These authors conclude that 'it is now thought that a positive energy balance at any time of life will lead to the condition of obesity which is characterised either by large fat cells or by more fat cells, or by both'.

Greenwood and Richardson (1979) suggest 'the idea that there are certain crucial periods, (such as during the first year of life, and possibly during adolescence), when numbers of adipose tissue cells are
particularly liable to increase in number can no longer be held to be the explanation as to why individuals with juvenile-onset obesity find it so difficult to lose weight'.

Ashwell et al (1981) suggest that this widely publicised hypothesis, while placing emphasis on prevention of overfeeding in early life, leads to the adoption of a 'fatalistic' approach to the treatment of individuals obese since childhood.

**Control of food intake and energy balance**

Another area of research examines the factors that control food intake and the mechanism whereby this is adjusted to balance energy expenditure and therefore maintain body weight. The RCP report (1983) reviews the evidence in this area.

The authors of this report cite evidence to show that 'there are mechanisms affecting food intake and limiting changes in body weight which involve, at least in part, an integration of the gastrointestinal, the neuro-hormonal system and the hypothalamus'. They also quote Garrow (1978) who concludes that 'in man control of food intake is complex, and the primitive hypothalamic reflexes are so buried under so many layers of conditioning cognitive and social factors that they are barely discernible'. The RCP report discusses studies which attempt to limit the social pressures, by monitoring the food intake of new born babies and young children, and thus assess the physiological control of food intake. They conclude from these and other studies of adults, that 'physiological control of food intake still operates in man, despite the social pressures affecting intake'.

From all the studies in this area it must be concluded that the inter-relationship of behavioural, (both social and psychological), and physiological factors controlling food intake is very complex. This is an area in which further research is clearly needed before the implications for the prevention of obesity in an individual and at community level can be assessed.

An area which is of greater relevance to this thesis is the extent to which the relationship between behavioural and physiological factors controlling food intake is innate, or is determined by early feeding practices.

The RCP report cites work by Rodin (1981) which suggests that infants are born with preferences for particular foods, fat babies responding to
the presentation of increasing concentrations of glucose very differently from thin babies, who show an aversion to sweet solutions. Rodin (1981) suggests that these differences may partly reflect the physiological effects of body composition at birth, but they may also be innate. The RCP report suggests that 'the interaction between mother and child is also very important and the learning of food habits can mean that some children are trained to eat more than the amounts that physiologically they would prefer'.

This area is also discussed by Garrow (1976) in a paper entitled 'Upbringing, appetite, and adult obesity' who quotes an editorial from the Lancet (1974) 'since obesity in adults is so difficult to cure we should do what we can to prevent it'. This author suggests that it is important to know how energy balance is controlled and to what extent obesity in adults is caused by early nutrition.

In this paper, Garrow (1976) refers to a previous paper 'Energy balance and obesity in man' (Garrow, 1974) in which he suggests a mechanism whereby changes in body weight in adulthood affect food intake and thus help maintain energy balance, 'energy intake is normally defined during infancy and childhood by the amount needed to satisfy hunger and support an acceptable rate of growth. In adult life, intake continues generally to follow the pattern established earlier in life, modified in the short term by the sensations of hunger and satiety. When energy imbalance occurs during adult life it is corrected by a more or less conscious effort when the change in body weight is no longer acceptable'.

Garrow (1976), in his later paper develops this idea, by discussing the role of early feeding patterns, 'my proposition about the relationship of upbringing, appetite and adult obesity is this - long term control of body weight in man depends on voluntary effort to maintain it within a desirable range, and short term control of energy balance permits imbalances of 200 Kilocalorie per day which in the long term would be disastrous. It is likely that one of the important effects of feeding patterns in infancy and childhood is to influence appetite and the psychological 'set point' for body weight which will ultimately determine whether the adult finds it easy or difficult to remain within the 'desirable range' of weights defined by life assurance companies'.

This author supports this hypothesis by discussing the psychological and social pressures determining preferred weight. He cites a number of studies to show how feeding habits can be influenced by the mother at an early age.

The work of Bruch (1940) suggests that 'anxious over-protective
parents thrust food on their children at the least sign of distress, so they never learn to interpret the sensation of hunger in an appropriate manner but equate food with consolation in any stressful situation'.

Garrow also suggests that the changes in composition of breast milk to meet the infant's energy requirements provide some sort of automatic appetite control and thus breast feeding infants may help the development of an appetite control mechanism.

This hypothesis suggested by Garrow (1976) is an interesting one, and outlines an area where further research is needed. Support for this hypothesis would clearly indicate the type of advice that should be given on feeding infants and young children.

Variations in energy requirements of school children and adolescents and the implications for the cash cafeteria system in school meals were discussed in Section 3.2. Knowledge of whether an appetite control mechanism is developed by infant and early childhood feeding patterns, thus helping the maintenance of energy balance in later life, has important implications for this situation.

The importance of the prevention of obesity in childhood

In 1980 a symposium was held on 'Nutrition in early childhood and its effects in later life'. In the preface to the symposium proceedings it is suggested that 'obesity of infants and children should be combatted - not only since it predisposes to adult overweight, but also because it is a potential risk factor for several chronic degenerative diseases in later life'.

Spahn et al (1982) examine this latter area, reviewing the relationships between childhood obesity and risk factors such as hyperlipoproteinaemia, diabetes, impaired glucose tolerance and hyperinsulinaemia, and hypertension. The authors also review aetiological factors and prognosis for childhood obesity and reach a number of conclusions;

- established childhood obesity is a progressive disease
- childhood obesity frequently is accompanied by important risk factors.
- when childhood obesity has already developed fully its prognosis becomes rather poor.
- with respect to persistence as well as to certain metabolic risk
factors, the duration of overweight seems to be of greater significance than a sensitive period in infancy. Therefore control of overweight is demanded as early as possible, and even during infancy.

An important aspect of current dietary recommendations (NACNE, 1983; COMA, 1984) is the maintenance of body weight within optimal limits of weight for height both in adults and children. Both these reports recommend a reduction in fat and sugar intake, and an increase in fibre intake, and adequate exercise, all of which will help in the achievement of this recommendation.

It must be therefore argued that the evidence cited in this section provides strong justification for the application of measures to prevent obesity in children and adolescents. The implications of this for school meals will be discussed in the concluding section of this chapter.

3.6.2 Coronary heart disease

There is also evidence relating childhood diet to the development of coronary heart disease; this is reviewed by Greenwood and Richardson (1979), West and Lloyd (1976) and by Truswell (1976). This last author discusses whether 'the choice of foods during childhood affects the time of onset of degenerative diseases in later life'.

Development of atherosclerosis in children and adolescents

As was discussed in Chapter Two, the aetiology of coronary heart disease is complex. The condition itself is the clinical manifestation, in adulthood, of the underlying disease condition atherosclerosis. The above papers review the evidence that the atherosclerotic processes begins much earlier in life.

Fatty streaks and atheromatous changes have been found as early as 3-4 months and are quite common by the age of 3-5 years. West and Lloyd (1976) suggest that, at this stage, it is probable that the fat can be reabsorbed and the streaks disappear. These authors, however, cite evidence from studies of American casualties of the Korean and Vietnamese wars to indicate that extensive atherosclerosis was already present in a substantial number of young men in their early twenties.

Greenwood and Richardson (1979) cite evidence to suggest that
adolescence appears to be an especially critical stage in the natural progression of atherosclerosis, with an acceleration of this process during the period of rapid growth and development, particularly in the male.

Holman et al (1958) related the development of atherosclerotic lesions to the velocity of growth and to the hormonal changes which are characteristic of puberty.

West and Lloyd (1976), therefore, suggest that a major decrease in overall mortality and morbidity from coronary heart disease can only come from primary prevention, and that there is ample justification for the view that childhood is not too early for the start of preventative measures.

Risk factors present in childhood

Of the risk factors identified which predispose to the development of coronary heart disease in adult life, a number can also be present in childhood. The identification of these risk factors gives clear guidelines for the early prevention of coronary heart disease. Both West and Lloyd (1976) and Greenwood and Richardson (1979) review the evidence relating to the presence of the following risk factors in childhood.

1. High blood cholesterol levels

West and Lloyd (1976) suggest that while serum cholesterol levels tend to be lower during childhood than in adult life, there is considerable evidence that in populations in which the adults have high coronary death rates and high serum cholesterol concentrations, the mean serum cholesterol concentration of the children is higher than in populations with low adult coronary death rates and cholesterol levels. These authors point out that 'it is not certain what level of cholesterol constitutes a risk factor in children', and suggest that 'it is likely that for children, as for adults, the risk increases steadily with increasing levels of cholesterol'. They suggest that as many as 5 per cent of children may have cholesterol levels which may be regarded as unacceptably high.

Greenwood and Richardson (1979) cite evidence from the Muscatine Study in Iowa (Lauer et al, 1975) which revealed that a considerable number of adolescents had concentrations of serum lipids at or above values which have been established as predictive of the early development of coronary heart disease in adults;
- 50 per cent of the children in the study had serum cholesterol concentrations above 180 mg/dl or greater,
- 9.1 per cent had a concentration of 220 mg/dl or greater
- there was little difference in serum cholesterol concentrations in boys and girls.

The authors suggest however, that a continued longitudinal study would be required to determine whether these high serum cholesterol levels reflect a permanent pattern.

West and Lloyd (1976) suggest that 'the causes of high average blood cholesterol levels in populations are likely to be largely environmental; of these factors, the most heavily implicated is dietary fat'. These authors also point out that the recent trend towards an increased proportion of energy from dietary fat applies equally to the childhood population.

Knuiman et al (1980) cite evidence from several infant feeding studies to indicate that the concentration of serum cholesterol can be manipulated by diet at an early age.

2. Raised blood pressure

West and Lloyd (1976) suggest that it is uncommon to find high blood pressure in children, but cite research by Buch (1973) which showed that individuals whose parents have higher than average blood pressure, are themselves likely to have higher than average blood pressure as children, and also that it is possible that raised blood pressure in adult life may be predictable from blood pressure recordings during childhood.

The Muscatine Study in Iowa (Lauer et al, 1975) revealed, (as with serum cholesterol levels), a considerable number of adolescents with blood pressure at or above values which have been established as predictive of the early development of coronary heart disease in adults - 16.7 per cent of those between 14 and 18 years had blood pressures greater than either 140 mm mercury (systolic) or 90 mm mercury (diastolic) or both. Unlike serum cholesterol levels, incidence of raised blood pressure increased with age.

Also in a study of 14-18 year olds, Goldring et al (1977) found that 7.6 per cent of children were hypertensive, and that blood pressure and weight were significantly related.

Greenwood and Richardson (1979) reviewing these studies suggest that as individuals tend to maintain the same relative position in the blood pressure distribution as they age, the result is that persons at the
higher end of the distribution may become hypertensive years earlier than persons at the lower end.

Evidence relating to environmental factors which may predispose to high blood pressure is controversial. Epidemiological studies relate high intakes of salt to high incidence of hypertension in the adult population (discussed in Chapter Two).

West and Lloyd (1976) suggest that it had been shown in animals that high salt intakes in early infancy may predispose to high blood pressure. Krecek et al (1980) also cite studies which suggest that transient high salt intake in early life might play an important role in the appearance of hypertension in adulthood. Studies carried out on young rats indicate that pre-puberty is a critical period for eliciting salt hypertension in rats.

However, there are clearly problems involved in extrapolations to humans from animal studies, and Krecek et al point out, 'it is very difficult to carry out the necessary longitudinal lifetime studies in man'.

3. Obesity

West and Lloyd (1976) cite evidence to indicate that obese children are likely to have higher blood pressure than children of normal weight. This relationship was also found in several studies cited by Greenwood and Richardson (1979).

4. Physical inactivity

This has been discussed in relation to obesity; in addition it has been shown to be a secondary risk factor for coronary heart disease in adults, acting through its relationship with obesity, and possibly also through its relationship with serum lipid levels. There are few if any studies relating physical inactivity in childhood to physical inactivity in adults.

5. Cigarette smoking

While not a nutritional problem, smoking is a primary risk factor in coronary heart disease in adults; and there are many who see cigarette smoking in adolescence and even younger children as a major health education problem, one which is outside the scope of this thesis.
Early prevention of coronary heart disease

The incidence, in childhood, of the above risk factors has implications for the primary prevention of coronary heart disease. The above evidence supports very clearly the suggestion that this prevention should begin in childhood if not infancy. West and Lloyd (1976) quote Kannel and Dawber (1972) to support this idea - 'promotion of cardiovascular health should be one of the chief concerns of the conscientious paediatrician'.

Kannel and Dawber (1972) discuss five aspects of such a preventative approach;
- prevention of obesity.
- the early determination of any lipid abnormalities and their correction by diet or other procedures if necessary.
- careful surveillance for early hypertension and the institution of corrective measures.
- the promotion of high-energy-output physical activity.
- discouragement of the cigarette smoking habit.

These authors suggest that 'although proof of the efficiency of prophylactic measures aimed at preventing atherosclerotic disease is lacking, it is reasonable to believe that the approach advocated will materially lower the morbidity and mortality rates from this disorder'.

Writing in 1976, West and Lloyd suggest that 'the fact that such an approach is not yet routine procedure in paediatric practice indicates the many difficulties that still have to be overcome'. The extent of these difficulties is illustrated by the fact that the use of dietary measures aimed at early primary prevention of coronary heart disease is still a somewhat controversial issue (discussed below).

Greenwood and Richardson (1979) also suggest that early identification of associated risk factors is an important aspect of primary prevention of coronary heart disease, suggesting that adolescence is a particularly important period in this respect, 'while little is known about the significance of the atheroma found in the arteries of adolescents and young adults ... and it is still not known which risk factors initiate the degenerative process and influence the progression of the disease ... it appears that the adolescent period is a time when early identification of associated risk factors may be beneficial to their later health and well-being'.
Three aspects of the dietary prevention of coronary heart disease in childhood, of possible relevance to school meals, need to be considered;
- prevention of obesity - this was discussed above
- dietary fat, particularly saturated fat, intake
- dietary salt intake.

The latter two aspects are discussed below.

Dietary fat.

The reduction of total fat, (particularly saturated fat) in the diet of adults is the main measure advocated by all recent reports on the prevention of coronary heart disease (discussed in Chapter Two). The current discussion is concerned with whether or not these recommendations should be applied to the diets of children.

West and Lloyd review the recommendations made in other countries and in the UK.

- the National Heart Foundation of Australia (1974) 'were satisfied that diets providing 30-35 per cent of calories from fat were adequate for the nutritional needs of growing children and they advocated that dietary education for the community should begin at school'.

- the National Heart Foundation of New Zealand (1971) 'considered that for the population as a whole reasonable restriction of saturated fat intake could be advised with reduction of total calories from fat to 35 per cent and of cholesterol to 300-600 milligrams per day. They also commented that these measures should be introduced as habits in childhood rather than as modifications of the diet later in life'.

- the American view is less clear cut, the Inter-Society Commission for Heart Disease Resources (1976) 'recommended that diets for all children should provide less than 35 per cent of calories from fat and should restrict dietary cholesterol to 150 milligrams per day'. The Committee on Nutrition of the American Academy of Paediatrics (1972) did not support this recommendation, and proposed that dietary intervention should be restricted to those children with a known high risk for coronary heart disease, namely those with familial hypercholesterolaemia.

- In the UK the DHSS (1974) report on Diet and Coronary Heart Disease made non-quantified recommendations for the reduction of dietary fat, particularly saturated fat, but did not recommend increased intakes of polyunsaturated fats. Recognising that dietary changes adopted by adults are likely to affect the whole family, it was specifically stated that these recommendations could also safely apply to children.

West and Lloyd (1976) thus conclude that 'faced with official
indecision and conflict of opinion it is difficult to give clear cut instructions about either the quantity or type of fat that should be eaten by the average child in order to prevent hypercholesterolaemia and delay the development of atherosclerosis'. They nevertheless recommend that 'parents can however be advised that some reduction in fat intake, especially from butter, cream, and highly saturated fats such as those in most meats, is probably desirable, and they can be reassured that one egg daily (about 250 milligrams cholesterol) is unlikely to be harmful'.

The COMA (1984) report on Diet and Cardiovascular Disease recommends the reduction of total fat intake to 35 per cent and saturated fat to 15 per cent of food energy, but specifically excludes infants and children under five from this recommendation, on the grounds that these groups usually obtain a substantial proportion of dietary energy from cows milk; they recommend that whole cows milk should still be consumed by children under five, even in families who are trying to implement the recommendation for fat by switching to semi-skimmed or skimmed milk.

**Dietary salt intake**

The recommendation to reduce salt intake was discussed in Chapter Two, with reference mainly, to the adult population. Given the controversial nature of this recommendation, its application to the diets of children must also be controversial. The NACNE report (1983), however, suggests that salt and salty foods should be reduced in the diet of infants on the grounds that taste preferences for those foods (as with sugar and sweet foods) are established in infancy.

It can be seen from the above discussion that, while many of the recommendations are controversial, strong evidence supports the idea that dietary measures to eliminate or modify the risk factors and thus possibly help prevent coronary heart disease should be initiated in childhood, and for some aspects in infancy.

West and Lloyd (1976), writing as paediatricians, emphasise the collaborative aspect of the problem, 'control of most of the risk factors, however, demands changes in social behaviour and thus paediatricians must collaborate with other health professionals and members of society if their approach to the problem is to be successful'.

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3.6.3 Application of current dietary recommendations to the diets of children.

Having examined some of the evidence relating childhood diet to the development of obesity and coronary heart disease, (conditions which are common in the adult population), the application of the recommendations of the NACNE and COMA reports to the diets of schoolchildren and adolescents needs to be considered.

The recommendation that fat intake should be reduced as an aspect of the early primary prevention of coronary heart disease was discussed above. On the grounds that specific nutrients and their relation to specific diseases cannot be considered in isolation, the following discussion refers to the overall dietary recommendations relating to the prevention of what are usually referred to as 'the diseases of affluence', the high incidence of which in the UK lead to the publication of these reports.

The recommendations of these reports, and some of the evidence upon which they were based were discussed in detail Chapter Two.

The controversy following the publication, in 1983, of the NACNE report was also discussed in Chapter Two; the application of these recommendations to the diets of children is particularly controversial.

The NACNE report, is fairly clear on this issue, 'the diet recommended represents a desirable average intake for the whole population, and is not aimed at 'vulnerable' groups ... it is suitable for all age groups, although a few additional recommendations for babies ... may be necessary', (are considered in separate government publications). The committee did however warn that, as the recommended diet was likely to be considerably bulkier and hence less energy dense compared with the usual diet of young children in this country, a young child or one with a small appetite may have difficulty in eating a sufficient quantity of food to meet nutritional requirements, therefore the diet 'should not be pushed to extreme limits'.

The exclusion of infants and children under five from the main recommendation of the COMA report (1984) was mentioned above, and it must be emphasised that the following discussion applies only to schoolchildren and adolescents, a consideration of the special needs of young children being outside the scope of this thesis. This report also recommended that 'obesity should be avoided both in adults and children by a combination of appropriate food intake and regular exercise'.

The British Dietetic Association, while endorsing the recommendations
of the NACNE report for adult diets, suggested that 'special consideration should be given to the needs of children and that the dietitian's skill was required to make the necessary adaptations to meet the special needs of this group' (BDA, 1984). At the same time, this Association warned against 'overpromotion of the guidelines by health professionals'.

In response, several paediatric dietitians expressed concern that 'the possible harm to the growth of young children from the over-enthusiastic implementation of the NACNE recommendations had not been stressed' (BDA, 1984). Members of this group also expressed concern over 'the over-zealous promotion of the guidelines which sadly has already occurred'.

Marks (The Times, 3-6-86) coined the term 'muesli-belt malnutrition' to describe a situation which is causing paediatricians some concern, and would appear to be due to such over-zealous application of dietary recommendations to the diets of children.

The possibility that guidelines may be misinterpreted or overenthusiastically applied does not invalidate the argument that there is a need for such guidelines. It does, however, emphasise the need for the careful formulation of the nutrition education message arising from these guidelines. The suggestion that the concept of 'a balanced diet' needs redefining in terms of the balance of energy from different sources is discussed in Chapter Six, as are the implications of this suggestion for nutrition education.

The professional concern of school caterers is the day-to-day feeding of schoolchildren; as suggested in Chapter Two 'perceived controversy among experts' is not helpful to these and others whose concern this is. It is therefore suggested that urgent consideration is given to the question of whether the recommendations of these reports should, and to what extent they safely can, be applied to the diets of schoolchildren, and what adaptations must be made to meet the special needs of this group.

There is evidence that some consideration is being given to this question. An official committee (the Joint Advisory Committee on Nutrition Education - JACNE) has been formed to consider the implementation of the NACNE and COMA recommendations, and the DHSS, COMA panel on child nutrition has been reconvened.

This section will discuss firstly whether the recommendations of the NACNE and COMA reports need to be modified in any way to meet the special needs of schoolchildren and adolescents, in particular energy and nutrient needs for growth. It must, however be borne in mind that it has not yet
been established what levels of intake of dietary fat, sugar, and fibre are compatible with early prevention of the diseases discussed above, and at the same time are consistent with optimal growth in children. Long term dietary studies are needed to establish these levels. It is also important that such a diet is acceptable to children's appetites and tastes.

Secondly, the question of whether there is any justification for the application of these recommendations (with any necessary modifications) to the diets of these groups needs to be considered; once again long term studies are needed to determine whether the application of these recommendations, modified if necessary, in childhood, will be beneficial in the prevention of degenerative diseases in adulthood.

A consideration of all these questions is a necessary preliminary to the use of these recommendations as the basis of the suggested 'guidelines on the nutritional aspects of school meals' (discussed in Chapter Four).

**Adaptation of recommendations for children.**

It was pointed out that the amount of fibre recommended for adults may be too bulky for a young child or one with a small appetite to consume in sufficient quantity to meet the energy and nutrient requirements for growth. It is suggested, therefore, that the recommendation for fibre would need to be age or energy related, reduced for younger children and increased with age. Several surveys have found fibre intakes correlated with energy intakes; a recommendation for fibre expressed in terms of fibre density (i.e. amount of fibre per unit of energy) would therefore, perhaps be more helpful.

Fats and sugars help to increase the energy density of the diet, thus enabling a young child or one with a small appetite to eat a sufficient quantity of food to meet energy requirements. These recommendations are already expressed in relation to energy intake (fats to contribute no more than 30-35 per cent of total energy and sugars 12 per cent).

On one hand, despite the use of terms such as 'over zealous' and 'over enthusiastic' it is difficult to envisage how a diet in which the contribution from fat and sugar is much below these levels, can be constructed consistent with the practicalities of feeding children. On the other hand it is also difficult to justify a diet in which the contribution from fat and sugar are much above these levels, except possibly for very young children or those with very small appetites, who are beyond the scope of this thesis. It is therefore suggested that for the age group who are the concern of this thesis the recommendations for
fat and sugar do not need to be modified.

It is also suggested that it is not necessary to modify the recommendation for salt intake on the grounds that there is no evidence from human experiments that a diet with low to moderate salt levels will have a harmful effect on growth; and as suggested high salt intakes in childhood are likely to lead to the development of a taste preference for salt and salty foods.

It is therefore concluded that the application of the recommendations of the NACNE and COMA reports to the diets of schoolchildren and adolescents (with the provisos discussed above) is justified on a number of grounds.

It is suggested that, while further evidence to support this must be obtained from dietary intake studies, the application of the NACNE recommendations with the above modifications to the diets of school children and adolescents, is unlikely to have any harmful effects on growth and health.

While the evidence that the application of current dietary recommendations to adult diets will have a beneficial effect on morbidity and mortality from coronary heart disease is equivocal, it is suggested that there is sufficient evidence to support the view put forward by West and Lloyd (1976) that dietary, and other, measures to modify risk factors should be initiated in childhood.

Truswell (1967) suggests that adolescence is an important period for the early prevention of coronary heart disease. He suggests that nutrition education should be introduced or intensified for school leavers on the grounds that 'this is the age when food is no longer needed for growth, but dairy food consumption is still high (Atkinson et al, 1972), when facilities and time for exercise are not routinely provided, when people start to smoke, and when plasma cholesterol levels increase in males, and the pace of atherosclerosis speeds up'.

The evidence also suggests that application of these recommendations to the diets of school children and adolescents is justified on the grounds of prevention of obesity in these groups.

McKigney and Munro (1975) also suggest that 'the most appropriate time to apply preventative measures, and to provide nutritional education is during adolescence'. These authors suggest that 'in addition, the two problems of atherosclerosis and of obesity raise the question of whether there should be a recommended dietary maximum as well a recommended dietary allowance for some nutrients'.
Further justification is provided by the view that childhood is an important period for the development of food habits (this is discussed in Chapter Six). Ways in which food habits can be changed will also be considered in Chapter Six, but it is suggested that this process is often difficult and time consuming and could be avoided if appropriate food habits were developed in childhood.

This view is supported by Greenwood and Richardson (1979) 'changing food habits by existing nutrition education techniques is time consuming and frequently unsuccessful. However, dietary habits tend to be developed in early childhood and adolescence and consequently these periods in the life cycle, particularly the latter may be the most appropriate time to improve nutrition knowledge and to establish sound eating habits'.

While the above authorities emphasise the importance of preventative measures and nutrition education in adolescents and the current study of school meals involves this age group, the overall argument of this thesis applies to all school meals and therefore all school age children. It is concluded, from a consideration of all the above evidence, that the recommendations of the NACNE and COMA reports with the above modifications can be used as the basis for the formulation of guidelines for school meals. It is also emphasised that such guidelines must be provisional until further dietary studies have been carried out.

3.7 CONCLUSION - THE IMPLICATIONS OF STUDIES ON NUTRITION IN CHILDHOOD AND ADOLESCENCE FOR SCHOOL MEALS AND NUTRITION EDUCATION

This chapter has discussed studies which indicate that in a number of areas of childhood and adolescent nutrition there is need for further research, surveillance, or monitoring of nutritional status. The findings of these studies also have important implications for school meals and for nutrition education.

The first section discussed the energy and nutrient requirements of schoolchildren and adolescents as the basis of tables of recommended daily amounts (RDA tables). It was pointed out that the recommendations for adolescents are based on very little evidence of the actual requirements of this group and that further research is needed. It was suggested that this should be borne in mind when these tables are used to evaluate results of dietary surveys, and as the basis of nutritional guidelines for school meals.

The next section discussed the importance of surveillance and the
monitoring of the nutritional status of schoolchildren and adolescents, as the basis of welfare policy changes, particularly in times of changing socio-economic conditions. One of the arguments of this thesis is that, not only was insufficient consideration given to the possible effects of the 1980 Education Act on the nutrition of schoolchildren, but also inadequate arrangements were made to monitor these effects. This section emphasises the latter point.

The following section discussed the theory that the continuing social class differences in height, growth and health in childhood (which do not correlate with differences in nutrient intake) could be explained by the mediating effect on growth and health of 'environmental handicap'. Nelson (1980) suggested that the diets of children suffering from such a handicap would need to be of better nutritional value than the diets of other children in order to achieve the same effects on growth and health. This theory is of particular relevance to school meals since studies (discussed in Chapter Four) indicate that the school meal makes a particularly important contribution to the nutrition of children from poorer families. Evidence is cited in Chapter Four to suggest that these children may be among those who are most adversely affected by the changes resulting from the 1980 Education Act.

The next section examined studies which revealed erratic eating habits in adolescents, and the consequent effects on nutrient intake and nutritional status of this group. Evidence relating to the possible effects of nutrient deficiencies was considered as was evidence relating the problems of overnutrition. These studies provide evidence of the need for nutritional guidelines for school meals.

Studies of adolescent eating habits also indicate that during this period there is considerably more freedom of choice over food than before, thus emphasizing the need for nutrition education to guide that choice; studies of adolescent eating habits, and attitudes to food and health give important guidance for nutrition education strategies for that group. Such strategies, and the further research needed in this area are discussed in Chapter Six.

The final section of this chapter considered the evidence relating childhood diet to the development of degenerative diseases in adulthood, and thus the justification for applying current dietary recommendations to the diets of school children and adolescents. It was concluded that although further research and dietary intake studies were needed in this area, a diet consistent with the practicalities of feeding children and meeting the recommendations of NACNE and COMA reports (with certain
modifications) was unlikely to have harmful effects on the growth and health of schoolchildren. This section provides the justification for using the recommendations of the above reports as the basis of the suggested nutritional guidelines for school meals.

Chapter Four discusses the changes in school meals provision since the 1980 Education Act. The argument is put forward that the school meal still has an important contribution to make to the nutrition of schoolchildren, and that there is a need for guidelines on the nutritional aspects of school meals to ensure that the school meal makes an appropriate contribution. The studies discussed above provide the necessary nutritional background to these guidelines.

From these studies it is clear that diets for children and adolescents need to provide enough energy and nutrients to support optimal growth, and at the same time incorporate current dietary recommendations concerning the balance between energy intake and expenditure, optimum levels of dietary fat, sugar, fibre and salt consistent with likely prevention of obesity and degenerative diseases of adulthood.

It is therefore suggested that the nutritional guidelines for school meals should be (in the current state of knowledge) based on;
- the nutrient recommendations in the DHSS (1979) RDA tables,
- the recommendations for levels of fat, sugar, salt intake given in the NACNE and COMA reports.
- the recommendation for fibre given in the NACNE report adjusted for reduced energy intake in younger children.
- no specific recommendation for energy intake should be given, but emphasis placed rather on energy intake adjusted to match individuals requirements; the importance of nutrition education in establishing understanding of the concept of energy balance is emphasised. Energy recommendations would be more helpful if expressed in terms of contribution to total energy intake made by fat, protein and carbohydrate.

While current nutritional thinking emphasises prevention of overnutrition, sufficient energy and nutrients must be provided for growth during childhood and adolescence. However, the studies discussed in this chapter indicate certain 'at risk' nutrients for these groups, intakes of which need to be monitored - calcium, iron, vitamin A, vitamin C, folate, riboflavin and zinc. Nutritional guidelines for school meals must ensure adequate provision of these nutrients.

The guidelines for school meals are discussed in greater detail in Chapter Four.
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CHAPTER FOUR
DEVELOPMENT OF GUIDELINES FOR NUTRITIONAL ASPECTS OF SCHOOL MEALS.

4.1 INTRODUCTION

In the Chapter One the development of the school meals service was examined against the background of changing social and economic conditions and the developing knowledge of nutrition.

The DES reports 'Catering in Schools', (1975a), and 'Nutrition in Schools' (1975b), were examined in detail, as they provided a framework for developing a school catering service to meet the needs of schoolchildren in the late 1970's and beyond. These reports indicate the depth of concern and extent of evidence considered before making changes to a service which has, from the beginning of the war onwards, been seen as making an important contribution to the welfare of children - the nutritional standard for the school meal was based on the view that it should be equivalent to the main meal of the day. It was also felt that school meals should be seen to make an important contribution to the general education of children.

The 1980 Education Act changed the basis of the provision of school meals and the effects of the Act have been to produce a school catering service very different from that envisaged by the DES Working Parties in 1975.

The argument of this thesis is that insufficient consideration was given to the effects that this Act would have on the school meals service. While there have been considerable social and economic changes since the war, and undernutrition in schoolchildren is now rare, good nutrition is still the basis of health in school children, and the school meal still has an important contribution to make in this respect. It is felt that the government, in passing the 1980 Education Act, have not accepted the responsibility for this and have negated the basis on which the service has developed. Financial expediency has been given a higher priority than the health of school children.

Over the same period of time, the late 1970's and early 1980's, there have also been changes in nutritional thinking which have led to suggestions that there should be change of emphasis in nutrition education, from ensuring an adequacy of nutrients, which is only rarely a problem, to reducing the consumption of certain dietary components.

It was also suggested that this change in emphasis should be reflected by the food provided in catering establishments, particularly
those where the meals provided made an important contribution to the individuals diet, such as schools, hospitals, and other welfare catering.

The view that there should be a national nutrition policy, supported and promoted by the government was discussed in Chapter Two, it was suggested that an aspect of such a policy should be nutritional guidelines for school meals.

The aim of this chapter is to bring together these two areas of change.

Firstly the effects of the 1980 Education Act, and the reaction of all those involved in school meals will be examined.

Secondly it will be argued that, while the application of nutritional standards (as existed before the 1980 Education Act) in a cash cafeteria is very difficult, there is as great a need as ever for guidelines on the nutritional aspects of school meals. Given the changes in nutritional thinking it is suggested that these guidelines should be based on current dietary recommendations, discussed in Chapter Two.

The third section of this chapter, therefore, discusses the form which these guidelines might take, incorporating both dietary goals based on the NACNE (1983) and COMA (1984) reports and dietary guidelines. This section also briefly discusses the implementation of such guidelines within the framework of the current school catering service. It is suggested that, for effective implementation, there will need to be liaison between the school caterer and those involved in nutrition education.

4.2 THE 1980 EDUCATION ACT AND ITS EFFECTS

4.2.1 Background to, and provisions of the 1980 Education Act.

Before the 1980 Education Act, LEAs were required to provide a midday meal of a prescribed nutritional content to every school pupil who wanted one, at a standard price, except in those cases where, under a parental income scale set by Regulations, it had to be provided free (DES, 1982).

The 1980 Education Act made important changes in the provision of school meals;
- it removed the obligation to provide school meals except for pupils whose parents were in receipt of Supplementary Benefit or Family Income Supplement,
- charges for school meals are now entirely at the discretion of the LEA,
LEAs are now required to make facilities available for those pupils who wish to bring their own food.

LEAs also have the power to provide free meals for a larger category of children than those covered in the Act.

Such free meals must be of a kind which 'appears to the authority to be requisite' (House of Commons Command Paper 505, 1982). In general it is considered that the kind of meal which is provided for paying pupils will be acceptable for those receiving free meals.

Authorities are urged to ensure that arrangements for pupils receiving free meals should be such as to minimise identification and possible embarrassment.

While not specifically mentioned in the Act, the LEAs were freed from the responsibility of providing meals of a set nutritional standard.

The background to the 1980 Education Act is given in a DES Memorandum to a House of Commons Select Committee on Education, Science and Arts under the chairmanship of Christopher Price MP which was set up to examine the provision of school meals (DES, 1982). Both the report of this Committee (House of Commons, 1982) and the government response to this report (House of Commons Command Paper, Number 505, 1982) give details of the (then) current provision for school meals. The recommendations of this Committee and the government response are discussed in Section 4.3.

The DES gave two reasons for these changes in the provision of school meals.

Firstly 'to facilitate developments in the school meals service'. The DES (1982) Memorandum stated that 'experiments had shown that non-traditional forms of provision, notably the cash cafeteria, were able to give better results than the standard approach in terms of both efficiency and consumer satisfaction'. The DES support this by comparing 'the average reduction in percentage take-up by secondary pupils between 1979 and 1980 which was significantly lower for the twenty-two LEAs which had introduced cash cafeteria systems into all or almost all of their secondary schools, than it was for the seventeen LEAs which made traditional provision in all their secondary schools'. Furthermore the trend towards increased secondary take-up between 1980 and 1981 was not shown in those LEAs with no cash cafeterias, even though this provision normally involves a higher nett subsidy from public funds. Cash cafeterias were preferred by pupils because they offered more choice;
there was, therefore, much less wastage.

The second reason was overtly financial, the government aimed 'to halve in real terms the nett cost to public funds of the school meals service ($409 million in 1979-1980 to $261 million in 1984-1985). To reduce the impact on the main core of education of the necessary savings on planned public expenditure, the government took the view that the school meals service should bear a disproportionate share of the economies.

The DES Memorandum (1982) suggested various measures, a combination of which would be necessary to reach planned expenditure levels;
- an average increase in charge, in real terms, of about 10 per cent from 1981-1982 levels,
- marketing measures to maintain take up,
- a reduction in unit food costs as a result of simplified menus and changed purchasing patterns,
- savings on overheads from increased efficiency,
- additional nett income from tuck shop sales,
- fewer free meals over the minimum Supplementary Benefit and Family Income Supplement criteria.

In other words, it was being proposed that the School Catering Service should operate on a commercial basis. The fact that this might mean sacrificing the traditional contribution made by school meals to the nutrition of school children, seemed to have been given virtually no consideration.

The prevailing attitude is clearly expressed in the concluding paragraphs of the DES Memorandum (1982), 'the target (ie. for reduced expenditure) is, without doubt a challenging one, but given the will, is attainable'. The attitude was also uncompromising 'to the extent that it is not reached, authorities will either have to make compensating reductions in other services or increase revenue from the rates'.

It would seem that the government felt that many authorities had not gone far enough down the commercial road, 'many LEAs are making great efforts to provide, in a cost effective way, the meals that pupils want at prices they can afford. Overall, however, there remains considerable scope ... for innovation in individual LEAs' practices both to improve take up, and through a combination of measures to secure further economies in line with the government's expenditure plans'.

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4.2.2 The effect of the 1980 Education Act on LEA School Meals Policies

Given the freedom to operate their own school meals service in any way they chose, as long as they met government expenditure targets, LEAs evolved very different school meals policies. The prices charged, the nutritional policy and the policy on free school meals all varied.

Three LEAs—Dorset, Lincolnshire and Hereford and Worcester no longer provided school meals for primary school pupils and sent in snack lunch boxes for children entitled to free school meals.

There were changes in the types of foods and meals served, more use was made of convenience foods, so called 'fast foods', in response to customer demand, snack meal alternatives were served, and many authorities changed as many schools as possible over to a cash cafeteria service where individual items were paid for separately.

The increase in prices, together with the different types of food served, seemed to many parents to represent poor value for money. Many parents took advantage of the fact that LEAs now had a statutory obligation to provide facilities for children to eat their own packed lunches.

The great need was to try and arrest, or, if possible, reverse the trend away from school meals, which had accelerated with the increase in prices. Many authorities actively marketed their school meals.

Changes in pricing and pricing structure.

Some metropolitan authorities kept their charges at the pre-1980 level of 35 pence, but many increased charges.

The variation and distribution of charges in January 1981 is shown in Table 4.1.

These are charges for a set two course meal, either as the only option available or (as was the case in some LEAs such as ILEA) retained as an option within the cash cafeteria system, where in most cases items were individually priced and the price paid by pupils depended on the items chosen.

Some authorities (eg. Solihull) priced the main course and sweet separately (Education 1980).

Increases in price were found to be the main reason for decline in numbers (Rona and Chinn 1984).
Table 4.1 Summary of LEA charges for a two-course meal
(based on the autumn school meals census, 1980, NASMO, 1981)

<table>
<thead>
<tr>
<th>Charge</th>
<th>No of LEAs</th>
</tr>
</thead>
<tbody>
<tr>
<td>35p</td>
<td>19</td>
</tr>
<tr>
<td>36p</td>
<td>1</td>
</tr>
<tr>
<td>38p</td>
<td>1</td>
</tr>
<tr>
<td>40p</td>
<td>23</td>
</tr>
<tr>
<td>45p</td>
<td>21</td>
</tr>
<tr>
<td>46p</td>
<td>1</td>
</tr>
<tr>
<td>50p</td>
<td>26</td>
</tr>
<tr>
<td>55p</td>
<td>3</td>
</tr>
<tr>
<td>60p</td>
<td>1</td>
</tr>
<tr>
<td>70p</td>
<td>1</td>
</tr>
</tbody>
</table>

(Note: where differential charging exists for primary and secondary schools the primary charge is used in the above analysis)

Free School Meals Policies

Many authorities changed the basis of their free school meals provision, some restricting provision to those in the categories set down in the 1980 Education Act, others being more generous. The variation in free school meals policy is shown by Table 4.2.

Table 4.2 Summary of free meals policies
(applicable in January 1981)
(From DES, 1981)

<table>
<thead>
<tr>
<th>Description</th>
<th>LEAs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entitlement restricted to receipt of SB/FIS</td>
<td>33</td>
</tr>
<tr>
<td>Income Scales based on SB rates</td>
<td>3</td>
</tr>
<tr>
<td>Income Scales based FIS rates</td>
<td>3</td>
</tr>
<tr>
<td>Former National Income Scale</td>
<td>50</td>
</tr>
<tr>
<td>Other scales</td>
<td>8</td>
</tr>
</tbody>
</table>

It is the provision of meals for those children who are entitled to free school meals that caused concern when the Act was passed is still causing concern (Rodgers 1985). This is discussed in section 4.3.2.

Nutrition Policies

LEAs seemed sharply divided on this issue. The Education, Science and Arts Committee (House of Commons, 1982) carried out a survey and found
that standards of meals provided varied considerably. In some authorities, the ambition to provide a meal 'suitable in all respects as the main meal of the day' remains. Others have 'frankly abandoned any such aim as both unrealistic and inappropriate in today's conditions' (House of Commons 1982).

Another author (Education, 1982) however suggested that 'most authorities reacted more positively and cut costs while still giving a good catering service to the school'. What was meant by 'a good catering service', was not defined in nutritional terms.

The polarisation of views is illustrated by the various comments from LEAs in June 1980 - three months after the Education Act.

All commented on the need not only to set their prices at the right level to balance meal costs and meal take up, but also on the need to meet consumer demand - two essentials of a commercial operation.

Some authorities felt that this was completely incompatible with concern for nutrition, 'a new commercial approach is needed ... the option is to create a cost effective catering service on a professional basis serving to the customers the food they want at a price they will pay' (Smith, 1980).

Other authorities mentioned both the need to maintain some basic nutritional standard for the meal and also the value of the school meal in education.

After the 1980 Act, the school catering service therefore had to attempt to reconcile two apparently incompatible functions, that is, to produce a more cost effective service, meeting consumer demand, while at the same time still fulfilling both the traditional roles of meeting childrens' nutritional needs and encouraging them to eat wisely.

Decline in uptake.

The main problem experienced by the school meals service was that of falling numbers. Schools now had to provide facilities for children to eat their own packed lunches, and many children, in view of rising prices, took advantage of this. The effect is shown in Tables 4.3 and 4.4. Therefore it was necessary to arrest and if possible reverse the decline in numbers.
Table 4.3 The overall impact of the various policies adopted by individual LEAs
(from DES, 1982)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pupils in attendance (000's)</td>
<td>7,577 (100%)</td>
<td>7,332 (100%)</td>
<td>7,170 (100%)</td>
</tr>
<tr>
<td>Pupils taking school meals</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- total</td>
<td>4,855 (64.1%)</td>
<td>3,435 (48.2%)</td>
<td>3,515 (49.0%)</td>
</tr>
<tr>
<td>- on payment</td>
<td>3,956 (52.2%)</td>
<td>2,811 (38.3%)</td>
<td>2,659 (37.1%)</td>
</tr>
<tr>
<td>- free*</td>
<td>899 (11.9%)</td>
<td>724 (9.9%)</td>
<td>856 (11.9%)</td>
</tr>
<tr>
<td>Pupils bringing own food #</td>
<td>952 (12.6%)</td>
<td>1,982 (27.0%)</td>
<td>1,879 (26.2%)</td>
</tr>
</tbody>
</table>

* Entitlement altered by the 1980 Act
# Before the 1980 Act many schools did not permit pupils to bring their own food

These totals conceal substantial variations. A comparison of the primary and secondary sectors is shown in Table 4.4

Table 4.4 A comparison of primary and secondary sectors
(as percentages of pupils in attendance)
(from DES, 1982)

<table>
<thead>
<tr>
<th></th>
<th>1979</th>
<th>1980</th>
<th>1981</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pupils taking school meals</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- primary</td>
<td>75.5</td>
<td>53.4</td>
<td>52.4</td>
</tr>
<tr>
<td>- secondary</td>
<td>50.6</td>
<td>41.7</td>
<td>44.6</td>
</tr>
<tr>
<td>Pupils bringing own food</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- primary</td>
<td>9.1</td>
<td>30.5</td>
<td>31.1</td>
</tr>
<tr>
<td>- secondary</td>
<td>16.7</td>
<td>23.8</td>
<td>21.5</td>
</tr>
</tbody>
</table>

Steps taken to reverse decline in numbers.

The main change that has occurred since the 1980 Education Act has been the large increase in numbers of schools with a cash cafeteria, where children have a wide choice of meal and snack items, and can decide how
much they spend. This seemed to be the formula for arresting the decline in numbers and there was also considerably less wastage.

A paper in 'Education' discussed the various ways in which LEAs had attempted to arrest and even reverse this decline in numbers.

Some authorities made use of marketing and consumer research techniques, these were used 'on a scale not formerly known in school catering ... this has taken the form of tape, and slide presentations, talks and tasting sessions for parents' evenings, advertising brochures and publicity through the media'.

Authorities made greater use of catering management expertise, engaging professional catering and marketing consultants to give advice on financial management and marketing techniques. A greater use was made of convenience foods.

In many cases equipment, facilities and school dining rooms were more suitable for serving traditional meals. It was recognised that before long there would be a need to provide better equipment for cooking and presentation of food and to improve dining facilities.

The concluding paragraph of this paper was hopeful, 'it is important to keep up with consumer demands, to avoid menu fatigue, to maintain liaison with the school and with parents. The new freedom provides both a challenge and an opportunity. A good start has been made in updating the school meals image'.

4.2.3 Reactions to the changes in school meals provision

Catering journals published a number of papers on the effects of the 1980 Education Act on school meals provision; the media interest was also considerable.

Papers in catering journals discussed the future of the school catering service, the commercial approach versus nutritional considerations, the policies of different LEAs on pricing, marketing, cash cafeterias and use of convenience foods.

National and local newspapers reported moves made by different LEAs, from withdrawal of primary school meals, loss of jobs through closure of kitchens, to marketing strategies. Many articles and letters, often written in emotive language - terms such as 'junk-foods', 'chips with everything' appeared frequently - gave parents the impression that coupled with rising prices, school meals were no longer good value for money. Such articles expressed concern on behalf of the parents at the effects of these changes and the more vocal parents wrote letters to the press.
However the fact that, many snack meals are of comparable nutritional value to some traditional hot meals (Bender, 1979; BNF, 1981) was rarely reported.

**Parents reaction**

Media propaganda aside, however, many parents felt concerned that they could no longer rely on the traditional role of school meals, to which they had become accustomed - 'parents whose children take the school dinner should be secure in the knowledge that it is a balanced nutritious meal' (DES, 1975b). Therefore, with increasing prices, parents readily withdrew their children from the school meals system.

There was also concern that these developments in the school meals service, were occurring in a period of 'marked socio-economic changes, characterised by a decrease in family size and a sharp increase in unemployment' (Rona and Chinn, 1984). It was, therefore, decided, in 1981, to add a special section to a nutritional surveillance system - the National Study of Health and Growth (NSGH).

In this study data were collected on the social circumstances of families, on parents' opinions of school meals, the price charged for school meals and their uptake. It was hoped to identify those factors which would 'best explain the pattern of uptake of school meals and to ascertain the relation between parents' opinion of school meals and their family's social circumstances' (Rona and Chinn, 1984).

The main findings of this survey were;
- the price for school meals was the main factor in England that determined whether a child would take a midday meal at school,
- the nutritional advantages and disadvantages of school meals were recognised as more important characteristics of the system than provision for the child of a safe place to stay, an opportunity for social interaction, or a reduction in the mother's time spent travelling,
- poor families in wealthier communities, more than elsewhere, may be reluctant to claim free meals because the demand for the service in the wealthy areas is lower than in the poorer areas and an individual child may be more easily identified by their classmates as receiving free lunches,
- the readiness of parents to take children out of the scheme if they dislike the meals may result in catering planners in schools being more prone to make use of convenience foods which are attractive to children instead of less popular, but healthier food.
Rona and Chinn (1984) conclude 'that price and child's liking for school meals are the main factors associated with the uptake of the service. Poor sectors of the community and mothers working outside the home valued school meals more than the rest. The scheme may become more identifiable as a service for the poor and for those forced to use it for special reasons, and the risk (that) the quality of the meals may deteriorate will increase'.

These authors also point that 'while in the seventies children from all social classes were making a similar use of the school meals service in England (Rona, Chinn and Smith, 1983) at present the service is used mainly by the poorer section of the community. The ideology of selection, which appears to be the philosophy underlying the Education Act, has succeeded'. The association of the school meals service with the poorer sections of the community and the likelihood of stigma attached to receiving free school meals is discussed in section 4.3.2.

The main argument of this thesis is that the school meal still has an important role in the nutrition of school children in the 1980's (this is discussed in section 4.3.2). That parents also still feel that this should be the case is emphasised by the findings of the above survey, 'parents consistently indicated that the nutritional aspect of the school meals system was the most relevant among reasons to support or not support the scheme' (Rona and Chinn, 1984).

This view, however is not entirely consistent with the finding that if a child disliked the school meal they were more likely to have lunch at home or a packed lunch, thus resulting in caterers serving 'foods that are attractive to children instead of less popular but healthier foods'.

This perhaps, highlights the main dilemma of the school catering service, that the foods that children like, and which therefore in a commercial service, must be the ones served, are very often not those foods which will constitute a nutritionally sound meal.

What many parents seem to forget, when giving views on the nutritional importance of the school meal, is that 'for food to be nutritious, it must also be eaten' (source unknown). It is also almost certainly true that children's food likes and dislikes are mainly formed long before they come to school (the formation of food habits is discussed in Chapter Six).

While, as is also argued in this thesis, the expertise of the school caterer is particularly important in trying to narrow the gap between the food that is nutritionally sound and the food that schoolchildren like to
eat, the parents also have some responsibility in this area. This was pointed out by the DES (1975) 'it never has been and never should be an aim of the school catering service to accept responsibility for the whole or the greater part of the nutrition of any pupil ... the nutrition of school children is the responsibility of their parents'.

This thesis, while expressing concern that the government, in passing the 1980 Education Act, has inadequately considered the effect that the Act would have on the nutrition of schoolchildren, also argues that the overall responsibility of ensuring that the child receives a nutritionally sound diet, still belongs with the parent. However, in the current social environment where the child is more frequently than ever before in a position to choose which foods he eats, the responsibility of both parents and school extends beyond merely providing nutritionally sound food. Both must also ensure, as far as possible, that children are equipped with both the knowledge and the attitudes to help them to choose wisely. Therefore, it is argued, now more than ever parents need the support and contribution of a school meals service which also accepts some of the responsibility for this.

Those professionally involved in school meals have expressed differing views on this issue.

Smith (1980) suggests that childrens' choice of food from a cash cafeteria service 'will have been determined by what they have been accustomed to at home. It is the parents who determine the dietary habits of the nation's children, not the schools or the school meal service'.

Harrison (1983) attributes the problems to what he calls the 'nobody's responsibility syndrome' 'many feel secure in the assumption that food education is being carried out by others, and for too long the standard of the nation's diet has suffered from being everybodys' concern but nobody's responsibility'. This author suggests that this is seen particularly in the school, 'the present generation of parents seems content to delegate the task of providing its offspring with a sound dietary education to the school, who in turn deflects its responsibility and tries to concentrate it within one department, home economics, while providing distractions in another area (in the form of a tuck shop) and ignoring a third area of the school (the school meals service) which could make an important contribution towards improving food education'. While accepting that 'everybody's concern, nobody's responsibility', could in some areas, be said to be a feature of the current social environment, very often fuelled by the media, this is perhaps a somewhat pessimistic
view of nutrition education in schools (discussed in Chapter Six).

Simpson (1981) suggests that 'the importance of good eating habits is unfortunately imperfectly understood' due to the lack of formal nutrition education received by many of today's parents. This author suggests, therefore, that 'many parents are less concerned about, and are less able to influence the dietary habits of their children'.

The role and responsibility of the school meals service in the 1980s in discussed in the following section. It is assumed however, throughout this thesis, that the overall responsibility for the nutrition of schoolchildren, in the socio-economic context of the 1980s, belongs to the parents, but that an important contribution, (as has been the tradition since the war) should be made by the school meals service, with the support, and where necessary the guidance, of the government and the LEAs.

It is also argued that sound nutrition education at community level is necessary to give guidance and support to parents. Nutrition education in the community and in schools is discussed in Chapter Six, where it is suggested that a national nutrition policy is needed to co-ordinate these and other aspects of nutrition.

It is clear from the above discussion that, while it is recognised that the school meals service must be more cost effective than it has been in the past, (and therefore must provide food which more closely meets consumer demand), at the same time the traditional role of the school meal in the nutrition and in the education of schoolchildren should not be lost. It is therefore important that ways are found to ensure that these two ideas are compatible.

4.3 THE NEED FOR GUIDELINES ON THE NUTRITIONAL ASPECTS OF SCHOOL MEALS.

As suggested above, the argument of this thesis is that the school meal still has an important nutritional role in the 1980s, and that in order to fulfill this role, guidelines on the nutritional aspects of school meals are needed.

After the 1980 Education Act many expressed concern that there was no longer any obligation for LEAs to provide meals of a set nutritional standard and the regard paid to the principles of good nutrition was left entirely to the LEAs themselves and depended on their attitude to the compatibility of commercialisation and nutrition.

On the other hand many would argue that the nutritional standards
which applied before the 1980 Act are no longer appropriate to current nutritional thinking, or applicable in a system where childrens' choice is an important factor determining the nutritional value of the meal.

In order to justify the view that these pre-1980 nutritional standards need to be replaced by nutritional guidelines, the nutritional role of the school meal in the 1980s must be examined. A number of views of this role - those of school caterers themselves, those of nutritionists and dietitians, and those of the government - were expressed after the 1980 Education Act. Firstly, however, it is necessary to examine suggestions that the pre-1980 nutritional standards were no longer either appropriate or applicable.

4.3.1. Current relevance of pre-1980 nutritional standards?

Between 1970 and 1975, Bender et al (1972 and 1977) carried out surveys in two areas in South East England (Essex and Brent) comparing the nutritional value of school meals with DES (1965) standards. In both surveys it was found that the protein and energy content of the meals were below DES standards. In the Brent survey plate waste accounted for 10 per cent, (ranging from 2-15 per cent) of both energy and protein served. Bender et al (1977) suggested that 'waste depended to a large extent on the menu, freedom of choice of food, or portion size, and the attitude of the dinner supervisors, who insisted that food was eaten or allowed whole meals to be thrown away'.

Other surveys, however, found DES standards 'broadly met' (Cook et al, 1975), and school meals reaching 80 per cent and 90 per cent of the energy and protein standards respectively (Richardson and Lawson, 1972) which the authors considered adequate.

McAllister et al. (1981) in a survey conducted in junior schools in South Glamorgan found energy levels below the DES standard, but protein levels adequate. McAllister suggests, however, that, as this survey and others had found energy intakes below the DES standard, it might be that the recommendations were inappropriate, rather than the meals inadequate.

Bender (1979) also made a similar suggestion in a letter to the British Medical Journal in which he compared the nutritional value of the standard 'meat and two veg' meal, and 'a snack meal of the soup and sandwiches, beans on toast type'. This author suggests that, in view both of the very large variations in energy needs of children and the fact that some snacks can be as nutritious as a traditional hot meal, 'a cafeteria type service offering a choice of foods and portions may be helpful ...
since children vary so much in their needs perhaps, when offered a choice
they select what they need rather than what the nutritionist thinks
that, on average, they ought to have'.

This is, perhaps, an argument to support the suggestion that a
different type of nutritional standard needs to be set for school meals.
Most would not agree, however, that children can be left entirely alone to
choose a nutritionally sound meal, the incidence of obesity in school
children, referred to in Chapter Two, is an indication of the extent to
which a number of children fail to match their energy intake to their
physiological need.

As was discussed in Chapter One the DES Working Parties (1975a; 1975b)
discussed the problem of ensuring that pupils, particularly those
who had free meals, chose a nutritionally balanced meal from an a la carte
menu. The 'Nutrition in Schools' report (DES, 1975), while confirming the
need for nutritional standards, recognised that the freedom of choice
which was an essential feature of the à la carte service was 'in-
compatible with the imposition of closely prescribed nutritional
 standards'.

In addition, as was discussed in Chapter Two, coinciding with the
changes in the school meals service, there had been a change of emphasis
in nutritional thinking, from ensuring an adequate intake of energy and
nutrients, to a concern with reducing consumption of some dietary
components in order to provide a better balance of energy from different
sources. It is thus reasonable to suggest that these ideas should be
reflected in the nutritional principles or standards on which the school
meals is based.

It could therefore be argued that, at the time of the 1980 Education
Act, there was a case for re-examining whether the existing standards were
nutritionally appropriate and also whether they could be applied in a
service, the essence of which was freedom of choice. This however, could
not, in any way, be presented as a case for abandoning nutritional
standards altogether.

Given, therefore, the change in nutritional thinking, also the
difficulty of ensuring that meals, where customer freedom of choice
operates, meet set standards, it is the argument of this thesis that
nutritional standards should be replaced by guidelines on nutritional
aspects of school meals.
This argument, however, depends on establishing that school meals have an important contribution to make to the nutrition of schoolchildren in the 1980s. This is discussed below.

4.3.2 The Nutritional Role of School Meals in the 1980s.

The importance of nutrition in the health and growth of schoolchildren and adolescents was discussed in Chapter Three. It can be concluded from this discussion that while some groups of children may have inadequate intakes of some nutrients, few are undernourished these days. Some children, however, are overweight, and evidence supports the idea that children today are possibly as much at risk from the overconsumption of food, or the consumption of too much of the wrong type of food, as children in the 1930's were from inadequate nutrition.

The view that children in families from lower socio-economic groups, particularly in times of high unemployment, should be given specific consideration was also discussed in Chapter Three. Evidence which suggests that these children are particularly affected by the changes in school meals provision is discussed in the following section.

In addition, while many argue that these days children are fed adequately at home before coming to school and again in the evening, various surveys show that this frequently is not the case; examination of 24 hour recall data from schoolchildren reveals much 'eating on demand'.

Finally, it is rarely disputed that the foundations of good eating habits in adult life are laid down in childhood.

It is thus suggested that while the nutritional problems of the 1980's are different from those of the 1930's and 1940's, the role of the school meal in the nutrition of school children is still an important one.

The various views put forward by caterers and dietitians concerning the nutritional role of school meals in the 1980's are discussed below; the role of the school meal in the nutrition of those children entitled to free meals is given particular consideration. The concern expressed in the House of Commons on the effect of the 1980 Education Act on school meal provision is also discussed. Many supported the above argument that, even though the nutritional context may have changed, school meals were as important as ever. The particular importance of the school meal to those children entitled to free school meals, was emphasised by many.
There were also suggestions that nutritional guidelines, based on current thinking, should be set once again by the government or by LEA's. Many suggested how these nutritional guidelines might be implemented within the school and most recognised the need for nutrition education.

The views of school caterers

While many expressed concern over the effects of the 1980 Education Act, there were a few who saw the removal of set nutritional standards as release from 'restrictive nutritional rules' (Smith 1980). This author attributed part of the 'ever rising costs of the school meals service' to the very strict statutory obligations to provide a particular kind of catering summer up in the statutory requirements 'a meal in all respects suitable as the main meal of the day'. He felt that this had led to a 'restricted and rigid form of catering in which success is laid on nutritionally perfectly balanced individual meals'.

Smith suggests that this type of school catering was not 'meeting the real needs of the customer', and that a new commercially orientated school catering service would provide 'cost effectively what the customer wants rather than an academic and outmoded idea of what the customer needs'. This author also expresses the view that, if the school catering service provides a choice of food that children 'will actually eat, nutrition will look after itself'. It could be argued that the view expressed in the same paper 'if chips is what customers want, then chips is what they will get' may not be compatible with 'nutrition looking after itself'.

This author also appears to dismiss the idea that the school meals service has 'the task of teaching the nations' children what a good nutritionally balanced meal is', suggesting that it is 'the parents who determine the dietary habits of the nations children, not the schools or school meals service'.

One of the aims of this study is to try and establish whether indeed 'nutrition will look after itself' and how closely 'what the customer wants' and therefore chooses in the cash cafeteria, meets his nutritional needs (as set out in the NACNE (1983) and COMA (1984) reports, and DES (1979) RDA tables). It is the argument of this thesis that the main task of those involved in nutrition education and school catering is to attempt to narrow the gap between the two.

The views described above, unfortunately, represented those of several involved in school catering. The fact that one involved in school
catering should dismiss current nutritional thought with the words 'the advocates of high dietary fibre and wholemeal bread etc, the perfect balanced meal and all other current nutritional fads' (Smith, 1980) clearly illustrates the need for a national nutrition policy such as is discussed in Chapter Six.

Nevertheless, there were those involved in school catering who felt that school meals still had an important part to play in the nutrition of school children. These people took a more positive view.

Simpson (1980) argues that 'the attraction of particular types of food and the financial imperatives in any particular situation must be weighed against the professional (and many would say moral) obligation to produce a varied and balanced menu, which is only another way of saying nutritionally sound meals ... some 190 meals are served annually to children during the period of their lives when they are most vulnerable from a physical point of view to dietary excesses or deficiencies'.

This author suggests that 'nothing in the new legislation suggests that the dietary needs of growing children at midday have in any way altered. If a local authority is offering to parents a lunchtime service for their children it has a moral obligation to ensure that it is of sufficient nutritive value to sustain them during the period that they remain in its care'. He places the responsibility firmly with the LEA, 'in the absence of a national nutritional standard for school meals each local authority must determine its own policy in respect of the nutritive value of the meals it provides'.

Simpson suggests that there is consensus among LEA's that the traditional school meal should continue to be offered to primary schoolchildren (nevertheless there are some authorities offering a cash cafeteria service in middle schools, and even in primary schools), but that a cash cafeteria service offering a range of individually priced items and dishes was the best way to meet the needs of secondary school children, even though the nutritional value of the meal depends on the choice of food by ever younger children. This author, while recognising that 'in respect of nutrition, control ostensibly passes completely into the hands of the customer', suggests ways in which cash cafeterias can be run in a 'responsible manner', so that while providing the food that the customer wants and thus will eat, his nutritional needs can also be met.

Suggested measures included;
- 'essentially not offering for sale any item which is poor value for
money from a nutritional point of view',
- 'the use of craft skills in presentation, individual portioning, and garnishing; these would include the development of composite dishes such as open sandwiches, ploughman's lunches, pizzas, plated salads, special hamburgers, pastas, curries, or stuffed potatoes, in all of which it is possible to achieve a balance of raw materials which are acceptable from a nutritional point of view',
- 'differential pricing, i.e. using laws of supply and demand in such a way that it is cheaper to eat well from a nutritional point of view than otherwise',
- 'selective publicity to feature the 'meal of the day' or 'weight watchers' selection, perhaps in conjunction with the Home Economics Department'.
- 'it is likely that, in the effort to reduce the labour cost of cafeteria operations, increased use will be made of the large range of prepared products now available from frozen food firms, wholesale butchers and cooked meat manufacturers. It will therefore become increasingly important to ensure that all such products are thoroughly tested not only for acceptability and cost, but also for their comparative nutritive value'.  

This author also stresses the importance of nutrition education, not only for children in school but for the community in general (discussed in Chapter Six), attributing the move away from school meals by secondary school children to the fact that freedom to choose is of more importance to these children than the fact that the alternative meal eaten outside school may be more expensive and less sound nutritionally. Simpson attributes the lack of parental concern in this area to lack of nutritional knowledge, 'it is also true that many parents are less concerned about and are less able to influence the dietary habits of their children. Because of the lack of formal nutritional education for the majority of today's parents and children, the importance of good eating habits is unfortunately imperfectly understood'. While recognising that 'it would be hypocritical to deny that the selection made by some pupils is unwise from a nutritional point of view', Simpson argues that, with the increased uptake evident in schools where there is a cash cafeteria, 'there is the opportunity to encourage more pupils in good eating habits'.

Simpson concludes that the attitude, prevalent during the 60's and 70's, that the school meals service need no longer be concerned with the
'nutritive value of the meals it offers to children' is likely to become increasingly unfashionable, 'it is no longer a question of protein and energy requirements, but more a question of the balance of the diet ... It is clear that the next decade will see a marked growth in preventative health measures and in nutrition education. As the primary concern of the school meals service is the feeding of young children and young adults it is not unreasonable to expect that it should be required to continue its historical role in whatever measures are adopted'. A similar view is also expressed by Kipps and Thomson (1980).

Simpson therefore, not only puts forward the argument for a continuing belief in the importance of the school meal in the 1980's, but also makes positive suggestions for running the service on a cost effective basis while still providing a nutritionally sound meal. Many of these suggestions are being put into practice in cash cafeterias; these will be examined in Chapter Six.

The role of school meals in the nutrition of those children entitled to free school meals

As can be seen from the above discussion there are differing views on the importance of the school meal to children in the 1980's. Few people, however, will deny that the school meal is particularly important to those children who are entitled to free school meals. Particular concern has been expressed about the effects of the changes in school meals provision on these children.

The importance of the free school meal was pointed out by Cook et al (1975) whose survey showed that, while school meals made an important contribution to the nutrition of schoolchildren generally, children in lower social classes, larger families, and without fathers, who took school meals, obtained a higher proportion than other children, of their weekday intake of nutrients at lunch time. This applied particularly to nutrients important for growth.

The 1975 DES reports, recognising the importance of these meals, discussed ways in which it could be ensured that children entitled to free school meals obtained a nutritionally adequate meal from an à la carte system.

A more recent study by Nelson and Paul (1983), carried out between 1977 and 1979 in Cambridge, concludes that school dinners played their most important role in the lower income families, and thus 'that the loss
of a nutritional meal would have its greatest adverse effect on those least able to afford it'.

Simpson (1982) also emphasises the particular importance of the school meal to those children entitled to free school meals.

A DHSS (1986) survey also found that 'the school meal, particularly where it was provided free, was shown to be an important factor in the welfare of older children from families receiving state benefits. For these older children a free school meal provided a significantly greater proportion of the total daily energy intake than the meals eaten by other children at home or at school'.

Those worried about the effects of the 1980 Education Act on children entitled to free meals, have expressed their concern over three aspects.

Firstly, if meals no longer met nutritional standards, it would be the children who needed the meals most who were particularly affected. This concern was highlighted by the work of Cook et al (1975) and Nelson (1983) discussed above. This is also supported by Rona and Chinn (1979) whose nutritional surveillance study found differences in anthropometric measurements between different socio-economic groups, partly attributable to differences in nutrition. The nutrition of children in families from lower socio-economic groups as an area of concern was discussed in Chapter Three.

Secondly, in the cash cafeteria system those children who had free meals would be easily identified either because they handed over tokens instead of money or because their choice was restricted, or, in the case of those authorities who only served meals to primary schoolchildren entitled to free meals, because they were the only ones eating school meals.

This concern was the subject of recommendations made by the Education, Science and Arts Committee (House of Commons paper No. 505. 1982), who found that teachers in both primary and secondary schools were of the view that 'the 'stigma' of receiving free school meals was not as important an issue to the pupils themselves as many suppose', and that 'children themselves are less embarrassed by such things than teachers and parents'. Nevertheless this committee recommended 'that the DES should continue to advise authorities that they should have regard to the desirability of maintaining discretion on free school meals, but should advise against any elaborate system for doing so which might prove counterproductive'.

A rather different view was taken by Weir (1982) who suggested that
the number of children, who were entitled to free school meals, but were not taking them was far from negligible. This author cites evidence from an OPCS survey (Wilson 1981) which found that 39 per cent of the eligible children were not receiving school meals. This figure reached 69 per cent for two parent families eligible through low income.

Rona and Chinn (1984) found, in 1981, that, in primary schools in two thirds of the study areas, more than 35 per cent of the children entitled to free meals were not receiving them. This was particularly noticeable where children entitled to free school meals went to schools situated in more wealthy areas.

The view that this may have been due to the parents rather than the children, feeling the stigma attached to free school meals, is supported by the work of Rona and Chinn (1984). These authors obtained data on parents opinions of the school meals system, and found that 'poor families in wealthier communities, more than elsewhere, may be reluctant to claim free school meals because the demand for the service in the wealthy areas is lower than in the poorer areas, and an individual child may be more easily identified by their classmates as receiving free lunches'.

The Child Poverty Action Group (CPAG) (Weir, 1982) analysed and compared DES census data for 1979 and 1980 and expressed concern about the large drop in numbers of children receiving free school meals. This was mainly due to the loss of entitlement to free meals, as a result of the less generous scale of eligibility for low income families. This group also found that it was often the authorities who made the highest charges that restricted the provision of free school meals to the minimum entitlement. However, the CPAG felt that the drop in free school meals was not only accounted for by the loss of entitlement, but also by parents 'deciding to provide meals at their own expense ... rather than subject their children to embarrassment and humiliation at school' - the problem of stigma had intensified.

It is difficult to see how, in areas where school meals have been discontinued except for children entitled to free school meals, these children can be anything but extremely obvious, when they are the only ones handed out a packed lunch, brought in specially. This situation is all too reminiscent of that in the 1930's (discussed in Chapter One), where 'the social context of school meals, in the eyes of the parents, was that of the Poor Law and the relieving officer' (Le Gros Clark, 1948). There must be many who feel that this is quite unacceptable in the 1980's.
Thirdly, concern was expressed that, in the cash cafeteria, where prices were higher, the amount of money allowed for the free school meal would not enable the child to buy a nutritionally sound meal.

This concern was highlighted in a survey carried out nationally by a Guardian journalist (Rodgers, 1985), who found that, in many education authorities, the allowance for free meals is too small for children to get a 'proper lunch'. While this is not defined in nutritional terms, Rodgers suggests that some LEAs themselves admit that it is difficult for children to get an adequate meal on the free school meal allowance.

This author also points out the very great variation between LEAs in their policies for provision of free school meals and describes two typical meals - 'the popular chips, beans, beefburger and a yogurt, or a healthy meal of a salad, jacket potato, fruit juice or sweet'. This survey found that the free meal allowance would not have covered either of these meals in thirty LEAs. One authority 'allowed only a free first course - pudding and a drink have to be paid for'.

Rodgers cites information from NASMO who pointed out that the definition of a meal was no longer uniform across the LEAs 'it can mean just soup and a roll, or a sandwich'.

This author concludes that 'with the government about to cut further the LEAs school meal allocation ... the chances of disadvantaged children getting a proper meal will get worse'.

The CPAG (Weir, 1982) also found in some schools that children did not get a full choice with their tokens.

There is, therefore, considerable support for the idea that the school meal is of particular importance to children from lower income families, and also considerable concern that these are the children suffering most from the effects of the 1980 Education Act.

Of particular concern is the number of children involved - nationally one child in six, attending school, now have free meals. In many areas, there is a much higher proportion, a recent survey in ILEA schools (ILEA, 1985) found that 39.6 per cent of secondary pupils, and 44.5 per cent of primary pupils were having free meals. In some areas of London eg. Tower Hamlets, which scores highest in nearly every category of deprivation, the proportion is higher - in this division unemployment among primary school parents is over 40 per cent and 65 per cent of pupils take free meals (Contact 1-3-85).
Concern from nutritionists and dietitians

The concern for the 'least privileged children within our society' is also discussed by Elton (1982), who points out that the drop from 12 per cent of children receiving school meals (pre-1980 Education Act) to 10 per cent in 1982, 'contrasts strongly with the rise in the proportion of children who must be experiencing falling living standards due to unemployment of the breadwinner or separation of parents'.

This author contrasts the 'impressive series of investigations' into child growth in relation to both infant milk and school milk, with the lack of any studies at all of the effects on the growth of children of changes in the school meals provision. Elton is, however, reassured by the fact that 'another large comprehensive, nationwide observational survey by the DHSS is imminent'. Some of the findings of this survey (DHSS, 1986) are discussed above.

Elton concludes with the suggestion that 'surely we need not wait until some subgroup of children does show a fall off in growth before a randomised controlled feeding trial is conducted to determine the extent to which this could be prevented by a more liberal provision of school meals?'

BDA Policy statement

The case for recognising that the school meal still makes an important contribution to the nutrition of schoolchildren, particularly those from low income families, was put forward quite strongly very soon after the 1980 Education Act by the British Dietetic Association in a Policy Statement (1980). This group expressed their concern over the effects on the health of schoolchildren of the changes in school meals provision, and suggested that qualitative guidelines for school meals should be set, at government, not LEA level.

In this statement the BDA indicated that new research was constantly showing a relationship between diet and health. This group cited references to work which indicated that certain nutritional problems were commonly observed in school children including;

- undernutrition in the following areas
  - calcium requirement in the rapidly growing adolescent
  - vitamin D and bone defects in Asian children
  - anaemia
Also discussed in this policy statement is the acquisition of eating habits, 'which occurs within, and contributes to the physiological, psychological and cultural development of the child'. The importance of the primary school years in providing the opportunity to develop good dietary habits is stressed. It was felt that this is particularly important when factors such as 'working mothers, ' latch key' children, increasing use of convenience foods and the role of the media in food advertising' contribute to the changing social environment. The importance of continuing good eating habits into the secondary school years, during which 'a period of rapid growth makes demands on the body's resources', is also stressed. This, it is suggested, emphasises the importance of the provision of suitable school meals, also of nutrition education as part of a programme to foster a positive attitude to health.

The BDA suggested, therefore, that 'it was a retrograde step for financial considerations to govern meal provision, without reference to nutritional needs, based on sound physiological principles', pointing out the importance of a meal planned from nutritional standards, particularly for the many children (over 30 per cent of those served) who qualify for free school meals.

This group felt that the removal of nutritional guidelines was contrary to the current interest and responsibility for nutrition and health shown by the government publication 'Eating for Health', and suggested that guidelines for school meals could follow the recommendations made in this document which include;

- increased dietary fibre
- reduced fat and sugar
- moderate quantities of protein
- increased bread, potatoes and fruit

It was felt that 'these qualitative guidelines would ensure a consistent nutritional service across the country and provide reassurance for those providing and eating the food. Suggested 'guidelines for the nutritional aspects of school meals' along similar lines are discussed below.

The authors of the policy statement recognise the difficulties facing
the school meals service, - 'the change in lifestyle' meaning mean that 'traditional meals may be unpopular with a significant number of children, and that 'financial and management aspects of the school meals service must also be considered'. They also recognise that fact that nutritionists are often wrongly accused of forgetting that 'food has to be consumed to be of any nutritional value' but also point out that 'there are a variety of ways of providing a nutritionally adequate diet', and do not feel that media concern 'that snack meal provision would, automatically result in an undesirable food intake is justified'. The similar view expressed by Bender (1979) was discussed above.

The BDA support the point made by the DES (1975), that the school meal does not necessarily have to be 'suitable in all respects as the main meal of the day', but suggests that the 'considerable experience available in the school meals service, could liaise at local level with dietitians, teachers, school medical officers and health education officers', to ensure that food suitable for the needs of the children would be provided'.

This group also emphasised the importance of educating children to make sensible food choices, and suggest not only that current knowledge in nutrition should be the basis of this education, but that dietitians are available at local level to support teachers in this. The role of all those involved in nutrition education in the implementation of the suggested guidelines is discussed in Chapter Six, as is the importance of liaison between these and school caterers.

Finally, the authors of the policy statement express the hope that 'the nutritional, educational, and social value of the school meals service will not be forgotten in the apparent urgency to cut costs'. They suggest that the 'food provision in schools should continue', with the 'nutritional standard of food' 'guided by central government and not left to the discretion of local authorities'.

**Concern within the House of Commons.**

A similar view was also expressed within the House of Commons. In 1982 the Education, Science and Arts Committee under the chairmanship of Mr Christopher Price M.P. examined the background to the 1980 Education Act, and the current provision of school meals, particularly examining the provision in Lincolnshire, where meals were no longer provided in primary schools, except for those children statutorily entitled to free meals.
This committee concluded that 'we do not believe that we are yet at the stage when those public authorities responsible can relieve themselves of the responsibility of providing school meals. It is arguable that we shall never reach that stage, and certainly the existence of high levels of unemployment make it important and not just prudent, that an adequate midday meal should be available to all children of compulsory school age'. While recognising that the nutritional problems were no longer of the type and magnitude of those pertaining to the period when the 1944 Education Act was passed, they also conclude, 'on the basis of evidence received, that to absolve the LEA's almost entirely from any nutritional obligations was a mistake'.

The committee, therefore, make the recommendation that 'the DES should convene a working party to determine new nutritional standards more suited to current conditions, and should issue this in the form of advice to LEA's. If it appears that such advice is being widely ignored, then the Education Act 1980 should be amended to allow the DES to impose minimum standards'.

The Government response to the report of this committee was that this was now the responsibility of the LEA's (and by implication no longer their concern), 'if individual LEA's wish guidance, it is open to them to seek advice from the Department's Catering Advisors, or to consult the material on recommended nutritional intakes, published by the DHSS Committee ... even if recommended standards were promulgated there is no guarantee that they would result in pupils eating the food so prescribed: previous experience with national standards showed that much of the food provided was wasted' (House of Commons Command Paper 505, 1982).

It is hardly surprising, therefore, that many nutritionists were frustrated by this apparent lack of interest in nutrition shown by the government. The fact that, at this time, the government appeared only to be concerned that school meals should meet RDAs clearly illustrates the need for a national nutrition policy such as is discussed in Chapter Six.

Thus the consensus of opinion overwhelmingly supports the idea that the school meal still has an important nutritional, educational and social role in the growth, health and development of schoolchildren in the 1980s. The suggestion has also come from several quarters that the best way of ensuring that this important function is fulfilled is for the government to once again assume responsibility for the nutritional aspects
of school meals.

It is recognised that it is probably no longer appropriate to express these standards in terms of the proportion of the day's energy and protein requirements which should be provided by the school meal, nor is it possible to apply this type of standard within the current school meals service.

It is therefore suggested that guidelines for the nutritional aspects of school meals, based on current knowledge of the role of nutrition in the growth and health of school children, should be formulated. Such guidelines should be applicable to the school catering service of the 1980s.

As discussed above, the BDA policy statement (1980) suggests that nutritional guidelines for school meals should be based on the recommendations made in 'Eating for Health' (DHSS, 1978). As was discussed in Chapter Two, these are dietary guidelines, the purpose of which is to suggest ways in which food intake could change in order to achieve quantified dietary goals. Since the BDA statement in 1980, the NACNE (1983) and COMA (1984) reports have suggested such dietary goals for the British diet. The view that the recommendations of these reports represented the consensus view among nutritionists was put forward in Chapter Two; the application of these recommendations to the diets of schoolchildren was discussed in Chapter Three. While it is recognised that these goals are meant to apply to the whole diet of the population, it is the aim of this study to examine the feasibility of their use as the basis of nutritional guidelines for both planning and evaluating school meals (as suggested by Sanderson and Winkler, 1983).

The school meals service of the 1980s inevitably means a much greater freedom of choice than ever before for children to choose their own meals from a selection of items available, therefore the nutritional value of the meals consumed very much depends on individual choice. However, as was emphasised both by the DES (1975b) and by the BDA (1980), the role of the caterer is to ensure that the foods are available from which the child can choose a nutritionally balanced meal (which as part of his overall diet) will help towards achieving dietary goals. Therefore dietary guidelines, suggesting foods which could be served, should be another aspect of these nutritional guidelines for school meals. In this area the particular expertise of the caterer is required, to serve these foods as dishes which children enjoy and are within the budget allowed.
It is also important that, given the freedom of choice, these guidelines include an emphasis on the importance of nutrition education to help children to make an informed choice. Such nutrition education should be based on knowledge of the relationship between nutrition and health, and should also aim to develop a positive attitude to food and health.

It must be emphasised that this responsibility does not fall solely on the school meals service. The importance of liaison with others involved in the nutrition education of children in school and of the community in general, including parents, should also be stressed. The establishment of Community Nutrition Groups in some areas, with a representative from school catering, is a move towards achieving the situation where the school caterer is seen as an important member of the nutrition education team. The importance of nutrition education is emphasised by Ball (1981) 'perhaps, more than at anytime in the past, the greatest need today is for children to be taught to be nutritionally aware of the diet they choose to eat'.

4.4 SUGGESTED GUIDELINES FOR THE NUTRITIONAL ASPECTS OF SCHOOL MEALS

It is suggested that guidelines for the nutritional aspects of school meals should give guidance in four areas;

- quantified dietary goals for school meals, based on the recommendations of the NACNE (1983) and COMA (1984) reports. These could be used as the basis of planning and of food purchasing, also for evaluating and monitoring school meals,

- dietary guidelines, suggesting foods which could be provided in order to achieve the dietary goals,

- the importance of nutrition education to guide children's choice towards a nutritionally balanced meal, it should be indicated that this is mainly the responsibility of those involved in nutrition education.

- the importance of liaison between those involved in nutrition education and the school caterer.

It is recognised that the third area involves those outside the school catering service, and it is particularly important that there is co-ordination between the efforts made by nutrition educators to change food habits, and those made by caterers to provide healthier foods for children. This may prove to be the most difficult area of all to implement and little progress will be made until each recognises the expertise of the other, and the contribution they can make together to the
nutrition of children. This area will be discussed in Chapter Six.

4.4.1 Dietary Goals.

The recommendations made in the NACNE (1983) and COMA (1983) reports and by other medical and nutritional experts were discussed in Chapter Two. The goals for school meals, suggested below are based on these recommendations.

Energy.

Because the energy needs of children vary very considerably and the proportion of the days nutritional requirements which will need to be provided by the school meal will vary with the eating habits of the individual, it is difficult to specify the amount of energy which should be provided by the school meal.

It is more appropriate to specify the proportion of total energy which should be derived from fat, carbohydrate, and protein.

An appropriate goal for school meals could be:

- Percentage of total energy to be provided by
  - fat: 30 - 35% (not more than 35%)
  - carbohydrate: 50 - 55%
  - protein: 10 - 12% (not less than 10%)

The use of the term 'balanced diet', redefined in terms of the proportion of total energy coming from different sources, is discussed in Chapter Six.

While not specifying the amount of energy to be provided by the school meal, it is recognised that an important aspect of nutrition education is the concept of balancing energy intake and energy expenditure to prevent obesity.

Fat

An appropriate goal for school meals could be;

- percentage of total energy to be provided by
  - fat: as above
  - of which saturated fatty acids: 10 - 15% (not more than 15%)

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Carbohydrate

An appropriate goal for school meals could be

Percentage of total energy to be provided by carbohydrate as above
of which sugar 10 - 14% (not more than 14%)

As the energy needs of children vary very considerably, it is probably more appropriate to express the recommendation for sugar in terms of the percentage of total energy to be provided. Also as the energy provided by the school meal will vary, it is inevitable that the higher the energy content of the meal, the more sugar it will contain.

Dietary fibre

It was suggested in Chapter Three that the recommendation for dietary fibre should be adjusted to relate to energy intakes of children.

An appropriate goal for school meals could be

2.5 gm/MJ

Salt

The NACNE (1983) report suggests that a reduction of one gram per head per day should come from a reduction in the salt added in cooking, and at the table. Therefore the salt used in cooking in school meals should be reduced, and children discouraged from adding salt at the table. It might also be reasonable to suggest an upper limit of 1.5 grams to come from salt in foods (based on one third of the WHO recommendation of 5 grams per head per day).

Other nutrients

As was discussed in Chapter Two, it is likely that the changes in food intake needed to achieve dietary goals - dietary guidelines, (discussed below), would lead to an increase in mineral and vitamin intake, without having a detrimental effect on protein intake. It is, therefore, probably unnecessary to make specific recommendations for the vitamin, mineral and protein content of school meals.

However low intakes of some nutrients (calcium and Vitamin D, iron, ascorbic acid, retinol, riboflavin, zinc) were found in the diets of some
schoolchildren and adolescents (discussed in Chapter Three). It is suggested that particular attention is paid to the amounts of these nutrients in school meals.

In addition, standards for monitoring and evaluating school meals are needed, it is suggested that these are based on RDA tables (DHSS, 1979). This is discussed in section 5.3.5.

3.4.2 Dietary Guidelines.

These recommendations, translated into food commodities, would mean an increased consumption of:
- bread and cereal foods, especially whole grain foods,
- fruit and vegetables, including potatoes, also pulses - peas, beans and lentils,
and a decreased consumption of:
- fats and fatty foods, fatty meats and meat products, fried foods, pastry, biscuits, and cakes. Meat could be replaced by poultry and fish;
- sugar and sugary foods, puddings, cakes, biscuits, sweetened drinks.

Perhaps these foods could be translated into the modern equivalent of the 'four week shopping basket' as suggested in the report 'The nutritional standard of the school dinner' (DES, 1965), which many caterers found helpful. In this form, these dietary guidelines could be quantified.

The expertise of school caterers is particularly important; their role in the implementation of these suggested 'guidelines for the nutritional aspects school meals' is discussed in Chapter Six.

3.4.3 The role of the Nutrition educator in guiding choice in school meals.

The nutritionist must also recognise the expertise with foods possessed by the Home Economist, who, with the caterer, must in turn ensure that the practice of this expertise is compatible with current nutritional knowledge.

This is emphasised by the British Dietetic Association in their Policy Statement (1980), and also the Royal College of Physicians' report on Obesity (1983), quoted by the James Committee, 'Health Educators should
ensure that their educational material is nutritionally up-to-date. This is particularly important in school teaching. The view that carbohydrates are specially fattening needs revision. Cookery instruction in school needs to emphasise the production of attractive and appetising meals with a lower fat and sugar content'.

In many schools now, however, nutrition teaching is based on the recommendations for dietary change made in the NACNE (1983) and COMA (1984) reports. There is discussion amongst nutritionists as to how these can be incorporated into either current, or newly devised nutrition teaching schemes. Some of these ideas are discussed in Chapter Six.

Nutrition education in schools, whether part of Home Economics or wherever else it appears in the curriculum, must also recognise that imparting knowledge will not necessarily change behaviour, positive attitudes towards food and health must also be achieved before behavioural change will occur. It is suggested in Chapter Six that nutrition education of children in schools should be seen as part of the overall community nutrition education programme, which would involve parents also.

If nutrition education is to effectively guide children's choice at lunchtime, any nutrition teaching scheme based, for example, on food groups, used as part of the nutrition education programme, must be easily remembered and easily applied. It has been suggested that such a scheme, with co-operation from the school caterers, could give 'point-of-choice' guidance to children at the cash cafeteria. This is discussed in Chapter Six.

3.4.4 Liaison between Nutrition Educators and School Caterers.

Such a 'point of choice' scheme would obviously, ideally, and probably essentially, involve the school caterer. Whilst appreciating the work load of school catering staff is heavy, it is hoped that a scheme could be evolved that is effective, and yet does not place too great an extra burden on the catering staff.

Such schemes have been working in USA and Canada for some years and also in France. Several education authorities already operate or are devising, schemes involving liaison between those who teach nutrition and school caterers to guide children towards a wise choice of items from the school cash cafeteria. Some of these schemes are discussed in Chapter Six.

It has already been suggested that the school caterer should be seen as an important member of the nutrition education team.
Chapter Five of this thesis describes a study which uses the quantified dietary goals as a basis for assessing the nutrition value of meals consumed by children at lunchtime, in order to determine whether there is a need for guidelines on the nutritional aspects of school meals as suggested.

Chapter Six will discuss, in the light of the findings of this study, how the guidelines might be implemented. Several LEAs are already implementing some aspects of these guidelines, these moves will also be examined.
Assistant Masters and Mistresses Association, (1985): *Is the Schoolburger here to stay?*


Inner London Education Authority Research and Statistics Division, Children in Need 1985.


National Advisory Committee on Nutrition Education (NACNE), (1983): Discussion paper for nutritional guidelines for Health Education in Britain. Report of an ad hoc working party under the chairmanship of Professor W. James, Health Education Council.


CHAPTER FIVE  A STUDY OF THE NUTRITIONAL VALUE OF MEALS CONSUMED AT LUNCHTIME IN A SAMPLE OF ILEA SCHOOLS

5.1 INTRODUCTION  AIMS OF THE STUDY

At the end of Chapter Four (4.3.3), it was suggested that the consensus of opinion overwhelmingly supported the idea that the school meal still had an important nutritional, educational and social role in the growth, health and development of school children in the 1980s, and that the best way of ensuring that this role was fulfilled was for the government to once again assume responsibility for the nutritional aspects of school meals. It was therefore suggested that guidelines on nutritional aspects of school meals should be formulated, based on current knowledge of the role of nutrition in the growth and health of school children (discussed in Chapter Three).

The concluding section of Chapter Four (4.4), suggested that such guidelines on the nutritional aspects of school meals should incorporate or give guidance in the following areas;
- quantified dietary goals
- dietary guidelines for achieving dietary goals
- nutrition education to guide choice
- liaison between school caterer and nutrition educator.

The current study uses the quantified dietary goals suggested in section 4.4.1. to evaluate the nutritional content of meals consumed at lunchtime in order to determine the need for the suggested guidelines on nutritional aspects of school meals and the feasibility of their implementation.

5.2 OBJECTIVES OF THE STUDY

The study will examine three main aspects of the nutritional value of meals consumed at lunchtime in a sample of ILEA schools.

Firstly, as was indicated in Chapter Four, one of the main effects of the 1980 Education Act was to hasten the change from a traditional fixed price service in school meals to a cash cafeteria system. In view of the concern expressed over the possible long term effects on children's health of the changes in provision of school meals, this study will compare the nutritional value of the meals consumed in schools where there is a cash cafeteria system, with those schools where a traditional fixed price system operates.
In practice, the comparison may not be as clear cut as this, as in some schools where the children pay a fixed price for their meal there may be opportunity to choose meals other than the traditional 'meat and vegetables, pudding and custard' type of meal. Many of the schools visited had a salad bar, or fast-food bar where items such as filled rolls, fruit, salads, beefburgers or frankfurters were available and could be chosen instead. There is, therefore, almost always quite a wide choice of food available from which the children can select their meal and the nutritional value of the meals consumed depends not only on the nutritional value of the foods provided by the school caterer but also on the foods that the child selects. This study will secondly examine the meals that children consume in order to ascertain how wisely they are choosing from the range of foods available to them.

Thirdly, as was also mentioned in Chapter Four (Section 4.2.2), following the 1980 Education Act and the increase in prices in many LEAs there was a sharp decline in numbers of children taking school meals, a trend which the introduction of a cash cafeteria system sought to reverse. It is, therefore, important that the nutritional value of school meals should be seen in the light of the alternative. In this study the nutritional value of school meals will be compared with the nutritional value of the alternatives, the main ones of which are packed lunches brought from home, food bought and consumed outside school at local cafes, take-aways, and shops, and meals eaten at home.

Two other aspects of school meals are also important.

Firstly, as economic factors may be a consideration in school meal uptake, the nutritional value of school meals and midday meal alternatives should be related to the cost to the consumer (data was collected but not analysed).

Secondly, many of those who feel that the school meal is no longer necessary argue that, because most children have a substantial and well-balanced meal at breakfast time and in the evening, the school meal is now less important in nutritional terms. This argument is not supported by various surveys (discussed in Chapter Three), and it was felt that, while resources were not available to carry out a quantitative investigation, the nutritional content of the school meal and midday meal alternatives should be related at least to a qualitative assessment of food consumed by children during the rest of the day (data collected but not analysed).
5.3 STUDY METHODOLOGY

5.3.1 Selection of sample schools.

A random sample of fifty secondary schools in the education authority was used for a major survey into children’s attitudes towards school meals. A small sample of these schools was used for the current study. As the main aim was to compare cash cafeteria systems with the traditional service, comparable schools using the two systems were included in the sample. In some cases where a school was about to change to a cash cafeteria, the school meal was surveyed before and after the change. It was possible that, at the time of major reorganisation, the meal and food choice might not have been representative, therefore the immediate changeover period was avoided to minimise this problem.

Description of the schools used.

- Garratt Green School - a girls school - surveyed before and after change to cash cafeteria.
- Sir Walter St John's School - a boys school surveyed before and after change to cash cafeteria.
- Walsingham School - a girls school which was on two separate sites, with separate kitchens.
  Walsingham lower school was surveyed before and after change to cafeteria.
  Walsingham upper school had already changed to a cash cafeteria at the time of the survey. This provided an opportunity to compare food choice in the upper and lower parts of the same school.
- Ernest Bevin School - this boys school was included because the headmaster, having read the introductory article in 'Contact', wrote and expressed interest in the survey, and asked whether his school could take part.

The list of schools which were about to change to a cash cafeteria system was supplied by the ILEA Education Catering Department.

Schools used for the pilot study

The pilot survey was carried out in;

- Prendergast school - a girls school serving fixed price meals
- Bacon School - a mixed school also serving fixed price meals.

Preliminary visits

After the schools were chosen, preliminary visits or telephone calls were made to the following people in order to explain the survey,
- the divisional catering officer, in whose division the school was, was telephoned to explain the survey and to ask permission to carry out the survey in the schools,
- the kitchen supervisor was visited in order to explain the purpose of the survey and what would be involved in the data collection. It was usually necessary to reassure her that the survey would in no way assess her personal performance,
- the head of the school was visited in order to explain the purpose of the survey and to ask permission to question a number of children who brought packed lunches to school, or who ate their lunches out of school, and also to arrange to collect data from these children, also to arrange to collect 24 hour recall data from a group of children. The arrangements for the collection of this latter data were usually delegated to another member of the staff,
- a member of staff was visited to arrange for the collection of 24 hour recall data. Members of staff who agreed to collect 24 hour recall data during lesson or tutor-group time included Home Economics, English and Sociology staff, and in some cases the Deputy Head.

The cooperation of all these people was an important factor in the nutrition survey, therefore the time spent obtaining this was vital. Also, the survey had to be designed to minimise the inconvenience and time involved for both catering and teaching staff who agreed to help survey in addition to their normal, usually heavy, work load.

5.3.2 Collection of data on school meals.

Assessment of portion sizes.

After trials it was decided that weighing each item of food as it was served onto the plate was impracticable for the following reasons;
- it would take too long to weigh it at the serving point, and would cause delays in the queue and inconvenience the child and serving staff.
- to transfer and weigh each item onto a fresh plate would detract from the appearance of the meal as originally served, would cause delay
and inconvenience to the child, and would cause the food to become cold.

Therefore, with the co-operation of the kitchen staff, a number of portions of each food were weighed before service started and average portion weights were obtained. As many of the items served, particularly in a cash cafeteria, were individual portions, e.g. sausages, fish fingers, jellies, yoghurts, mashed potatoes, the loss of accuracy was minimal.

Items where there was greatest variation in portion size were vegetables, e.g. chips, carrots. Dishes cooked in large trays and cut up before serving, e.g. pies and iced cakes, presented less difficulty - here portion sizes were fairly standard, except for corner pieces.

**Sampling of meals to be analysed nutritionally**

When service started, children passing the food service counter were sampled, and foods chosen were noted on a numbered form. The children were asked to return the form at the end of their meal and to return any plate waste to be weighed. If the children sampled returned for second helpings, this was noted.

In order that the food choice did not influence the sampling (or vice versa) every fifth, third or alternate child was noted before the food choice was made. The frequency of sampling depended on factors such as the speed at which the queue was moving and the number of service points.

Most children agreed to co-operate in this part of the survey. If a sampled child refused to co-operate, the next co-operative child in the queue was chosen.

**Statistical aspects**

In one school (Ernest Bevin) there were several service points serving different types of food; these were surveyed separately. However, the collection of data was further complicated by the fact that some items appeared on all three service points.

The survey was carried out on three different days of the week in each school.

Three schools were surveyed both before and after changing over to a cash cafeteria system.
Money spent

In some schools where the researcher was able to stand near the till in a cash cafeteria service, the amount of money spent was noted. It was also possible, in some cases, to note unobtrusively whether a ticket for a free lunch was handed in.

Collection of data on food choice

In pilot studies this information was obtained as a separate exercise, where a large number of children were sampled, and food choice was noted by the researcher on a numbered form as the child passed along the food service counter. Data from a larger number of children could be gathered in this way. However, in the main survey, in order to reduce the number of visits to each school, it was decided that a qualitative assessment of children's food choice could be obtained from the forms used to collect the data for the nutritional evaluation of the school meal.

5.3.3 Collection of data on midday meal alternatives.

Packed Lunches

Children who ate packed lunches on the school premises were questioned about the contents of their meals. It was occasionally possible to weigh items from packed lunches. Since these almost always included fairly standard items, e.g. sandwiches made from sliced bread, bought rolls, biscuits, crisps, it was always possible to weigh these items at a later stage and obtain sufficiently accurate weights to be able to analyse a number of packed lunches for nutritional content.

Off-premises lunches

It was more difficult to obtain data from children who ate lunch out of school and co-operation rates were lower. In two schools it was possible to stand at the school entrance and question children as they returned. In one case most of the children brought sandwiches from a nearby sandwich bar, so it was possible to obtain fairly accurate data for these, as for packed lunches. In another school most children had eaten at the local fish and chip shop, and by buying portions from this shop weights could be obtained. In another school the Deputy Headmaster
selected boys as they returned from lunch; the accuracy of information obtained in this particular case was least reliable.

5.3.4 Collection of data on food consumed during the rest of the day.

It was decided that, with the limited resources available, a 24 hour recall was the most practicable way of collecting information on food consumed during the rest of the day. Although more accurate information can be obtained when data is collected by personal interview using a nutritionist, most Head Teachers felt that it would cause least disruption of school timetables if the data could be collected by a teacher from a whole class or tutor-group at the same time. Therefore this data was collected by a teacher on a prepared form, during class or tutor-group time. In a few schools collection of data was incorporated into a teaching project on food in Home Economics or Sociology classes. In one school data was collected using a three-day diary.

5.3.5 Analysis of data.

Computer analysis of nutritional value of school meals and midday meal alternatives

Where quantitative data were obtained for school meals, packed lunches and other foods consumed at lunchtime, they were analysed by computer at the University of Surrey. The computer program data base was McCance and Widdowson's 'The Composition of Foods' by Paul and Southgate, published by HMSO (1978) and RDA tables (DHSS, 1979).

The foods were analysed for the following nutrients;

<table>
<thead>
<tr>
<th>Group A</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy</td>
<td>Vitamin C</td>
</tr>
<tr>
<td>Protein</td>
<td>Vitamin A</td>
</tr>
<tr>
<td>Thiamin</td>
<td>Vitamin D</td>
</tr>
<tr>
<td>Riboflavin</td>
<td>Calcium</td>
</tr>
<tr>
<td>Nicotinic acid</td>
<td>Iron</td>
</tr>
<tr>
<td>Folate</td>
<td></td>
</tr>
</tbody>
</table>

(expressed as percentage difference between the amounts of the nutrients provided by the meals and the RDAs)

From the above the percentage of the RDA for these nutrients provided by each meal was calculated.
From the computer analysis the percentage of total energy in each meal derived from fat, carbohydrate and protein was calculated.

In order to be able to compare the analysed data on school meals with current ideas on a 'balanced diet' and the suggested dietary goals for school meals the amount of sugar in each meal should be calculated as a percentage of the total energy provided by sugar. Similarly the amount of dietary fibre in each meal should be calculated in terms of grams of dietary fibre per MJ of energy. This, however, was not done.

Statistical analysis of the above data

Mean values for all nutrients analysed, and calculations derived from them, for all the sample meals served each day were obtained.

The following were calculated for sample days at sample schools
- standard deviation from the mean
- range of values
- distribution of values.

These values are tabulated or expressed graphically and included either in the results section (5.4) or in the appendix to this thesis.

Standards for comparison of nutritional values

It was suggested in Chapter Four (4.4) that the guidelines for the nutritional aspects of school meals should incorporate quantified goals which could be used not only as the basis of menu planning and food purchasing, but also for evaluating and monitoring the nutritional value of school meals. These suggested quantified dietary goals based on the recommendations of the NACNE (1983) and COMA (1984) reports were discussed in detail in section 4.4.1 and are summarised below.

In section 4.4.2 it was suggested that if dietary goals were expressed in terms of changes in consumption of foods which would be required to meet the goals, it is likely that vitamins and mineral intake would increase, therefore it would be unnecessary to make specific recommendations for the vitamin and mineral content of school meals, for
the purposes of menu planning and food purchasing. However, in studies such as the current one, where the nutritional content of meals consumed has been analysed, standards for evaluating the nutritional content are required. Suggestions for such standards are discussed below.

The figure of one third of the RDA (DHSS, 1979) for the following nutrients;

- energy
- protein
- thiamin
- riboflavin
- nicotinic acid
- Vitamin C
- vitamin A
- calcium
- iron

These values for the age groups involved in the current study are given below.

<table>
<thead>
<tr>
<th></th>
<th>12-14 years</th>
<th>15-17 years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>boys</td>
<td>girls</td>
</tr>
<tr>
<td>Energy MJ</td>
<td>3.63</td>
<td>3.00</td>
</tr>
<tr>
<td>Protein (g)</td>
<td>22</td>
<td>18</td>
</tr>
<tr>
<td>Thiamin (mg)</td>
<td>0.36</td>
<td>0.30</td>
</tr>
<tr>
<td>Riboflavin (mg)</td>
<td>0.46</td>
<td>0.46</td>
</tr>
<tr>
<td>Nicotinic Acid (mg)</td>
<td>5.3</td>
<td>5.3</td>
</tr>
<tr>
<td>Vitamin A (ug)</td>
<td>240</td>
<td>240</td>
</tr>
<tr>
<td>Vitamin C (mg)</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Calcium (mg)</td>
<td>230</td>
<td>230</td>
</tr>
<tr>
<td>Iron (mg)</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

These were the values used in a survey of school meals at Parkside School, Cambridge (1980).

Using a standard of one third RDA for assessing the nutritional value of school meals does not imply that this should necessarily be a standard to which school meals should conform. The use of RDA tables as a standard for evaluating dietary survey data was discussed in section 3.2.1, and the basis of the recommendations for adolescents was discussed in section 3.2.2. This discussion will be related to the results of the current study:

Folate

While the computer analysis compares the values with the published RDA (DHSS, 1979) for this nutrient, this is now being reviewed, and doubts are expressed on the accuracy of figures for folate content of foods given
in food tables.

**Vitamin D.**

The dietary requirement for vitamin D is now disputed.

It is, therefore, doubtful whether these comparisons for folate and vitamin D are valid. This will be discussed in more detail in the sections on these nutrients.

**Zinc.**

Zinc requirements of adolescents were discussed in section 3.5. No RDA was given by the DHSS (1979), but in the USA a figure of 15 mg per day is recommended for adolescents. In the UK average intakes of zinc have been variously estimated as 11 mg per day (Davies 1977) and 9.1 mg per day (Spring et al, 1970) and on present evidence zinc deficiency is not common so it must be assumed that these intakes are adequate. Lyon et al (1979), however, questioned this assumption. In this survey, the figure of 3 mg per day (as used in the Parkside survey), will be used as a standard for comparison.

Therefore, in summary, the standards used to assess the midday meal in this survey are as follows;

- one third of the RDA for the following nutrients:
  - Energy Vitamin C
  - Protein Vitamin A
  - Thiamin Calcium
  - Nicotinic acid Iron
- percentage of total energy
  - from fat not more than 35 %
  - from carbohydrates 50 - 55 %
  - from protein not less than 10 %
- dietary fibre 8.5g
- sugar 18 g
- salt 1.5g
- zinc 3 mg

**Use of RDA tables to evaluate data from school meals survey**

In connection with the use of RDA tables (DHSS, 1979) to evaluate the data in the current study the following points need to be made.

In addition to the variation in requirements between individuals (discussed in Chapter Three), it must be borne in mind that, in the current survey, quantitative information is only available for one meal of
the day. As discussed above, a standard of 33 per cent of the RDA was taken as the amount that the midday meals should provide, but there is the possibility that intakes markedly above or below this will be compensated for by the other meals in the day. With only qualitative information available on the food intake for the rest of the day it is not possible to state whether or not this occurs.

For some nutrients, eg. Vitamin C, where single portions of some foods provide a substantial proportion of the RDA, an insufficient amount of the nutrient in one meal can more easily be compensated for in another. Other nutrients, however, such as some B group vitamins, are found in smaller quantities in a wide range of foods, and particularly low intakes will be difficult to compensate for during the rest of the day.

Nevertheless, when discussing the results of this study, it will be assumed that, if a substantial proportion of the group have intakes for that meal of less than 33 per cent of RDA, the meal does not provide adequate amounts of the nutrient. There is, perhaps, particular cause for concern if a substantial proportion of the group have intakes of less than 20 per cent of the RDA.

On the other hand, particularly high intakes of energy, (eg. more than 75 per cent of RDA), high intakes of fat or sugar, unless compensated for in the rest of the day, may also be a cause for concern.

In section 3.5 on the eating habits of adolescents, it was suggested that particular attention should be paid to the extremes at either end of the range of intakes. Therefore, even though the mean values for the energy and nutrient content of all the meals in each category may show that on average the meals meet the standards set for comparison, an examination of the distribution, standard deviation from the mean, and the ranges of intakes for energy and each nutrient will reveal any individuals with particularly high or low intakes. As discussed previously this does not necessarily mean that the individual is necessarily malnourished as they may have particularly low or high requirements for the nutrient in question.

Analysis of 24 hour recall data.

As has been discussed in the aims of the survey, in order to assess the nutritional importance of the school meal, it should be related at least to a qualitative assessment of food eaten during the rest of the day. The intention was to compare 24 hour recall data from children who
ate school lunches with those from children who did not. However, due to the difficulties of drawing valid conclusions from such qualitative data, this was not analysed.

Analysis of Food Choice data.

Meals showing specific characteristics e.g. high energy, high fat, low fat, were selected from all the meals analysed to illustrate effects of wise choice of items, or otherwise, on nutritional value of the meal.

5.4 RESULTS AND DISCUSSION OF RESULTS

5.4.1 Quantitative data from school meals and midday meal alternatives.

Mean values and dispersion of data for energy and all nutrients.

Mean values for all nutrients analysed and calculations derived from them for all sampled meals served each day are tabulated and included in the appendix to this thesis. Tables of dispersion of analysed data (standard variations, range of values, distribution of values), for sample days in sample schools are also included in the appendix.

Results and discussion of results of values for individual nutrients.

The mean values, and dispersion of data for each nutrient analysed will be tabulated and discussed separately in order that the following aspects can be examined;
- to determine how the midday meals from all categories, traditional service, cash cafeteria school meals, packed lunches, and off-premises lunches, compare with the standards discussed above (section 5.3.5)
- how the nutritional value of traditional service school meals compares with that of cash cafeteria school meals in both a boys school and a girls school.
- how the nutritional value of school meals (traditional and cash cafeteria service) compares with that of non school meals (packed lunches and off-premises lunches).

General conclusions concerning the values for each nutrient and the
nutritional implications are also considered.

Energy (expressed as a percentage of RDA)

The following tables and figures show for sample days in a boys school and a girls school. (For numbers of meals, see tables in appendix).

Table 5.1 - mean energy contents of different types of meal
Table 5.2 - means, standard deviations and ranges of energy contents
Figure 5.1 - distribution of values for energy contents

Table 5.1 Mean energy content (% RDA) of different types of meal.

<table>
<thead>
<tr>
<th></th>
<th>Boys</th>
<th>Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meals</td>
<td>Traditional</td>
<td>Cash</td>
</tr>
<tr>
<td>meal</td>
<td>cafeteria</td>
<td>meal</td>
</tr>
<tr>
<td>Day 1</td>
<td>37.8</td>
<td>39.2</td>
</tr>
<tr>
<td>Day 2</td>
<td>29.5</td>
<td>38.4</td>
</tr>
<tr>
<td>Day 3</td>
<td>38.1</td>
<td>38.3</td>
</tr>
<tr>
<td>Weighted means</td>
<td>35.2</td>
<td>38.9</td>
</tr>
</tbody>
</table>

Table 5.2 Means, SDs, ranges of energy content (%RDA) of different types of meal.

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys - traditional</td>
<td>37.8</td>
<td>11.5</td>
<td>19.7 - 60.5</td>
</tr>
<tr>
<td>Boys - cafeteria</td>
<td>38.3</td>
<td>17.0</td>
<td>19.0 - 120.7</td>
</tr>
<tr>
<td>Girls - traditional</td>
<td>23.9</td>
<td>8.9</td>
<td>9.1 - 42.3</td>
</tr>
<tr>
<td>Girls - cafeteria</td>
<td>35.9</td>
<td>11.3</td>
<td>13.5 - 58.7</td>
</tr>
<tr>
<td>Off-premises lunches</td>
<td>24.0</td>
<td>10.8</td>
<td>5.0 - 49.0</td>
</tr>
<tr>
<td>Packed lunches</td>
<td>26.0</td>
<td>12.5</td>
<td>6.0 - 50.0</td>
</tr>
</tbody>
</table>

Discussion of results - Energy

Comparison of energy from meals with standards (33 per cent of RDA)

Mean values from the three days showed that both traditional service and cash cafeteria meals from the boys school provide energy intakes greater than 33 per cent of RDA on average, as do the meals from the girls
Figure 5.1 Distributions of energy content of different types of meal.

<table>
<thead>
<tr>
<th>Percentage of sample</th>
<th>less than 33%</th>
<th>more than 33%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys traditional</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys cash cafeteria</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Girls traditional</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Girls cash cafeteria</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Off-premises lunches</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Packed lunches</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 cm. represents 10% of sample
\[\square\] represents <20% or >75% of RDA.
school cash cafeteria. The meals from the girls school traditional service, packed lunches (girls) and off-premises lunches (boys) do not.

The trend indicated by the means becomes clearer if the distribution (Figure 5.1) is examined

- the girls school cash cafeteria showing equal distribution of energy intakes above and below 33 per cent, which may well be consistent with the variation in energy requirement of the group - the meal would thus seem to be providing enough energy.

- the girls school traditional service, off premises lunches and packed lunches contain a substantial proportion providing less than 33 per cent of RDA for energy, indicating that these meals were probably not providing enough energy.

- the meals from the boys school traditional service show a greater percentage providing more than 33 per cent of RDA, whereas those from the boys school cash cafeteria show a more even distribution, but still more above 33 per cent of RDA than below.

Comparison of energy values between traditional service and cash cafeteria service in both a boys school and a girls school.

Mean values for three days show a greater variation between days for traditional service meals than for cash cafeterias. This could be explained by the fact that the traditional service offers less choice, therefore if the items are not liked, they are not eaten. In a cash cafeteria, not only is the range of items offered greater, but is more consistent day to day. It is therefore expected that there would be less variation in energy intake between days.

Mean values also indicate that both boys and girls increase their energy intake where there are more foods that they like - as in a cash cafeteria. The increase in intakes is more marked in a girls school than in a boys school. This may be explained by the difference in quality of the traditional service meals in the girls school and the boys school in question, or it may indicate that girls' appetites are more susceptible to likes and dislikes. The distribution of energy intakes also reflects these trends.

The standard deviations from the mean show a greater spread of intakes in cash cafeteria service meals than in traditional service meals. This could be explained by the fact that where there is a greater freedom of choice over which foods are eaten and how much is eaten (a feature of a system where each item is paid for individually) children may more
accurately match their energy intake to their requirement. This factor could also be complicated by the amount of money the child has to spend and is an area which needs to be further investigated.

The range of energy intakes also reflects this, being greater in cash cafeteria systems than in traditional systems with girls showing less variation in intake than boys in both. This could indicate a smaller variation in energy requirement in girls than in boys, possibly accounted for by differences in physical activity; and again financial factors may operate. In the boys school the lower ends of the range were similar in both cash cafeteria and traditional services, but there was one case of a very high energy intake in the cash cafeteria. This meal will be examined in the section on food choice. This boy could have a very high energy requirement, or he could have been one of several boys in the school observed by the researcher to be overweight. In the girls school the lowest intake was observed in the traditional service which could be explained by the suggestion that the food was not liked.

Comparison of energy values of school meals and non-school meals.

The mean values for energy intake provided by school meals (except for girls school traditional service meals) were considerably higher than for non-school meals; this is also reflected in the distribution of the values, a substantial proportion of the non-school meals providing less than 33 per cent of RDA and many less than 20 per cent.

The values at both the top and bottom of the range were considerably lower for non-school meals than for school meals.

The much lower energy intake of most of the children not having school lunches, particularly the boys buying lunch off the premises, could be explained by the amount of money available. Although a detailed comparison of the relative costs was not carried out, children buying lunch outside school were spending more money than those eating in school. It is more difficult to explain the lower energy content of the girls packed lunches. Possibly the fact that many are preparing their own, or are given money to buy food on the way to school, could be important. Several girls had little or nothing for lunch, possibly due to lack of money to buy food, or lack of time for its purchase or preparation. One girl was saving money for her holiday by not eating lunch and had saved £1.55 already that week by Thursday. These very low intakes will be examined in more detail in the section on food choices. Deliberate reduction of energy intake in order to slim (as discussed previously) may
be an important fact in determining energy intake in girls.

**General conclusions and nutritional implications - Energy**

The suggestion that the cash cafeteria provides the flexibility for children to match their energy intake to their very variable energy requirements (Bender 1979) and the implications for school meals and nutrition education were discussed in section 4.2.2.

It would seem that, with some exceptions, school lunches are providing adequate energy for most children, whereas non-school lunches are not. The cash cafeteria system provides more items that children like and, by giving more freedom of choice, would appear to meet variation in energy needs more closely than the traditional system. The extent to which financial constraints are a factor requires further investigation as also does the choice of items in individual meals providing energy intakes at both the top and the bottom of the range.

The variation in energy requirements and incidence of obesity in adolescence have already been discussed (3.2.2 and 3.5.5) as has the importance of maintaining energy balance to prevent obesity (3.6.1).

**Balance of energy from different sources**

Table 5.3 (a.b.c.) shows mean values for balance of energy (as % of total energy) from different sources in different types of meal.

**Discussion of results - balance of energy from different sources**

Comparison of balance of energy from different sources with standards (dietary goals) - 30 - 35 % from fat
50 - 55 % from carbohydrate
10 - 12 % from protein

Table 5.3 shows that the meals which were nearest to these standards were those in the girls school traditional service, however, as pointed out above, these provided the lowest amount of energy, indicating probably that meals were not liked and not consumed.

The greatest imbalance was found in the boys school traditional service between fat (46 %) and carbohydrate (44 %), The proportion of energy from protein (10%), was at the lower end of the recommended range, but probably adequate. The menu in this school for the traditional
service was particularly high in fatty foods, e.g. sausage rolls, pastry, iced Victoria sandwich cakes; possibly in the mistaken belief that the high energy requirements of some teenage boys, need to be met by a diet high in fat. (The subjective impression of the researcher that a noticeable number of boys in this school were overweight has already been mentioned. This impression was formed before the nutritional analysis was carried out).

Table 5.3 Mean values for percentage of total energy derived from fat, carbohydrate (CHO), protein for different types of meals.

<table>
<thead>
<tr>
<th></th>
<th>Traditional</th>
<th>Cash cafeteria</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) Boys</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentage</td>
<td>Fat</td>
<td>CHO</td>
</tr>
<tr>
<td>energy from</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Day 1</td>
<td>50.5</td>
<td>38.8</td>
</tr>
<tr>
<td>Day 2</td>
<td>39.2</td>
<td>49.0</td>
</tr>
<tr>
<td>Day 3</td>
<td>42.6</td>
<td>49.5</td>
</tr>
<tr>
<td>Weighted mean</td>
<td>43.8</td>
<td>46.2</td>
</tr>
<tr>
<td>(b) Girls</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentage</td>
<td>Fat</td>
<td>CHO</td>
</tr>
<tr>
<td>energy from</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Day 1</td>
<td>36.7</td>
<td>48.5</td>
</tr>
<tr>
<td>Day 2</td>
<td>36.2</td>
<td>50.9</td>
</tr>
<tr>
<td>Day 3</td>
<td>35.9</td>
<td>50.4</td>
</tr>
<tr>
<td>Weighted mean</td>
<td>36.2</td>
<td>50.2</td>
</tr>
<tr>
<td>(c) Alternatives to school meals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Packed lunch</td>
<td>Fat</td>
<td>CHO</td>
</tr>
<tr>
<td>Percentage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>energy from</td>
<td></td>
<td></td>
</tr>
<tr>
<td>43.7</td>
<td>46.2</td>
<td>9.9</td>
</tr>
<tr>
<td>Off-premises lunch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentage</td>
<td>Fat</td>
<td>CHO</td>
</tr>
<tr>
<td>energy from</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>54</td>
<td>6</td>
</tr>
</tbody>
</table>
Meals eaten off the premises (boys) also showed an imbalance, the proportion of energy from fat again being too high (40%), but in this case at the expense of protein at (6%). The proportion of energy from carbohydrate is close to that recommended; but it is likely that this could be due to a high sugar intake.

Packed lunches also showed too great a proportion of energy from fat (44%) and too low a proportion from carbohydrate (46%).

Comparison of balance of energy from different sources in traditional meals and cash cafeteria meals in both a boys school and a girls school

The proportion of energy provided by fat, carbohydrate and protein in cash cafeteria meals was similar in both the boys school and the girls school; that is, too high a proportion of energy from fat, and too low from carbohydrate. However, when the boys school changed from traditional service to cash cafeteria service, the proportion of energy from fat decreased and from carbohydrate increased; indicating possibly a preference for less fatty foods when given the choice.

In the girls school the proportion of energy from fat increased when the system was changed; the energy intake also increased, indicating that the girls were eating more, and suggesting that the foods that they like are those higher in fat. The proportion of energy from carbohydrate remained almost the same; the proportion from protein was reduced.

Comparison of balance of energy from different sources in school meals and non-school meals.

The imbalance in packed lunches was comparable to that found in the boys school meals traditional service. This high fat intake was explained by the frequency with which crisps, sometimes several packets, formed part of a packed lunch.

Off-premises lunches also showed an imbalance; in this case fat was increased at the expense of protein. The proportion of energy from carbohydrate was close to recommended amount, but again could well be accounted for by high sugar intakes. Many of the meals consumed off the premises consisted of just chips, or just chocolate (e.g. a Mars Bar), or possibly both, and fizzy drinks appeared frequently.
General conclusions and nutritional implications - balance of energy from different sources

These will be discussed with fat, sugar, dietary fibre and salt.

**Energy from fat (percentage of total energy)**

The following tables and figures show for sample meals in a boys school and a girls school;

Table 5.4 - mean values for percentage of total energy derived from fat in different types of meals
Table 5.5 - means, standard deviations and ranges for percentage of total energy derived from fat
Figure 5.2 - distribution of values for percentage of total energy derived from fat

**Table 5.4 Mean values for percentage total energy derived from fat in different types of meals**

<table>
<thead>
<tr>
<th>Meals</th>
<th>Boys Traditional meal</th>
<th>Cash cafeteria</th>
<th>Girls Traditional meal</th>
<th>Cafeteria (1)</th>
<th>Cafeteria (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 1</td>
<td>50.5</td>
<td>42.7</td>
<td>36.7</td>
<td>38.4</td>
<td>38.8</td>
</tr>
<tr>
<td>Day 2</td>
<td>39.2</td>
<td>38.0</td>
<td>36.2</td>
<td>38.1</td>
<td>35.3</td>
</tr>
<tr>
<td>Day 3</td>
<td>42.6</td>
<td>38.0</td>
<td>35.9</td>
<td>40.0</td>
<td>35.3</td>
</tr>
<tr>
<td>Weighted means</td>
<td>43.8</td>
<td>39.6</td>
<td>36.2</td>
<td>38.8</td>
<td>36.6</td>
</tr>
</tbody>
</table>

**Table 5.5 Means, SDs ranges - percentage of total energy derived from fat in different types of meal.**

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys traditional</td>
<td>50.5</td>
<td>4.6</td>
<td>41.7 - 58.7</td>
</tr>
<tr>
<td>Boys cafeteria</td>
<td>38.0</td>
<td>7.7</td>
<td>26.0 - 58.4</td>
</tr>
<tr>
<td>Girls traditional</td>
<td>35.9</td>
<td>8.6</td>
<td>18.1 - 53.4</td>
</tr>
<tr>
<td>Girls cafeteria</td>
<td>39.2</td>
<td>8.1</td>
<td>27.0 - 64.8</td>
</tr>
<tr>
<td>Off-premises lunch</td>
<td>39.8</td>
<td>10.4</td>
<td>24.0 - 64.0</td>
</tr>
<tr>
<td>Packed lunch</td>
<td>43.7</td>
<td>7.8</td>
<td>31.0 - 61.0</td>
</tr>
</tbody>
</table>
Figure 5.2 Distributions of energy derived from fat in different types of meal.

<table>
<thead>
<tr>
<th>Percentage of sample less than 35%</th>
<th>more than 35%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys traditional</td>
<td></td>
</tr>
<tr>
<td>Boys cash</td>
<td></td>
</tr>
<tr>
<td>cafeteria</td>
<td></td>
</tr>
<tr>
<td>Girls traditional</td>
<td></td>
</tr>
<tr>
<td>Girls cash</td>
<td></td>
</tr>
<tr>
<td>cafeteria</td>
<td></td>
</tr>
<tr>
<td>Off-premises lunches</td>
<td></td>
</tr>
<tr>
<td>Packed lunches</td>
<td></td>
</tr>
</tbody>
</table>

1 cm. represents 10% of sample

Figure 5.3 Distributions of sugar content of different types of meal. (see pp 290/1).

<table>
<thead>
<tr>
<th>Percentage of sample less than 18gm.</th>
<th>more than 18gm.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys traditional</td>
<td></td>
</tr>
<tr>
<td>Boys cash</td>
<td></td>
</tr>
<tr>
<td>cafeteria</td>
<td></td>
</tr>
<tr>
<td>Girls traditional</td>
<td></td>
</tr>
<tr>
<td>Girls cash</td>
<td></td>
</tr>
<tr>
<td>cafeteria</td>
<td></td>
</tr>
<tr>
<td>Off-premises lunches</td>
<td></td>
</tr>
<tr>
<td>Packed lunches</td>
<td></td>
</tr>
</tbody>
</table>

1 cm. represents 10% of sample
Discussion of results - percentage of total energy from fat

This has already been discussed in the previous section. However, examination of the distribution of values, standard deviations, and ranges (Tables 5.4, 5.5, and Figure 5.2) showed the effects of changing from a traditional service to a cash cafeteria.

In the boys school the change to a cash cafeteria system resulted in a greater spread in the intake of fatty foods and the lower end of the range of intakes was lower - probably as a result of greater freedom of choice.

In the girls school the spread of intakes remained much the same when the system changed, but the whole range moved upwards.

The different effects of the change to a cash cafeteria in the boys and girls schools could be explained by the greater change in the items served in the girls school.

The individual meals providing the highest proportion of energy from fat occurred in the girls cash cafeteria, packed lunches and off-premises lunches (60% energy from fat). These meals will be examined in more detail in the section on food choice.

General conclusions and nutritional implications - percentage energy from fat.

These will be discussed together with sugar, dietary fibre, and salt.

Sugar (grams)

The following tables and figures show for sample days in a boys school and a girls school;
Table 5.6 - mean sugar content of different types of meal
Table 5.7 - means, standard deviations, and ranges of sugar content
Figure 5.3 - distribution of values for sugar content.

Discussion of results - sugar

Comparison of sugar content of meals with standards (not more than 18 grams)

The mean values for sugar in all meals were higher than the standard. In the boys cash cafeteria the mean value was nearly three times the
standard. While there was a change in the proportion of energy from fat and carbohydrate when the system changed to cash cafeteria, it is clear that the carbohydrate was in the form of sugar rather than complex carbohydrate. Similarly the energy from carbohydrate in off-premises lunches was again mainly from sugar.

Table 5.6 Sugar (grams) in different types of meal

<table>
<thead>
<tr>
<th>Boys</th>
<th>Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meals</td>
<td>Traditional meal</td>
</tr>
<tr>
<td>Day 1</td>
<td>39.9</td>
</tr>
<tr>
<td>Day 2</td>
<td>41.4</td>
</tr>
<tr>
<td>Day 3</td>
<td>51.8</td>
</tr>
<tr>
<td>Weighted means</td>
<td>44.9</td>
</tr>
</tbody>
</table>

Table 5.7 Means, SDs Ranges - Sugar (grams)
in different types of meal

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys traditional</td>
<td>39.9</td>
<td>20.0</td>
<td>20.5 – 101.0</td>
</tr>
<tr>
<td>Boys cafeteria</td>
<td>53.7</td>
<td>40.3</td>
<td>15.5 – 212.0</td>
</tr>
<tr>
<td>Girls traditional</td>
<td>22.4</td>
<td>9.8</td>
<td>5.5 – 44.7</td>
</tr>
<tr>
<td>Girls cafeteria</td>
<td>32.1</td>
<td>16.4</td>
<td>0.6 – 63.0</td>
</tr>
<tr>
<td>Off-premises lunch</td>
<td>49.0</td>
<td>43.2</td>
<td>0.0 – 199.0</td>
</tr>
<tr>
<td>Packed lunch</td>
<td>26.0</td>
<td>17.1</td>
<td>0.0 – 59.0</td>
</tr>
</tbody>
</table>

The girls school meals and packed lunches (girls), provided smaller quantities of sugar. This could be explained by the findings of a number of surveys on adolescent attitudes to foods (discussed in section 3.5.6) which indicate that girls are more anxious to avoid spots and putting on weight, both of which they connect with sugar intakes.

The mistaken belief that the high energy requirements of teenage boys need to be met by sugary foods may be responsible for the high sugar intake found in the boys school.
Comparison of sugar contents of traditional and cash cafeteria meals in a boys school and a girls school:

In both the boys school and the girls school the sugar intake increased when the system changed from a traditional to cash cafeteria service. The spread of intakes is much wider in cash cafeteria meals than in traditional service meals, again showing the effect of greater freedom of choice. The low sugar content of some meals consumed by girls are due the lack of sweet course in a meal. The individual meal providing the highest intake of sugar, 212 grams, was consumed in the boys school cash cafeteria, indicating the effect of freedom of choice.

Comparison of sugar contents of school lunches and non-school lunches

The differences between off-premises lunches (boys) and packed lunches (girls) were more marked than the differences between non-school lunches and school lunches. Mean values, standard deviation, and ranges of sugar contents for off-premises and packed lunches are comparable to boys and girls school cash cafeteria meals respectively, showing the effects of the freedom of choice which operates in non-school lunches.

Dietary fibre (in grams)

The following tables and figures show for sample days in a boys school and a girls school;

Table 5.8 - mean dietary fibre contents of different types of meal
Table 5.9 - means, standard deviations and ranges of dietary fibre contents
Figure 5.4 - distribution of values for dietary fibre content.

Discussion of results - dietary fibre

Comparison of dietary fibre contents with standards (8.5 grams)

Mean values for dietary fibre are lower than the standard in all meals. However, the values may be underestimated as the computer database did not include a value for the dietary fibre content of chips, or for several dishes including pastry. As a value for frozen chips is given as 3.2 grams per 100 grams and the average portion of chips was 120 grams,
these would make an appreciable contribution to the fibre content of some meals. This source of error is greater for cash cafeteria meals and off-premises lunches which more frequently contain chips.

Table 5.8 Mean dietary fibre contents (grams) of different types of meal

<table>
<thead>
<tr>
<th>Meals</th>
<th>Boys</th>
<th>Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Traditional</td>
<td>Cash cafeteria</td>
</tr>
<tr>
<td>Day 1</td>
<td>4.92</td>
<td>4.70</td>
</tr>
<tr>
<td>Day 2</td>
<td>7.64</td>
<td>6.51</td>
</tr>
<tr>
<td>Day 3</td>
<td>3.73</td>
<td>4.78</td>
</tr>
<tr>
<td>Weighted means</td>
<td>5.34</td>
<td>5.35</td>
</tr>
</tbody>
</table>

Table 5.9 Means SDs and ranges of dietary fibre contents (grams) of different types of meal

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys traditional</td>
<td>4.92</td>
<td>2.29</td>
<td>1.24 - 9.64</td>
</tr>
<tr>
<td>Boys cafeteria</td>
<td>4.78</td>
<td>3.61</td>
<td>0.00 - 11.70</td>
</tr>
<tr>
<td>Girls traditional</td>
<td>3.05</td>
<td>1.64</td>
<td>0.00 - 6.46</td>
</tr>
<tr>
<td>Girls cafeteria</td>
<td>2.95</td>
<td>2.34</td>
<td>0.00 - 9.00</td>
</tr>
<tr>
<td>Off premises lunches</td>
<td>1.00</td>
<td>1.15</td>
<td>0.00 - 3.00</td>
</tr>
<tr>
<td>Packed lunches</td>
<td>5.70</td>
<td>2.30</td>
<td>1.70 - 10.00</td>
</tr>
</tbody>
</table>

The mean values for the dietary fibre content of meals were greater in the boys schools than the girls schools, probably due to the fact that the boys were consuming larger portions of those foods containing fibre. Distributions and ranges of values show some very low intakes (some given as 0), however, as previously explained, these are likely to be underestimates. Only the boys school meals and packed lunches provided individual meals containing more than 8 grams of fibre; the boys school meals due probably to the large intakes of food, and packed lunches due to the contribution of bread.
Figure 5.4 Distributions of dietary fibre in different types of meal.

<table>
<thead>
<tr>
<th></th>
<th>Percentage of sample less than 8gm.</th>
<th>more than 8gm.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys traditional</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys cash cafeteria</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Girls traditional</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Girls cash cafeteria</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Off-premises lunches</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Packed lunches</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 cm. represents 10% of sample

Figure 5.5 Distributions of sodium content of different types of meal. (see pp 294/5).

<table>
<thead>
<tr>
<th></th>
<th>Percentage of sample less than 1.5gm.</th>
<th>more than 1.5gm.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys traditional</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys cash cafeteria</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Girls traditional</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Girls cash cafeteria</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Off-premises lunches</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Packed lunches</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 cm. represents 10% of sample
Comparison of dietary fibre contents of traditional service meals with cash cafeteria meals in a boys school and a girls school

Results show little difference in dietary fibre intake in the boys school when the system was changed. There was probably a greater difference than indicated due to the more frequent consumption of chips. However, this was possibly compensated for by smaller consumption of vegetables other than potatoes. It was observed that vegetables were quite frequently consumed in the traditional service meals at this school.

In the girls school, fibre intakes showed an apparent decrease when the system changed. Due to the lack of values for the dietary fibre content of chips, this was probably not a real decrease as chip consumption increased.

Once again, greater freedom of choice in the cash cafeteria system was reflected in the greater spread of values for dietary fibre intakes in cash cafeteria meals.

Comparison of dietary fibre contents of school meals with non-school meals

The mean values for dietary fibre contents of packed lunches was comparatively high, due to the frequent consumption of bread, even though this was rarely wholemeal bread; crisps also contribute to the dietary fibre content of packed lunches.

The spread of values was quite high, due to the variable composition of packed lunches.

Off-premises lunches gave low values for dietary fibre, these were probably under-estimated.

Sodium (in grams)

The following tables and figures show for sample days in a boys school and a girls school;

Table 5.10 mean sodium contents of different types of meal
Table 5.11 - means, standard deviations, and ranges of sodium contents
Figure 5.5 - distribution of values for sodium content
Table 5.10 Mean sodium contents (grams) of different types of meal

<table>
<thead>
<tr>
<th>Boys</th>
<th>Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meals</td>
<td>Traditional meal</td>
</tr>
<tr>
<td>Day 1</td>
<td>1.08</td>
</tr>
<tr>
<td>Day 2</td>
<td>1.30</td>
</tr>
<tr>
<td>Day 3</td>
<td>1.14</td>
</tr>
<tr>
<td>Weighted means</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 5.11 Means, SDs, ranges of sodium contents (grams) of different types of meals

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys traditional</td>
<td>1.10</td>
<td>0.25</td>
<td>0.58 - 1.70</td>
</tr>
<tr>
<td>Boys cafeteria</td>
<td>1.05</td>
<td>0.47</td>
<td>0.45 - 2.20</td>
</tr>
<tr>
<td>Girls traditional</td>
<td>1.18</td>
<td>0.61</td>
<td>0.40 - 2.60</td>
</tr>
<tr>
<td>Girls cafeteria</td>
<td>0.82</td>
<td>0.37</td>
<td>0.25 - 1.70</td>
</tr>
<tr>
<td>Off-premises lunches</td>
<td>0.41</td>
<td>0.41</td>
<td>0.02 - 1.49</td>
</tr>
<tr>
<td>Packed lunches</td>
<td>0.83</td>
<td>0.46</td>
<td>0.23 - 2.00</td>
</tr>
</tbody>
</table>

Discussion of results - sodium

Comparison of sodium contents with standards

Mean values for all meals are less than 1.5 grams. Distribution of values show very few meals containing more than 1.5 grams.

Comparison of sodium contents of traditional service meals with cash cafeteria meals in a boys school and a girls school

The change to cash cafeteria meals appeared to have little effect on sodium intake.

However these figures, obtained by computer analysis of foods served, take no account of variations (which may be considerable) in salt added in cooking, recipe variation in salt content, or salt added at the
Conclusions and Nutritional Implications - balance of energy from different sources
- sugar
- dietary fibre

Balance of energy from different sources

The mean values for meals from all categories showed that too much of the energy was coming from fat, this was particularly true of the packed lunches and the boys school traditional service meals.

The meals nearest to the recommended standard were those in the girls school traditional service, but smaller meals were eaten, indicating that these meals were not providing the foods that the girls liked.

In most cases where the proportion of energy from fat was high, that from carbohydrate was low. The exception to this was the off-premises lunches, where the energy from protein was low. In these lunches the proportion of energy from carbohydrate was close to the recommended level, but this was due to very high sugar intakes.

When the boys school changed to the cash cafeteria service, the proportion of energy from fat decreased and that from carbohydrate increased. However the energy from fat was replaced by energy from sugar rather than from complex carbohydrates.

When the girls school changed to a cash cafeteria the proportion of energy from fat increased and that for protein decreased, the carbohydrate remained much the same.

Sugar

The mean values for meals from all categories showed that too much sugar was consumed, particularly by boys, the change to cash cafeteria in each case being accompanied by an increase in sugar consumption.

Dietary fibre

Even when an underestimate in values for dietary fibre was taken into account, mean values for meals in all categories were low, the source of error being greatest in cash cafeteria meals where more chips were consumed. Particularly low values were found in off-premises lunches.
In the case of almost all the nutrients discussed, the greater freedom of choice found in the cash cafeteria, off-premises lunches, and packed lunches, was reflected in a wide spread of intakes. Those meals at the extremes of the ranges, with high fat and sugar and low dietary fibre contents are cause for concern.

The background to the current dietary recommendations to reduce fat, sugar and salt intake, and increase dietary fibre intake has already been discussed (2.4); as has the NACNE (1983) report suggestion that the idea of a balanced diet should be redefined (3.4.1.) in terms of the balance of energy from different sources.

The justification for the application of current dietary recommendations to the diets of school children and adolescents was discussed in section (3.6.3), and of the use of these dietary goals as the bases for guidelines or nutritional aspects of school meals in section 3.4.

Dietary guidelines in terms of changes in food consumption to implement these dietary goals with particular reference to school meals will be discussed in Chapter Six.

Protein, vitamins and minerals.

Results - protein, vitamins and minerals

The following tables and figures show for sample days in a boys school and a girls school;
- mean nutrient contents of different types of meal
- means, standard deviations and ranges of nutrient contents
- distribution of values for nutrient content
for the following nutrients (as percentage of RDA)
- protein Tables 5.12, 5.13; Figure 5.6
- thiamin 5.14, 5.15; 5.7
- riboflavin 5.16, 5.17 5.8
- nicotinic acid 5.18, 5.19 5.9
- folate 5.20, 5.21 5.10
- vitamin C 5.22, 5.23 5.11
- vitamin A 5.24, 5.25 5.12
- vitamin D 5.26, 5.27 5.13
- calcium 5.28, 5.29 5.14
- iron 5.30, 5.31 5.15
Tables 5.31, 5.32 and Figure 5.16 give the values for zinc in milligrams.

**Discussion of results - protein, vitamins and minerals**

**Comparison of nutrient content of meals with standards** (33 per cent of RDA for all above nutrients except zinc - 3 milligrams)

**Protein, nicotinic acid, calcium and vitamin C**

The mean values (Tables 5.12, 5.18, 5.22, 5.28) for school meals in all categories were greater than 33 per cent of RDA for these nutrients. Distribution of values (Figures 5.6, 5.9), however, for both protein and nicotinic acid in the girls school traditional service showed that there were more girls receiving less than 33 per cent RDA than there were receiving more than 33 per cent RDA; also, in these meals, there were more girls with intakes below 20 per cent RDA, particularly for nicotinic acid. This could be explained by the lower food intake from these traditional service meals.

**Thiamin.**

Mean values (Table 5.14) for thiamin were greater than 33 per cent RDA in cash cafeteria meals, but not in the traditional meals in both the boys and girls school. This could be explained by the greater food intake in the cash cafeteria service. Thiamin is fairly widely distributed in foods and is usually related to energy intake. Bread (a good source of thiamin, due to fortification) is eaten more frequently in the cash cafeteria in the form of rolls with beefburgers and frankfurters.

Distribution of values (Figure 5.7) for thiamin showed that 50 per cent of the meals eaten in the girls school traditional service contained less than 20 per cent RDA.

**Riboflavin.**

Mean values (Table 5.16) for school meals in all categories were less than 33 per cent RDA.

Distribution of values (Figure 5.8) showed that a relatively high proportion of meals were providing less than 20 per cent RDA, particularly in the girls school.
### Table 5.12 Mean protein content (% RDA) of different types of meal

<table>
<thead>
<tr>
<th>Boys Traditional meal</th>
<th>Cash cafeteria</th>
<th>Girls Traditional meal</th>
<th>Cafeteria (1)</th>
<th>Cafeteria (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 1 38.1</td>
<td>36.4</td>
<td>54.6</td>
<td>40.3</td>
<td>30.3</td>
</tr>
<tr>
<td>Day 2 33.7</td>
<td>39.0</td>
<td>31.0</td>
<td>37.1</td>
<td>27.0</td>
</tr>
<tr>
<td>Day 3 29.5</td>
<td>39.3</td>
<td>32.4</td>
<td>38.1</td>
<td>29.4</td>
</tr>
<tr>
<td>Weighted means 33.4</td>
<td>38.2</td>
<td>36.1</td>
<td>38.5</td>
<td>29.1</td>
</tr>
</tbody>
</table>

### Table 5.13 Means, SDs, ranges of protein content (% RDA) of different types of meal

<table>
<thead>
<tr>
<th>Boys traditional</th>
<th>Boys cafeteria</th>
<th>Girls traditional</th>
<th>Girls cafeteria</th>
<th>Off-premises lunches</th>
<th>Packed lunches</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean 38.1</td>
<td>39.3</td>
<td>32.4</td>
<td>37.8</td>
<td>14.0</td>
<td>26.0</td>
</tr>
<tr>
<td>SD 12.8</td>
<td>14.2</td>
<td>14.7</td>
<td>10.8</td>
<td>8.0</td>
<td>16.5</td>
</tr>
<tr>
<td>Range 22.0 - 82.4</td>
<td>14.5 - 80.4</td>
<td>7.7 - 66.9</td>
<td>17.9 - 61.7</td>
<td>5.0 - 37.0</td>
<td>3.0 - 68.0</td>
</tr>
</tbody>
</table>

### Figure 5.6 Distributions of protein content of different types of meal

- **Percentage of sample**
  - less than 33% RDA
  - more than 33% RDA

- **Boys**
  - traditional
  - cash cafeteria

- **Girls**
  - traditional
  - cash cafeteria

- **Off-premises lunches**
  - Packed lunches

1 cm. represents 10% of sample

\[\equiv\] represents <20% or >75% of RDA.
Table 5.14 Mean thiamin content (% RDA) of different types of meal

<table>
<thead>
<tr>
<th></th>
<th>Boys</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Traditional</td>
<td>Cash cafeteria</td>
<td>Traditional meal</td>
<td>Cafeteria (1)</td>
<td>Cafeteria (2)</td>
</tr>
<tr>
<td>Day 1</td>
<td>28.5</td>
<td>32.4</td>
<td>57.0</td>
<td>39.2</td>
<td>32.4</td>
</tr>
<tr>
<td>Day 2</td>
<td>25.5</td>
<td>34.8</td>
<td>24.0</td>
<td>37.5</td>
<td>28.5</td>
</tr>
<tr>
<td>Day 3</td>
<td>27.0</td>
<td>35.6</td>
<td>21.6</td>
<td>34.4</td>
<td>30.2</td>
</tr>
<tr>
<td>Weighted means</td>
<td>27.0</td>
<td>34.2</td>
<td>29.4</td>
<td>37.0</td>
<td>30.5</td>
</tr>
</tbody>
</table>

Table 5.15 Means, SDs, ranges of thiamin contents (% RDA) of different types of meal

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys traditional</td>
<td>28.5</td>
<td>9.64</td>
<td>8.5 - 54.8</td>
</tr>
<tr>
<td>Boys cafeteria</td>
<td>35.3</td>
<td>11.87</td>
<td>15.5 - 67.7</td>
</tr>
<tr>
<td>Girls traditional</td>
<td>21.6</td>
<td>7.83</td>
<td>5.8 - 44.0</td>
</tr>
<tr>
<td>Girls cafeteria</td>
<td>37.6</td>
<td>14.47</td>
<td>13.2 - 73.4</td>
</tr>
<tr>
<td>Off-premises lunches</td>
<td>14.0</td>
<td>6.70</td>
<td>0.0 - 24.0</td>
</tr>
<tr>
<td>Packed lunches</td>
<td>28.0</td>
<td>19.90</td>
<td>5.0 - 87.0</td>
</tr>
</tbody>
</table>

Figure 5.7 Distributions of thiamin content of different types of meal

1 cm. represents 10% of sample

\[
\text{represents } <20\% \text{ or } >75\% \text{ of RDA.}
\]
Table 5.16 Mean riboflavin content (% RDA) of different types of meal

<table>
<thead>
<tr>
<th></th>
<th>Boys</th>
<th>Girls</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Traditional</td>
<td>Cash</td>
<td>Traditional</td>
<td>Cafeteria</td>
</tr>
<tr>
<td></td>
<td>meal</td>
<td>cafeteria</td>
<td>meal</td>
<td>(1)</td>
</tr>
<tr>
<td>Day 1</td>
<td>36.1</td>
<td>24.8</td>
<td>41.8</td>
<td>21.9</td>
</tr>
<tr>
<td>Day 2</td>
<td>26.3</td>
<td>29.8</td>
<td>22.5</td>
<td>23.0</td>
</tr>
<tr>
<td>Day 3</td>
<td>25.9</td>
<td>31.0</td>
<td>25.1</td>
<td>23.1</td>
</tr>
<tr>
<td>Weighted means</td>
<td>29.0</td>
<td>28.4</td>
<td>27.2</td>
<td>22.7</td>
</tr>
</tbody>
</table>

Table 5.17 Means, SDs, ranges of riboflavin content (% RDA) of different types of meal

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys traditional</td>
<td>36.0</td>
<td>40.6</td>
<td>7.1 - 212</td>
</tr>
<tr>
<td>(27.4)</td>
<td>(10.5)</td>
<td></td>
<td>(47.2)</td>
</tr>
<tr>
<td>Boys cafeteria</td>
<td>31.0</td>
<td>15.2</td>
<td>7.5 - 81.4</td>
</tr>
<tr>
<td>Girls traditional</td>
<td>25.1</td>
<td>12.3</td>
<td>6.7 - 57.3</td>
</tr>
<tr>
<td>Girls cafeteria</td>
<td>23.3</td>
<td>12.2</td>
<td>5.0 - 42.4</td>
</tr>
<tr>
<td>Off-premises lunches</td>
<td>14.0</td>
<td>6.7</td>
<td>0.0 - 24.0</td>
</tr>
<tr>
<td>Packed lunches</td>
<td>15.0</td>
<td>16.2</td>
<td>1.0 - 77.0</td>
</tr>
</tbody>
</table>

Figures in () omit anomalous data

Figure 5.8 Distributions of riboflavin content of different types of meal.

Percentage of sample less than 33% RDA more than 33% RDA

Boys traditional
Boys cash cafeteria
Girls traditional
Girls cash cafeteria
Off-premises lunches
Packed lunches

1 cm. represents 10% of sample
/// represents <20% or >75% of RDA.
Table 5.18 Mean nicotinic acid content (% RDA) of different types of meal

<table>
<thead>
<tr>
<th></th>
<th>Boys</th>
<th>Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Traditional meal</td>
<td>Cash cafeteria</td>
</tr>
<tr>
<td>Day 1</td>
<td>55.5</td>
<td>52.6</td>
</tr>
<tr>
<td>Day 2</td>
<td>52.4</td>
<td>51.6</td>
</tr>
<tr>
<td>Day 3</td>
<td>41.8</td>
<td>53.9</td>
</tr>
<tr>
<td>Weighted mean</td>
<td>49.3</td>
<td>52.6</td>
</tr>
</tbody>
</table>

Table 5.19 Means, SDs, ranges of nicotinic acid content (% RDA) of different types of meal

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>traditional</td>
<td>56.0</td>
<td>21.7</td>
<td>28.3 - 151</td>
</tr>
<tr>
<td>cafeteri a</td>
<td>(42.0)</td>
<td>(11.1)</td>
<td>(72.3)</td>
</tr>
<tr>
<td>Girls</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>traditional</td>
<td>40.0</td>
<td>19.0</td>
<td>14.0 - 88.0</td>
</tr>
<tr>
<td>cafeteri a</td>
<td>46.0</td>
<td>16.1</td>
<td>21.0 - 82.0</td>
</tr>
<tr>
<td>Off-premises lunches</td>
<td>24.0</td>
<td>12.9</td>
<td>4.0 - 64.0</td>
</tr>
<tr>
<td>Packed lunches</td>
<td>38.0</td>
<td>19.0</td>
<td>10.0 - 87.0</td>
</tr>
</tbody>
</table>

Figures in () omit anomalous data.

Figure 5.9 Distributions of nicotinic acid content of different types of meal.

Percentage of sample less than 33% RDA
more than 33% RDA

Boys
- traditional
- cash cafeteria
- Girls
- cash cafeteria

Packed lunch
- Girls
- traditional
- Off-premises lunches

1 cm. represents 10% of sample.
represents <20% or >75% of RDA.
Table 5.20 Mean folate content (% RDA) of different types of meal

<table>
<thead>
<tr>
<th></th>
<th>Boys</th>
<th>Girls</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Traditional meal</td>
<td>Cash cafeteria</td>
<td>Traditional meal</td>
<td>Cafeteria (1)</td>
</tr>
<tr>
<td>Day 1</td>
<td>20.4</td>
<td>17.3</td>
<td>19.7</td>
<td>14.0</td>
</tr>
<tr>
<td>Day 2</td>
<td>20.0</td>
<td>21.2</td>
<td>13.3</td>
<td>14.1</td>
</tr>
<tr>
<td>Day 3</td>
<td>19.6</td>
<td>20.8</td>
<td>9.1</td>
<td>13.7</td>
</tr>
<tr>
<td>Weighted means</td>
<td>20.0</td>
<td>19.7</td>
<td>12.9</td>
<td>13.9</td>
</tr>
</tbody>
</table>

Table 5.21 Means, SDs, ranges of folate content (% RDA) of different types of meal

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys traditional</td>
<td>20.4</td>
<td>11.34</td>
<td>8.1 - 56.6</td>
</tr>
<tr>
<td>Boys cafeteria</td>
<td>20.8</td>
<td>8.88</td>
<td>5.8 - 41.7</td>
</tr>
<tr>
<td>Girls traditional</td>
<td>9.1</td>
<td>3.93</td>
<td>3.2 - 18.8</td>
</tr>
<tr>
<td>Girls cafeteria</td>
<td>13.9</td>
<td>6.03</td>
<td>5.3 - 26.5</td>
</tr>
<tr>
<td>Off-premises lunches</td>
<td>5.0</td>
<td>4.00</td>
<td>0.0 - 16.0</td>
</tr>
<tr>
<td>Packed lunches</td>
<td>11.0</td>
<td>9.50</td>
<td>2.0 - 36.0</td>
</tr>
</tbody>
</table>

Figure 5.10 Distributions of folate content of different types of meal

<table>
<thead>
<tr>
<th>Percentage of sample</th>
<th>less than 33% RDA</th>
<th>more than 33% RDA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys traditional</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys cash cafeteria</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Girls traditional</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Girls cash cafeteria</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Off-premises lunches</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Packed lunches</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 cm. represents 10% of sample

represents <20% or >75% of RDA

303
Table 5.22 Mean vitamin C content (%RDA) of different types of meal

<table>
<thead>
<tr>
<th></th>
<th>Boys</th>
<th></th>
<th>Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Traditional meal</td>
<td>Cash cafeteria</td>
<td>Traditional meal</td>
</tr>
<tr>
<td>Day 1</td>
<td>98.7</td>
<td>103</td>
<td>86.9</td>
</tr>
<tr>
<td>Day 2</td>
<td>73.6</td>
<td>111</td>
<td>51.5</td>
</tr>
<tr>
<td>Day 3</td>
<td>83.6</td>
<td>138</td>
<td>33.2</td>
</tr>
<tr>
<td>Weighted means</td>
<td>84.4</td>
<td>116</td>
<td>51.2</td>
</tr>
</tbody>
</table>

Table 5.23 Means, SDs, ranges vitamin C content (% RDA) of different types of meal

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys traditional</td>
<td>98.8</td>
<td>48.5</td>
<td>25.1 - 197.6</td>
</tr>
<tr>
<td>Boys cafeteria</td>
<td>138.9</td>
<td>98.7</td>
<td>13.9 - 336.0</td>
</tr>
<tr>
<td>Girls traditional</td>
<td>33.2</td>
<td>24.7</td>
<td>0 - 86.8</td>
</tr>
<tr>
<td>Girls cafeteria</td>
<td>148.8</td>
<td>127.7</td>
<td>0 - 393.0</td>
</tr>
<tr>
<td>Off-premises lunches</td>
<td>30.0</td>
<td>27.6</td>
<td>0 - 82.0</td>
</tr>
<tr>
<td>Packed lunches</td>
<td>48.0</td>
<td>87.7</td>
<td>0 - 354.0</td>
</tr>
</tbody>
</table>

Figure 5.11 Distributions of vitamin C content of different types of meal

Percentage of sample less than 33% RDA more than 33% RDA

Boys
- traditional
- cash
- cafeteria

Girls
- traditional
- cash
- cafeteria

Off-premises lunches
Packed lunches

1 cm. represents 10% of sample
/// represents <20% or >75% of RDA
Table 5.24 Mean vitamin A content (%RDA)
of different types of meal

<table>
<thead>
<tr>
<th></th>
<th>Boys</th>
<th></th>
<th>Girls</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Traditional</td>
<td>Cash cafeteria</td>
<td>Traditional</td>
<td>Cafeteria (1)</td>
</tr>
<tr>
<td>Day 1</td>
<td>226.0</td>
<td>46.0</td>
<td>228</td>
<td>24.0</td>
</tr>
<tr>
<td>Day 2</td>
<td>47.5</td>
<td>49.8</td>
<td>112</td>
<td>22.8</td>
</tr>
<tr>
<td>Day 3</td>
<td>50.1</td>
<td>34.1</td>
<td>146</td>
<td>27.6</td>
</tr>
<tr>
<td>Weighted means</td>
<td>84.1</td>
<td>43.7</td>
<td>147</td>
<td>24.8</td>
</tr>
</tbody>
</table>

Table 5.25 Means, SDs, ranges of Vitamin A content (% RDA)
of different types of meal

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys traditional</td>
<td>226</td>
<td>276</td>
<td>28 - 1578</td>
</tr>
<tr>
<td>(159)</td>
<td>(144)</td>
<td>(560)</td>
<td></td>
</tr>
<tr>
<td>Boys cafeteria</td>
<td>34</td>
<td>31</td>
<td>2 - 139</td>
</tr>
<tr>
<td>Girls traditional</td>
<td>146</td>
<td>151</td>
<td>11 - 519</td>
</tr>
<tr>
<td>Girls cafeteria</td>
<td>23</td>
<td>16</td>
<td>0 - 55</td>
</tr>
<tr>
<td>Off-premises lunches</td>
<td>8</td>
<td>11</td>
<td>0 - 36</td>
</tr>
<tr>
<td>Packed lunches</td>
<td>20</td>
<td>20</td>
<td>0 - 76</td>
</tr>
</tbody>
</table>

Figures in () omit anomalous data

Figure 5.12 Distributions of vitamin A content of
different types of meal

Percentage of sample less than 33% RDA more than 33% RDA

Boys
traditional
Boys cash cafeteria
Girls
traditional
Girls cash cafeteria
Off-premises lunches
Packed lunches

1 cm. represents 10% of sample
\[\] represents <20% or >75% of RDA
Table 5.26 Mean vitamin D content (% RDA) of different types of meal

<table>
<thead>
<tr>
<th></th>
<th>Boys</th>
<th>Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Traditional meals</td>
<td>Cash cafeteria meals</td>
</tr>
<tr>
<td>Day 1</td>
<td>20.9</td>
<td>15.8</td>
</tr>
<tr>
<td>Day 2</td>
<td>12.5</td>
<td>12.4</td>
</tr>
<tr>
<td>Day 3</td>
<td>25.1</td>
<td>9.2</td>
</tr>
<tr>
<td>Weighted means</td>
<td>19.8</td>
<td>12.6</td>
</tr>
</tbody>
</table>

Table 5.27 Means, SDs, ranges of vitamin D content (% RDA) of different types of meal

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys traditional</td>
<td>21</td>
<td>8.0</td>
<td>11.2 - 34.5</td>
</tr>
<tr>
<td>Boys cafeteria</td>
<td>9</td>
<td>11.8</td>
<td>0 - 41.0</td>
</tr>
<tr>
<td>Girls traditional</td>
<td>8</td>
<td>6.1</td>
<td>0 - 20.0</td>
</tr>
<tr>
<td>Girls cafeteria</td>
<td>9</td>
<td>9.5</td>
<td>0 - 25.0</td>
</tr>
<tr>
<td>Off-premises lunches</td>
<td>4</td>
<td>7.3</td>
<td>0 - 23.0</td>
</tr>
<tr>
<td>Packed lunches</td>
<td>10</td>
<td>8.6</td>
<td>0 - 24.0</td>
</tr>
</tbody>
</table>

Figure 5.13 Distributions of vitamin D content of different types of meal.

Percentage of sample (RDA) less than 33% more than 33%

Boys traditional
Boys cash cafeteria
Girls traditional
Girls cash cafeteria
Off-premises lunches
Packed lunches

1 cm. represents 10% of sample
represents <20% or >75% of RDA.
Table 5.28 Mean calcium content (%RDA) of different types of meal

<table>
<thead>
<tr>
<th></th>
<th>Boys</th>
<th></th>
<th>Girls</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Traditional</td>
<td>Cash cafeteria</td>
<td>Traditional</td>
<td>Cafeteria (1)</td>
</tr>
<tr>
<td>Day 1</td>
<td>67.6</td>
<td>57.9</td>
<td>41.9</td>
<td>35.7</td>
</tr>
<tr>
<td>Day 2</td>
<td>58.2</td>
<td>71.5</td>
<td>49.8</td>
<td>36.4</td>
</tr>
<tr>
<td>Day 3</td>
<td>58.4</td>
<td>74.1</td>
<td>37.6</td>
<td>39.9</td>
</tr>
<tr>
<td>Weighted means</td>
<td>61.2</td>
<td>67.5</td>
<td>43.6</td>
<td>37.0</td>
</tr>
</tbody>
</table>

Table 5.29 Means, SDs, ranges of calcium content (% RDA) of different types of meal

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys traditional</td>
<td>67.6</td>
<td>29.0</td>
<td>22.1 - 89.1</td>
</tr>
<tr>
<td>Boys cafeteria</td>
<td>74.0</td>
<td>38.0</td>
<td>15.0 - 215.0</td>
</tr>
<tr>
<td>Girls traditional</td>
<td>38.0</td>
<td>19.0</td>
<td>5.0 - 68.0</td>
</tr>
<tr>
<td>Girls cafeteria</td>
<td>36.0</td>
<td>20.0</td>
<td>10.0 - 79.0</td>
</tr>
<tr>
<td>Off-premises lunches</td>
<td>22.0</td>
<td>16.1</td>
<td>4.0 - 74.0</td>
</tr>
<tr>
<td>Packed lunches</td>
<td>29.0</td>
<td>23.7</td>
<td>1.0 - 79.0</td>
</tr>
</tbody>
</table>

Figure 5.14 Distributions of calcium content of different types of meal

- Percentage of sample less than 33% RDA
- More than 33% RDA

- Boys traditional
- Boys cash cafeteria
- Girls traditional
- Girls cash cafeteria
- Off-premises lunches
- Packed lunches

1 cm. represents 10% of sample
/ / / represents <20% or >75% of RDA.
Table 5.30 Mean iron content (% RDA) of different types of meal

<table>
<thead>
<tr>
<th></th>
<th>Boys Traditional meal</th>
<th>Boys Cafeteria meal (1)</th>
<th>Girls Traditional meal</th>
<th>Girls Cafeteria meal (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 1</td>
<td>42.3</td>
<td>40.5</td>
<td>32.9</td>
<td>21.7</td>
</tr>
<tr>
<td>Day 2</td>
<td>34.8</td>
<td>19.3</td>
<td>30.5</td>
<td>24.0</td>
</tr>
<tr>
<td>Day 3</td>
<td>35.8</td>
<td>23.4</td>
<td>29.0</td>
<td>24.7</td>
</tr>
<tr>
<td>Weighted means</td>
<td>37.4</td>
<td>25.0</td>
<td>30.8</td>
<td>23.5</td>
</tr>
</tbody>
</table>

Table 5.31 Means, SDs, ranges of iron content (% RDA) of different types of meal

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys traditional</td>
<td>42.3</td>
<td>35.0</td>
<td>18.8 - 196</td>
</tr>
<tr>
<td>(34.6) (7.32)</td>
<td></td>
<td></td>
<td>(48.5)</td>
</tr>
<tr>
<td>Boys cafeteria</td>
<td>37.6</td>
<td>15.0</td>
<td>13.9 - 79.6</td>
</tr>
<tr>
<td>Girls traditional</td>
<td>23.4</td>
<td>10.0</td>
<td>7.8 - 44.6</td>
</tr>
<tr>
<td>Girls cafeteria</td>
<td>30.1</td>
<td>10.9</td>
<td>15.9 - 55.9</td>
</tr>
<tr>
<td>Off-premises lunches</td>
<td>17.0</td>
<td>6.4</td>
<td>4.0 - 27.0</td>
</tr>
<tr>
<td>Packed lunches</td>
<td>20.0</td>
<td>10.9</td>
<td>4.0 - 45.0</td>
</tr>
</tbody>
</table>

Values in () omits anomalous data

Figure 5.15 Distributions of iron content of different types of meal

- 1 cm. represents 10% of sample
- [ ] represents <20% or >75% of RDA.
Table 5.32 Mean zinc content (milligrams) of different types of meal

<table>
<thead>
<tr>
<th></th>
<th>Boys</th>
<th>Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Traditional</td>
<td>Cash cafeteria</td>
</tr>
<tr>
<td>Day 1</td>
<td>4.01</td>
<td>3.46</td>
</tr>
<tr>
<td>Day 2</td>
<td>3.02</td>
<td>3.52</td>
</tr>
<tr>
<td>Day 3</td>
<td>2.65</td>
<td>3.35</td>
</tr>
<tr>
<td>Weighted means</td>
<td>3.17</td>
<td>3.44</td>
</tr>
</tbody>
</table>

Table 5.33 Means, SDs, ranges of zinc content (milligrams) of different types of meal

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys traditional</td>
<td>4.0</td>
<td>2.25</td>
<td>1.6 - 13.1</td>
</tr>
<tr>
<td>Boys cafeteria</td>
<td>3.4</td>
<td>1.25</td>
<td>1.4 - 7.0</td>
</tr>
<tr>
<td>Girls traditional</td>
<td>2.5</td>
<td>1.3</td>
<td>0.9 - 5.5</td>
</tr>
<tr>
<td>Girls cafeteria</td>
<td>2.6</td>
<td>1.1</td>
<td>1.1 - 4.5</td>
</tr>
<tr>
<td>Off-premises lunches</td>
<td>1.1</td>
<td>0.86</td>
<td>0.2 - 5.4</td>
</tr>
<tr>
<td>Packed lunches</td>
<td>1.7</td>
<td>1.2</td>
<td>0.2 - 5.4</td>
</tr>
</tbody>
</table>

Figure 5.16 Distributions of zinc content of different types of meal

Percentage of sample less than 3mg. more than 3 mg.

Boys
- traditional
- cash
- cafeteria

Girls
- traditional
- cash
- cafeteria

Off-premises lunches

Packed lunches

1 cm. represents 10% of sample.
Iron and Zinc

Mean values (Tables 5.30, 5.32) for school meals were above the standards set for iron and zinc in both the traditional and cash cafeteria service in the boys school, but not in the girls school meals. Iron intakes were lowest in the girls school traditional service meals, except for one day when the filled rolls contained liver sausage which contributes iron.

The distribution (Figure 5.15) of values for iron content of meals in the girls school showed that 37 and 17 per cent of the meals in the traditional and cash cafeteria service, respectively, were providing less than 20 per cent RDA.

Vitamin A

Mean values (Table 5.24) for vitamin A content of school meals were greater than 33 per cent RDA for all categories except girls school cash cafeteria. The high mean value for the traditional meals in the boys school were accounted for by the appearance of liver on the menu on one day. Although only one boy chose liver, this raised the mean value for that day very considerably. Similarly, liver sausage in the filled rolls gave a high mean value for vitamin A content on another day. Carrots were served and fairly frequently chosen in the traditional service meals, making a reasonable contribution to vitamin A content of meals due to their carotene content, whereas carrots were rarely chosen from the cash cafeteria service.

Folate and vitamin D

The mean values (Tables 5.20, 5.26) for folate and vitamin D were less than 33 per cent RDA in all categories of school meals. These two nutrients are discussed more fully below.

The intakes of both these nutrients were higher in the boys school meals than in the girls school meals, probably due to the larger amount of food eaten.
Comparison of nutrient content meals in traditional and cash cafeteria service in a boys school and a girls school.

Protein, thiamin, nicotinic acid, vitamin C, iron.

The mean values for these nutrients (Tables 5.12, 5.14, 5.18, 5.22, 5.30) increase when the meals change to cash cafeteria service.

For all these nutrients, except vitamin C, the increase is likely to be mainly due to the greater food intake. Also, bread is a good source of these four nutrients, and the amount of bread eaten in the cash cafeteria is greater due to the consumption of beefburgers and frankfurters in rolls. The increase in vitamin C intakes is likely to be due to the consumption of orange juice which was very popular in cash cafeterias.

Riboflavin.

The mean values for riboflavin content of meals (Table 5.16) appear to decrease, but the liver and liver sausage served each on one day in the traditional service distort the mean values for this nutrient. The mean values, discounting the effect of liver sausage and liver which do not appear frequently on the menu, do not alter very much.

Folate

The mean values for folate content of meals (Table 5.20) do not change in the boys school, probably due to the fact that although they are eating fewer green vegetables, a good source of folate, they are eating more bread, which does contain folate, but in small quantities. The mean values increase in the girls school probably due to the consumption of bread. Few green vegetables were eaten by the girls in the traditional service.

Vitamin D.

The mean value for this nutrient (Table 5.26) increases in the girls school and decreases in the boys school, probably due to corresponding changes in fat intake.
Calcium.

Mean values (Table 5.28) increase in the boys school and decrease in the girls school.

In the girls school the high value for Day Two of the traditional service probably distorts the mean value. This was due to grated cheese and macaroni cheese both appearing on the menu. If this high value is discounted, the calcium intake probably changes very little, as cheese was not consumed very often in the cash cafeteria service. This would be compensated for by an increase in milk consumption in the form of milkshakes and a slightly increased bread consumption.

Vitamin A.

The mean values for this nutrient decrease in both the boys and girls schools. Again the liver and liver sausage served each on one day in the traditional service meals distort values the mean values for these meals. Liver was chosen by only one boy; but the liver sausage filled rolls were quite popular. The reduced consumption of carrots when the schools changed to cash cafeteria probably contributed to the lower value in cash cafeteria meals.

Non school lunches.

Protein, vitamins and minerals

Provision of protein, vitamins and minerals by non school lunches is shown by Table 5.34, indicating that non-school lunches on average do not provide adequate amounts of any of the above nutrients except vitamin C.

Examination of mean values indicates that packed lunches more adequately meet recommendations for these nutrients than do off-premises lunches. This is due to the intake of bread, often with a filling such as cheese or ham, which are foods with a high nutrient density (but also high in fat, particularly cheese.)

The spread of values for all nutrients was greater for packed lunches than for off-premises lunches indicating that, while a well-planned packed lunch can adequately provide most nutrients if it is adequate in size to meet energy needs, there is quite a large gap between these lunches at one end of the range, and the several packed lunches which consisted just of items such as crisps, biscuits and cake - the frequent inclusion of
packets of crisps in packed lunches contributing to high fat intake.

Table 5.34 Provision of nutrients by non-school lunches

<table>
<thead>
<tr>
<th></th>
<th>Off-premises Lunches</th>
<th>Packed Lunches</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% RDA provided by meal (mean values)</td>
<td>% RDA provided by meal (mean values)</td>
</tr>
<tr>
<td>Protein</td>
<td>14 84 26 36</td>
<td>14 100 15 80</td>
</tr>
<tr>
<td>Riboflavin</td>
<td>14 100 15 80</td>
<td>14 88 28 44</td>
</tr>
<tr>
<td>Thiamin</td>
<td>14 88 28 44</td>
<td>24 40 38 24</td>
</tr>
<tr>
<td>Nicotinic acid</td>
<td>5 100 11 88</td>
<td>24 40 38 24</td>
</tr>
<tr>
<td>Folate</td>
<td>30 48 48 48</td>
<td>38 48 48 48</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>8 88 20 56</td>
<td>8 88 20 56</td>
</tr>
<tr>
<td>Vitamin D</td>
<td>4 92 10 88</td>
<td>22 52 29 60</td>
</tr>
<tr>
<td>Iron</td>
<td>22 52 29 60</td>
<td>22 52 29 60</td>
</tr>
<tr>
<td>Calcium</td>
<td>Mean value &lt; 3mg</td>
<td>Mean value &lt; 3mg</td>
</tr>
<tr>
<td>Zinc</td>
<td>1.1 mg 96% 1.7 mg 77%</td>
<td>1.7 mg 77%</td>
</tr>
</tbody>
</table>

General conclusions and nutritional implications – protein, vitamins and minerals

Examination of the mean values for the above nutrients shows that school lunches provide adequate amounts of these.

The distribution and range of values indicates that the girls school traditional meals least adequately met recommendations for the above nutrients, due mainly to the fact that smaller quantities of food were eaten.

The change to cash cafeteria service meant an increased intake of most of these nutrients, particularly those occurring widely in different foods. This was due to a greater food intake in cash cafeteria meals.

Intakes of one or two nutrients, however, did not follow this trend.

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- Mean values for riboflavin contents were below 33 per cent RDA and decreased slightly in cash cafeteria meals.

- Mean values for vitamin A content also decreased in the change to cash cafeteria meals, and were below 33 per cent RDA in the girls school cafeteria meals.

These exceptions can, to a certain extent, be explained by the distortion of mean values for traditional meals by certain foods, but the change in types of foods served in the cash cafeteria meals may also be a contributory factor. The amounts of these nutrients in cash cafeteria meals may need to be monitored.

Mean values for folate intakes were also inadequate but, as has been discussed, by less than it would appear. The change in types of foods served may also contribute to the low mean values found in the girls cash cafeteria.

Non-school meals, particularly off-premises lunches, clearly show less adequate provision of most nutrients. Packed lunches show a much greater spread of values, indicating a considerable difference between a well planned packed lunch and a poor one.

From examination of the distribution, standard deviation and ranges of values for all these nutrients, the following trends become clear:

- The change to cash cafeteria service meant a greater range of intakes of energy and most nutrients; in most cases consistent with variation in energy intakes; this is more marked in the boys school than in the girls school.

- The range of intakes of vitamin C also increased very considerably, mostly due to the high values at the top of the range - consumption of orange juice was popular in the cash cafeteria meals.

- Vitamin D also shows a greater spread of values in both the boys and girls schools; this follows the greater spread of fat intakes in the cash cafeteria service.

- Protein, riboflavin, nicotinic acid, iron and calcium: the spread of values for these nutrients increases when the boys school changed to cash cafeteria; whereas the spread of values in the girls school stayed about the same (calcium, iron, riboflavin) or decreased (protein, nicotinic acid).

This could indicate that when boys are given a freedom of choice, the items that they choose to make up a meal vary quite widely; but girls,
given freedom of choice, show less variation in the intake. This could possibly be explained by the fact that the girls enjoyed the food from the cash cafeteria more, so that there were fewer with the low intakes found in the traditional service.

**Nutritional implications**

Previous discussion (3.5.4) has pointed out that despite low intakes of several nutrients, there has been little evidence to indicate deficiency of these nutrients. On the other hand, suggestions of subclinical deficiency or other effects of low intakes of some nutrients are hard to refute. Calcium, iron, retinol, ascorbic acid, zinc, folate and riboflavin have been discussed in this connection.

It is suggested therefore that while the focus of concern in school meals is switched to fat, sugar and fibre levels, the meals should still provide adequate amounts of protein, vitamins and minerals, to meet requirements.

The requirements for these nutrients have been examined, (3.2.2), and any evidence of low intakes leading to harmful effects, have been discussed. (3.5.4)

While it is likely that if energy needs are met from the foods suggested to provide the recommended proportions of fat, complex carbohydrates and protein, the needs for vitamins and minerals will also be met, it is important to examine the changes in provision of these nutrients that will result from an alteration in the types of foods eaten. This will be discussed further in relation to dietary guidelines in Chapter Six.
5.4.2. Food choice data from different types of meals

As discussed above, a wide range of intakes is likely to be a feature of systems which allow a greater freedom of choice, such as a cash cafeteria service, lunches eaten off premises, and packed lunches. Some of the meals which provide intakes of nutrients at the extremes of the range will be examined in order to illustrate the importance of wise choice of foods if a balanced meal is to be consumed.

Results

Tables 5.35, 5.36, 5.37, 5.38, 5.39, 5.40. show the nutritional composition of individual meals. Meals were selected which provided intakes of energy, sugar, or fat at the ends of the ranges of values.

Discussion of results

From an examination of the meals in the tables listed above, several points emerge.

Relationship between energy and other nutrients

In most cases the meals, providing low and high intakes of energy also provided low and high intakes respectively of several other nutrients, eg. protein, thiamin, and nicotinic acid. In some cases, however, where the intake of energy was high due to a high fat content, the amount of energy provided was proportionally greater than the amount of the nutrients; this was also true of a number of meals providing a high intake of sugar - meals of low nutrient density.

Energy from fat and sugar.

Energy intakes are closely related to fat or sugar intake. It was very difficult to find a meal which provided the proportion of energy from fat, near the recommended level of 34 per cent which was also near the recommended level for sugar (18 grams) and yet provided approximately 33 per cent of the RDA for energy (and most other nutrients).
Table 5.35 Meals from girls school cash cafeteria.

<table>
<thead>
<tr>
<th>Lowest energy (13.5 % RDA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>49 g chicken</td>
</tr>
<tr>
<td>69 g runner beans</td>
</tr>
<tr>
<td>97 g canned tomatoes</td>
</tr>
<tr>
<td>121 g custard</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Nutrients</th>
<th>% RDA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy</td>
<td>13.5</td>
</tr>
<tr>
<td>Protein</td>
<td>32.2</td>
</tr>
<tr>
<td>Thiamin</td>
<td>20.4</td>
</tr>
<tr>
<td>Riboflavin</td>
<td>29.0</td>
</tr>
<tr>
<td>Nicotinic acid</td>
<td>41.6</td>
</tr>
<tr>
<td>Folate</td>
<td>16.6</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>83.7</td>
</tr>
<tr>
<td>Vitamin A</td>
<td>25.3</td>
</tr>
<tr>
<td>Vitamin D</td>
<td>0.7</td>
</tr>
<tr>
<td>Calcium</td>
<td>31.6</td>
</tr>
<tr>
<td>Iron</td>
<td>18.2</td>
</tr>
<tr>
<td>Zinc</td>
<td>1.7 mg</td>
</tr>
<tr>
<td>Sugar</td>
<td>17.3 g</td>
</tr>
<tr>
<td>Dietary fibre</td>
<td>3.63 g</td>
</tr>
<tr>
<td>Energy from fat</td>
<td>30.9 %</td>
</tr>
</tbody>
</table>

Lowest energy because low fat and low sugar.
Low fibre.
| Meals from girls school cash cafeteria | | | |
|--------------------------------------|------------------|------------------|
| High sugar (48.7 g)                  | Low sugar (18.6 g) | Highest energy (58.7 % RDA) |
| 123 g chips                          | 49 g chicken      | 61 g bread roll  |
| 10 g tomato ketchup                  | 158 g cheese &    | 38 g beefburger  |
| 88 g biscuit                         | tomato pizza      | 123 g chips      |
| 116 g jelly                          | 10 g tomato ketchup | 92 g coleslaw    |
| 80 g chocolate milk                  | 185 g orange juice | 10 g tomato ketchup |
| 116 g jelly                          | 10 g tomato ketchup | 146 g fruit yogourt |
| 80 g chocolate milk                  | 185 g orange juice | 102 g biscuits   |

<table>
<thead>
<tr>
<th>Nutrients</th>
<th>% RDA</th>
<th>% RDA</th>
<th>% RDA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy</td>
<td>40.9</td>
<td>40.8</td>
<td>58.7</td>
</tr>
<tr>
<td>Protein</td>
<td>22.8</td>
<td>57.7</td>
<td>62.7</td>
</tr>
<tr>
<td>Thiamin</td>
<td>28.3</td>
<td>52.3</td>
<td>55.8</td>
</tr>
<tr>
<td>Riboflavin</td>
<td>11.3</td>
<td>27.3</td>
<td>42.1</td>
</tr>
<tr>
<td>Nicotinic acid</td>
<td>28.5</td>
<td>75.9</td>
<td>72.7</td>
</tr>
<tr>
<td>Folate</td>
<td>6.5</td>
<td>21.1</td>
<td>21.8</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>49.2</td>
<td>327.0</td>
<td>22.6</td>
</tr>
<tr>
<td>Vitamin A</td>
<td>11.4</td>
<td>26.3</td>
<td>36.4</td>
</tr>
<tr>
<td>Vitamin D</td>
<td>7.5</td>
<td>1.2</td>
<td>22.3</td>
</tr>
<tr>
<td>Calcium</td>
<td>18.2</td>
<td>63.4</td>
<td>64.2</td>
</tr>
<tr>
<td>Iron</td>
<td>26.7</td>
<td>38.3</td>
<td>48.2</td>
</tr>
<tr>
<td>Zinc</td>
<td>1.19 mg</td>
<td>3.9 mg</td>
<td>4.43 mg</td>
</tr>
<tr>
<td>Sugar</td>
<td>48.7 g</td>
<td>18.6 g</td>
<td>47.1 g</td>
</tr>
<tr>
<td>Dietary fibre</td>
<td>1.22 g</td>
<td>0.416 g</td>
<td>5.4 g</td>
</tr>
<tr>
<td>Sodium</td>
<td>0.336 g</td>
<td>0.824 g</td>
<td>1.27 g</td>
</tr>
<tr>
<td>Energy from fat</td>
<td>38.7 %</td>
<td>36.5 %</td>
<td>35.0 %</td>
</tr>
</tbody>
</table>

Riboflavin, calcium, vitamin A low. No main course. A good meal, high energy because high sugar Fat near standard Other nutrients good. Vitamin C & fibre slightly low.
### Table 5.35 Meals from girls school cash cafeteria

<table>
<thead>
<tr>
<th>Percentage energy from fat</th>
<th>High fat</th>
<th>High fat</th>
<th>Low fat</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>64.8 %</td>
<td>54.3 %</td>
<td>27 %</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item</th>
<th>Nutrients</th>
<th>% RDA</th>
<th>% RDA</th>
<th>% RDA</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 g sausage roll</td>
<td>Energy</td>
<td>30.9</td>
<td>39.4</td>
<td>34</td>
</tr>
<tr>
<td>47 g mashed potato</td>
<td>Protein</td>
<td>21.8</td>
<td>25.5</td>
<td>41.6</td>
</tr>
<tr>
<td>73 g baked beans</td>
<td>Thiamin</td>
<td>20.9</td>
<td>28.5</td>
<td>53</td>
</tr>
<tr>
<td>66 g cheesecake</td>
<td>Riboflavin</td>
<td>10.4</td>
<td>8.4</td>
<td>35.8</td>
</tr>
<tr>
<td>47 g bread roll</td>
<td>Nicotinic acid</td>
<td>27.2</td>
<td>28.7</td>
<td>48.7</td>
</tr>
<tr>
<td>25 g frankfurter</td>
<td>Folate</td>
<td>10.1</td>
<td>7.3</td>
<td>21.1</td>
</tr>
<tr>
<td>68 g biscuits</td>
<td>Vitamin C</td>
<td>20.4</td>
<td>0.0</td>
<td>316.0</td>
</tr>
<tr>
<td>118 g chips</td>
<td>Vitamin A</td>
<td>37.6</td>
<td>55.4</td>
<td>4.7</td>
</tr>
<tr>
<td>73 g baked beans</td>
<td>Vitamin D</td>
<td>12.9</td>
<td>30.6</td>
<td>0.0</td>
</tr>
<tr>
<td>146 g fruit yogourt</td>
<td>Calcium</td>
<td>17.9</td>
<td>23.4</td>
<td>50.8</td>
</tr>
<tr>
<td>185 g orange juice</td>
<td>Iron</td>
<td>20.1</td>
<td>24.2</td>
<td>37.8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Nutrients</th>
<th>% RDA</th>
<th>% RDA</th>
<th>% RDA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zinc</td>
<td>1.4 mg</td>
<td>1.33 mg</td>
<td>3.41 mg</td>
</tr>
<tr>
<td>Sugar</td>
<td>13.2 g</td>
<td>24.0 g</td>
<td>41.6 g</td>
</tr>
<tr>
<td>Dietary fibre</td>
<td>6.34 g</td>
<td>3.14 g</td>
<td>6.59 g</td>
</tr>
<tr>
<td>Sodium</td>
<td>0.86 g</td>
<td>0.81 g</td>
<td>0.96 g</td>
</tr>
<tr>
<td>Energy from fat</td>
<td>64.8 %</td>
<td>54.3 %</td>
<td>27.0 %</td>
</tr>
</tbody>
</table>

**Very high fat** - sausage roll and cheesecake. **Most nutrients except vitamin A low** - High fat because of cream horn and biscuits. **Fat and vitamin A low** - Moderately high sugar.

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Table 5.36 Meals from boys school cash cafeteria

<table>
<thead>
<tr>
<th>Lowest energy</th>
<th>Highest energy</th>
<th>High energy</th>
</tr>
</thead>
<tbody>
<tr>
<td>19 % RDA</td>
<td>102 % RDA</td>
<td>61.5 % RDA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25 g frankfurter</td>
<td>38 g beefburger</td>
<td>76 g beefburger</td>
</tr>
<tr>
<td>47 g roll</td>
<td>61 g roll</td>
<td>122 g roll (2)</td>
</tr>
<tr>
<td>120 g chips</td>
<td>83 g baked beans</td>
<td>83 g baked beans</td>
</tr>
<tr>
<td>.173 g orange juice</td>
<td>120 g chips</td>
<td>240 g chips</td>
</tr>
<tr>
<td></td>
<td>15 g crisps</td>
<td>75 g apple puff</td>
</tr>
<tr>
<td></td>
<td>100 g cream horn</td>
<td>69 g jam tart</td>
</tr>
<tr>
<td></td>
<td>276 g milk shake (2)</td>
<td>106 g custard</td>
</tr>
<tr>
<td></td>
<td>111 g jelly</td>
<td></td>
</tr>
<tr>
<td></td>
<td>106 g custard</td>
<td></td>
</tr>
<tr>
<td></td>
<td>76 g shortbread biscuit</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Nutrients</th>
<th>% RDA</th>
<th>% RDA</th>
<th>% RDA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy</td>
<td>19.0</td>
<td>102.7</td>
<td>61.5</td>
</tr>
<tr>
<td>Protein</td>
<td>15.7</td>
<td>80.7</td>
<td>65.2</td>
</tr>
<tr>
<td>Thiamin</td>
<td>28.4</td>
<td>67.7</td>
<td>58.3</td>
</tr>
<tr>
<td>Riboflavin</td>
<td>7.5</td>
<td>81.4</td>
<td>34.6</td>
</tr>
<tr>
<td>Nicotinic acid</td>
<td>27.0</td>
<td>97.0</td>
<td>54.0</td>
</tr>
<tr>
<td>Folate</td>
<td>12.4</td>
<td>36.3</td>
<td>34.6</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>241.0</td>
<td>71.7</td>
<td>102.0</td>
</tr>
<tr>
<td>Vitamin A</td>
<td>2.0</td>
<td>139.0</td>
<td>34.0</td>
</tr>
<tr>
<td>Vitamin D</td>
<td>0.0</td>
<td>26.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Calcium</td>
<td>15.0</td>
<td>215.0</td>
<td>89.0</td>
</tr>
<tr>
<td>Iron</td>
<td>26.0</td>
<td>62.9</td>
<td>79.6</td>
</tr>
<tr>
<td>Zinc</td>
<td>2.0 mg</td>
<td>4.5 mg</td>
<td>2.8 mg</td>
</tr>
<tr>
<td>Sodium</td>
<td>0.5 g</td>
<td>2.2 g</td>
<td>1.0 g</td>
</tr>
<tr>
<td>Sugar</td>
<td>15.5 g</td>
<td>212.0 g</td>
<td>50.0 g</td>
</tr>
<tr>
<td>Dietary fibre</td>
<td>1.3 g</td>
<td>10.3 g</td>
<td>11.7 g</td>
</tr>
<tr>
<td>Energy from fat</td>
<td>33.6 %</td>
<td>39.8 %</td>
<td>36.5 %</td>
</tr>
</tbody>
</table>

Low energy, low fat and sugar. Very high energy content due to very high sugar. All nutrients high. High energy and all nutrients. Percent energy from fat near standard. Sugar mod. high. Fibre high.
Table 5.36 Meals from boys school cash cafeteria

<table>
<thead>
<tr>
<th>Percentage energy from fat</th>
<th>High fat</th>
<th>Low fat 26.8 %</th>
<th>Low fat 31.2 %</th>
</tr>
</thead>
<tbody>
<tr>
<td>61 g bread roll</td>
<td>122 g white bread</td>
<td>47 g bread roll</td>
<td></td>
</tr>
<tr>
<td>38 g beefburger</td>
<td>76 g beefburger</td>
<td>25 g frankfurter</td>
<td></td>
</tr>
<tr>
<td>102 g mashed potato</td>
<td>83 g baked beans</td>
<td>120 g chips</td>
<td></td>
</tr>
<tr>
<td>200 g cream horn (2)</td>
<td>120 g chips</td>
<td>83 g baked beans</td>
<td></td>
</tr>
<tr>
<td>76 g shortbread biscuit (2)</td>
<td>111 g jelly</td>
<td>138 g milk shake</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Nutrients</th>
<th>% RDA</th>
<th>% RDA</th>
<th>% RDA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy</td>
<td>56.4</td>
<td>34</td>
<td>45.2</td>
</tr>
<tr>
<td>Protein</td>
<td>36.9</td>
<td>50.1</td>
<td>44.9</td>
</tr>
<tr>
<td>Thiamin</td>
<td>37.8</td>
<td>44.6</td>
<td>40.6</td>
</tr>
<tr>
<td>Riboflavin</td>
<td>13.8</td>
<td>19.8</td>
<td>52.4</td>
</tr>
<tr>
<td>Nicotinic acid</td>
<td>56.0</td>
<td>73.0</td>
<td>53.0</td>
</tr>
<tr>
<td>Folate</td>
<td>15.9</td>
<td>30.9</td>
<td>23.3</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>27.2</td>
<td>241.0</td>
<td>61.9</td>
</tr>
<tr>
<td>Vitamin A</td>
<td>105.0</td>
<td>2.0</td>
<td>35.0</td>
</tr>
<tr>
<td>Vitamin D</td>
<td>41.0</td>
<td>0.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Calcium</td>
<td>48.0</td>
<td>38.0</td>
<td>74.0</td>
</tr>
<tr>
<td>Iron</td>
<td>45.2</td>
<td>66.6</td>
<td>33.1</td>
</tr>
<tr>
<td>Zinc</td>
<td>3.4 mg</td>
<td>6.0 mg</td>
<td>2.8 mg</td>
</tr>
<tr>
<td>Sugar</td>
<td>27.1 g</td>
<td>36.9 g</td>
<td>103.0 g</td>
</tr>
<tr>
<td>Dietary fibre</td>
<td>5.96 g</td>
<td>9.35 g</td>
<td>7.32 g</td>
</tr>
<tr>
<td>Sodium</td>
<td>0.72 g</td>
<td>0.83 g</td>
<td>0.91 g</td>
</tr>
<tr>
<td>Energy from fat</td>
<td>56.0 %</td>
<td>26.8 %</td>
<td>31.2 %</td>
</tr>
</tbody>
</table>

Table 5.36 Meals from a boys school cash cafeteria

<table>
<thead>
<tr>
<th>Nutrients</th>
<th>% RDA</th>
<th>% RDA</th>
<th>% RDA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy</td>
<td>27.6</td>
<td>19.2</td>
<td>23.5</td>
</tr>
<tr>
<td>Protein</td>
<td>14.5</td>
<td>30.9</td>
<td>25.6</td>
</tr>
<tr>
<td>Thiamin</td>
<td>19.4</td>
<td>17.7</td>
<td>31.7</td>
</tr>
<tr>
<td>Riboflavin</td>
<td>19.5</td>
<td>42.0</td>
<td>18.5</td>
</tr>
<tr>
<td>Nicotinic acid</td>
<td>19.0</td>
<td>37.0</td>
<td>42.0</td>
</tr>
<tr>
<td>Folate</td>
<td>8.2</td>
<td>5.8</td>
<td>26.7</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>212.0</td>
<td>13.9</td>
<td>336.0</td>
</tr>
<tr>
<td>Vitamin A</td>
<td>54.0</td>
<td>2.0</td>
<td>28.0</td>
</tr>
<tr>
<td>Vitamin D</td>
<td>31.0</td>
<td>6.0</td>
<td>6.0</td>
</tr>
<tr>
<td>Calcium</td>
<td>46.0</td>
<td>90.0</td>
<td>42.0</td>
</tr>
<tr>
<td>Iron</td>
<td>19.8</td>
<td>13.9</td>
<td>32.8</td>
</tr>
<tr>
<td>Zinc</td>
<td>1.4 mg</td>
<td>2.7 mg</td>
<td>2.9 mg</td>
</tr>
<tr>
<td>Sodium</td>
<td>0.55 g</td>
<td>0.75 g</td>
<td>0.65 g</td>
</tr>
<tr>
<td>Sugar</td>
<td>61.6 g</td>
<td>32.1 g</td>
<td>17.1 g</td>
</tr>
<tr>
<td>Dietary fibre</td>
<td>1.82 g</td>
<td>0.39 g</td>
<td>2.5 g</td>
</tr>
<tr>
<td>Energy from fat</td>
<td>49.4 %</td>
<td>44.2 %</td>
<td>45.8 %</td>
</tr>
</tbody>
</table>

Low protein - no main course. Lowest nicotinic acid & zinc. Thiamin, riboflavin, iron, dietary fibre low. Sugar & fat high.


Low sugar - no pudding. Highest Vitamin C. High fat.

65 g apple puff  82 g sausage quiche  82 g sausage quiche
106 g custard  30 g onion  72 g cabbage
79 g iced victoria sandwich  131 g fruit yogourt  120 g chips
106 g custard  47 g salad (cucumber, lettuce, radish, tomato, onion, mustard & cress)
173 g orange juice
Table 5.36 Meals from a boys school cash cafeteria.

<table>
<thead>
<tr>
<th>High dietary fibre</th>
<th>High dietary fibre</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.4 g</td>
<td>8.7 g</td>
</tr>
<tr>
<td>25 g frankfurter</td>
<td>61 g bread roll</td>
</tr>
<tr>
<td>47 g bread roll</td>
<td>38 g beefburger</td>
</tr>
<tr>
<td>72 g cod in batter</td>
<td>83 g baked beans</td>
</tr>
<tr>
<td>57 g chips</td>
<td>120 g chips</td>
</tr>
<tr>
<td>83 g baked beans</td>
<td>69 g jam tart</td>
</tr>
<tr>
<td>65 g apple puff</td>
<td>106 g custard</td>
</tr>
<tr>
<td>131 g fruit yogourt</td>
<td></td>
</tr>
<tr>
<td>173 g orange juice</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Nutrients</th>
<th>% RDA</th>
<th>% RDA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy</td>
<td>33.0</td>
<td>34.8</td>
</tr>
<tr>
<td>Protein</td>
<td>48.9</td>
<td>38.6</td>
</tr>
<tr>
<td>Thiamin</td>
<td>42.5</td>
<td>33.7</td>
</tr>
<tr>
<td>Riboflavin</td>
<td>29.0</td>
<td>25.0</td>
</tr>
<tr>
<td>Nicotinic acid</td>
<td>61.0</td>
<td>55.0</td>
</tr>
<tr>
<td>Folate</td>
<td>23.7</td>
<td>22.1</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>228.0</td>
<td>49.2</td>
</tr>
<tr>
<td>Vitamin A</td>
<td>14.0</td>
<td>13.0</td>
</tr>
<tr>
<td>Vitamin D</td>
<td>6.0</td>
<td>5.0</td>
</tr>
<tr>
<td>Calcium</td>
<td>69.0</td>
<td>53.0</td>
</tr>
<tr>
<td>Iron</td>
<td>42.0</td>
<td>47.3</td>
</tr>
<tr>
<td>Sodium</td>
<td>1.25 g</td>
<td>1.3 g</td>
</tr>
<tr>
<td>Sugar</td>
<td>44.7 g</td>
<td>43.4 g</td>
</tr>
<tr>
<td>Dietary</td>
<td>10.4 g</td>
<td>8.7 g</td>
</tr>
<tr>
<td>Energy from fat</td>
<td>39.5 %</td>
<td>32.8 %</td>
</tr>
<tr>
<td>Zinc</td>
<td>3.4 mg</td>
<td>4.0 mg</td>
</tr>
</tbody>
</table>

Fat & sugar A good meal, moderately high. low fat, sugar Vitamin A low moderately high

323
Table 5.37 Meals from a boys school traditional service

<table>
<thead>
<tr>
<th>Nutrients</th>
<th>% RDA</th>
<th>% RDA</th>
<th>% RDA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy</td>
<td>19.7</td>
<td>60.5</td>
<td>59.2</td>
</tr>
<tr>
<td>Protein</td>
<td>22.0</td>
<td>56.5</td>
<td>82.4</td>
</tr>
<tr>
<td>Thiamin</td>
<td>8.5</td>
<td>43.5</td>
<td>54.8</td>
</tr>
<tr>
<td>Riboflavin</td>
<td>17.1</td>
<td>47.2</td>
<td>212.0</td>
</tr>
<tr>
<td>Nicotinic acid</td>
<td>28.0</td>
<td>72.0</td>
<td>151.0</td>
</tr>
<tr>
<td>Folate</td>
<td>8.7</td>
<td>30.8</td>
<td>56.6</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>25.1</td>
<td>124.2</td>
<td>151.6</td>
</tr>
<tr>
<td>Vitamin A</td>
<td>192.0</td>
<td>560.0</td>
<td>1578.0</td>
</tr>
<tr>
<td>Vitamin D</td>
<td>17.0</td>
<td>35.0</td>
<td>35.0</td>
</tr>
<tr>
<td>Calcium</td>
<td>80.0</td>
<td>160.0</td>
<td>72.0</td>
</tr>
<tr>
<td>Iron</td>
<td>18.8</td>
<td>48.5</td>
<td>195.9</td>
</tr>
<tr>
<td>Zinc</td>
<td>2.4 mg</td>
<td>5.4 mg</td>
<td>13.1 mg</td>
</tr>
<tr>
<td>Sugar</td>
<td>21.3 g</td>
<td>78.5 g</td>
<td>101.0 g</td>
</tr>
<tr>
<td>Dietary fibre</td>
<td>3.55 g</td>
<td>9.64 g</td>
<td>6.7 g</td>
</tr>
<tr>
<td>Sodium</td>
<td>0.6 g</td>
<td>1.7 g</td>
<td>1.4 g</td>
</tr>
<tr>
<td>Energy from fat</td>
<td>49.1 %</td>
<td>52.9 %</td>
<td>41.7 %</td>
</tr>
</tbody>
</table>

Lowest protein, thiamin, nicotinic acid, Vit. C, iron. Low fibre, high fat, sugar near standard

High in all nutrients, high fat (sausage roll) & sugar, high fibre

Highest protein (2 main courses) thiamin, Vit. A iron, riboflavin nicotinic acid - due to liver.  

324
Table 5.37 Meals from a boys school traditional service

<table>
<thead>
<tr>
<th>Nutrients</th>
<th>% RDA</th>
<th>% RDA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy</td>
<td>37.8</td>
<td>36.7</td>
</tr>
<tr>
<td>Protein</td>
<td>24.4</td>
<td>27.8</td>
</tr>
<tr>
<td>Thiamin</td>
<td>24.6</td>
<td>29.4</td>
</tr>
<tr>
<td>Riboflavin</td>
<td>7.1</td>
<td>25.3</td>
</tr>
<tr>
<td>Nicotinic acid</td>
<td>37.0</td>
<td>44.0</td>
</tr>
<tr>
<td>Folate</td>
<td>9.5</td>
<td>8.1</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>49.7</td>
<td>44.9</td>
</tr>
<tr>
<td>Vitamin A</td>
<td>42.0</td>
<td>29.0</td>
</tr>
<tr>
<td>Vitamin D</td>
<td>24.0</td>
<td>18.0</td>
</tr>
<tr>
<td>Calcium</td>
<td>26.0</td>
<td>57.0</td>
</tr>
<tr>
<td>Iron</td>
<td>30.6</td>
<td>23.4</td>
</tr>
<tr>
<td>Sugar</td>
<td>26.6 g</td>
<td>20.5 g</td>
</tr>
<tr>
<td>Dietary fibre</td>
<td>1.51 g</td>
<td>1.24 g</td>
</tr>
<tr>
<td>Energy from fat</td>
<td>58.7%</td>
<td>56.8%</td>
</tr>
<tr>
<td>Sodium</td>
<td>0.95 g</td>
<td>1.0 g</td>
</tr>
<tr>
<td>Zinc</td>
<td>1.6 mg</td>
<td>2.4 mg</td>
</tr>
</tbody>
</table>

Highest fat (sausage roll), lowest sugar (no pudding)
Table S.38 Meals from a girls school traditional school meal

<table>
<thead>
<tr>
<th></th>
<th>Lowest energy 9.1 % RDA</th>
<th>Highest energy 42.3 % RDA</th>
<th>Highest sugar 44.7 gms</th>
</tr>
</thead>
<tbody>
<tr>
<td>105 g spaghetti rings</td>
<td>105 g spaghetti rings</td>
<td>105 g spaghetti rings</td>
<td></td>
</tr>
<tr>
<td>71 g carrots</td>
<td>206 g hot pot</td>
<td>58 g bread</td>
<td></td>
</tr>
<tr>
<td>80 g hot pot</td>
<td>56 g mashed potato</td>
<td>75 g sponge</td>
<td></td>
</tr>
<tr>
<td>56 g mashed potato</td>
<td>71 g carrots</td>
<td>pudding</td>
<td></td>
</tr>
<tr>
<td>117 g apple</td>
<td>58 g bread</td>
<td>112 g custard</td>
<td></td>
</tr>
<tr>
<td></td>
<td>75 g sponge</td>
<td>82 g milk jelly</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>pudding</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>112 g custard</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Nutrients</th>
<th>% RDA</th>
<th>% RDA</th>
<th>% RDA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy</td>
<td>9.1</td>
<td>42.3</td>
<td>30.9</td>
</tr>
<tr>
<td>Protein</td>
<td>7.7</td>
<td>66.9</td>
<td>32.7</td>
</tr>
<tr>
<td>Thiamin</td>
<td>14.7</td>
<td>44.0</td>
<td>20.9</td>
</tr>
<tr>
<td>Riboflavin</td>
<td>6.7</td>
<td>42.0</td>
<td>27.8</td>
</tr>
<tr>
<td>Nicotinic acid</td>
<td>14.0</td>
<td>88.0</td>
<td>34.0</td>
</tr>
<tr>
<td>Folate</td>
<td>6.3</td>
<td>18.8</td>
<td>10.1</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>40.6</td>
<td>70.5</td>
<td>0.0</td>
</tr>
<tr>
<td>Vitamin A</td>
<td>200.0</td>
<td>311.0</td>
<td>27.0</td>
</tr>
<tr>
<td>Vitamin D</td>
<td>0.0</td>
<td>13.0</td>
<td>13.0</td>
</tr>
<tr>
<td>Calcium</td>
<td>9.0</td>
<td>68.0</td>
<td>63.0</td>
</tr>
<tr>
<td>Iron</td>
<td>10.1</td>
<td>44.6</td>
<td>22.9</td>
</tr>
<tr>
<td>Zinc</td>
<td>0.9 mg</td>
<td>5.5 mg</td>
<td>1.9 mg</td>
</tr>
<tr>
<td>Energy from fat</td>
<td>18.1 %</td>
<td>30.4 %</td>
<td>27.7 %</td>
</tr>
<tr>
<td>Dietary fibre</td>
<td>5.4 g</td>
<td>6.11 g</td>
<td>3.41 g</td>
</tr>
<tr>
<td>Sugar</td>
<td>17.5 g</td>
<td>34.9 g</td>
<td>44.7 g</td>
</tr>
<tr>
<td>Sodium</td>
<td>0.65 g</td>
<td>2.6 g</td>
<td>1.2 g</td>
</tr>
</tbody>
</table>

All nutrients except Vit A & C < 20 % RDA, low fat, sugar % fibre near standard
Highest energy, protein, thiamin, nicotinic acid folate, iron, zinc high sugar & salt (hot-pot)
Highest sugar (two puddings) very low Vit C.
<table>
<thead>
<tr>
<th>Nutrients</th>
<th>% RDA</th>
<th>% RDA</th>
<th>% RDA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy</td>
<td>11.9</td>
<td>35.3</td>
<td>15.9</td>
</tr>
<tr>
<td>Protein</td>
<td>18.2</td>
<td>57.5</td>
<td>20.0</td>
</tr>
<tr>
<td>Thiamin</td>
<td>10.7</td>
<td>28.4</td>
<td>25.9</td>
</tr>
<tr>
<td>Riboflavin</td>
<td>11.9</td>
<td>38.7</td>
<td>37.3</td>
</tr>
<tr>
<td>Nicotinic acid</td>
<td>16.0</td>
<td>75.0</td>
<td>30.0</td>
</tr>
<tr>
<td>Folate</td>
<td>1.7</td>
<td>11.4</td>
<td>11.2</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>0.0</td>
<td>59.2</td>
<td>20.8</td>
</tr>
<tr>
<td>Vitamin A</td>
<td>11.0</td>
<td>115.0</td>
<td>517.0</td>
</tr>
<tr>
<td>Vitamin D</td>
<td>4.0</td>
<td>13.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Calcium</td>
<td>22.0</td>
<td>56.0</td>
<td>17.0</td>
</tr>
<tr>
<td>Iron</td>
<td>7.8</td>
<td>34.0</td>
<td>31.0</td>
</tr>
<tr>
<td>Zinc</td>
<td>2.1 mg</td>
<td>4.8 mg</td>
<td>1.8 mg</td>
</tr>
<tr>
<td>Energy from fat</td>
<td>53.4 %</td>
<td>35.3 %</td>
<td>24.6 %</td>
</tr>
<tr>
<td>Dietary fibre</td>
<td>0.0 g</td>
<td>2.34 g</td>
<td>6.64 g</td>
</tr>
<tr>
<td>Sugar</td>
<td>13.1 g</td>
<td>30.9 g</td>
<td>18.2 g</td>
</tr>
<tr>
<td>Sodium</td>
<td>0.4 g</td>
<td>2.25 g</td>
<td>1.1 g</td>
</tr>
</tbody>
</table>

Highest fat, low energy, < 20 % RDA Adequate energy & all nutrients, fat near standard, low fibre, high low fibre, low zinc, Fat & sugar low. high sugar & salt
Table 5.39 Meals from a girls school packed lunches

<table>
<thead>
<tr>
<th>Nutrients</th>
<th>% RDA</th>
<th>% RDA</th>
<th>% RDA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy</td>
<td>6.0</td>
<td>50.0</td>
<td>41.0</td>
</tr>
<tr>
<td>Protein</td>
<td>3.0</td>
<td>51.0</td>
<td>68.0</td>
</tr>
<tr>
<td>Thiamin</td>
<td>5.0</td>
<td>87.0</td>
<td>22.0</td>
</tr>
<tr>
<td>Riboflavin</td>
<td>1.0</td>
<td>21.0</td>
<td>47.0</td>
</tr>
<tr>
<td>Nicotinic acid</td>
<td>10.0</td>
<td>64.0</td>
<td>64.0</td>
</tr>
<tr>
<td>Folate</td>
<td>2.0</td>
<td>35.0</td>
<td>15.0</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>17.0</td>
<td>328.0</td>
<td>27.0</td>
</tr>
<tr>
<td>Vitamin A</td>
<td>0.0</td>
<td>39.0</td>
<td>76.0</td>
</tr>
<tr>
<td>Vitamin D</td>
<td>0.0</td>
<td>34.0</td>
<td>15.0</td>
</tr>
<tr>
<td>Calcium</td>
<td>1.0</td>
<td>42.0</td>
<td>53.0</td>
</tr>
<tr>
<td>Iron</td>
<td>4.0</td>
<td>41.0</td>
<td>16.0</td>
</tr>
<tr>
<td>Zinc</td>
<td>2.7 mg</td>
<td>3.4 mg</td>
<td>5.4 mg</td>
</tr>
<tr>
<td>Sugar</td>
<td>0.0 g</td>
<td>70.0 g</td>
<td>23.0 g</td>
</tr>
<tr>
<td>Dietary fibre</td>
<td>2.9 g</td>
<td>8.9 g</td>
<td>5.7 g</td>
</tr>
<tr>
<td>Energy from fat</td>
<td>60.0 %</td>
<td>34.0 %</td>
<td>61.0 %</td>
</tr>
<tr>
<td>Sodium</td>
<td>0.18 g</td>
<td>1.95 g</td>
<td>1.2 g</td>
</tr>
</tbody>
</table>

- Lowest protein, Good meal except Iron low, very high
- thiamin, nicotinic high sugar fat due to very
- acid, riboflavin large piece of
- calcium, iron. (coca-cola)
- High fat. cheese
Table 5.39 Meals from a girls school packed lunches

<table>
<thead>
<tr>
<th>Lowest fat</th>
<th>Highest sugar</th>
<th>Lowest sugar</th>
</tr>
</thead>
<tbody>
<tr>
<td>32 % energy from fat</td>
<td>59 g</td>
<td>19.5 g</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>184 g ham sandwich</th>
<th>119 g peanut butter sandwich</th>
<th>102 g cheese sandwich (brown bread)</th>
</tr>
</thead>
<tbody>
<tr>
<td>330 g coca cola</td>
<td>64 g cake</td>
<td>25 g crisps</td>
</tr>
<tr>
<td></td>
<td>330 g coca cola</td>
<td>330 g fizzy lemonade</td>
</tr>
<tr>
<td></td>
<td>25 g crisps</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Nutrients</th>
<th>% RDA</th>
<th>% RDA</th>
<th>% RDA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy</td>
<td>28.0</td>
<td>47.0</td>
<td>26.0</td>
</tr>
<tr>
<td>Protein</td>
<td>37.0</td>
<td>40.0</td>
<td>32.0</td>
</tr>
<tr>
<td>Thiamin</td>
<td>57.0</td>
<td>29.0</td>
<td>20.0</td>
</tr>
<tr>
<td>Riboflavin</td>
<td>14.0</td>
<td>12.0</td>
<td>18.0</td>
</tr>
<tr>
<td>Nicotinic acid</td>
<td>46.0</td>
<td>87.0</td>
<td>41.0</td>
</tr>
<tr>
<td>Folate</td>
<td>9.0</td>
<td>18.0</td>
<td>10.0</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>0.0</td>
<td>17.0</td>
<td>17.0</td>
</tr>
<tr>
<td>Vitamin A</td>
<td>25.0</td>
<td>26.0</td>
<td>32.0</td>
</tr>
<tr>
<td>Vitamin D</td>
<td>16.0</td>
<td>18.0</td>
<td>9.0</td>
</tr>
<tr>
<td>Calcium</td>
<td>17.0</td>
<td>29.0</td>
<td>59.0</td>
</tr>
<tr>
<td>Iron</td>
<td>21.0</td>
<td>30.0</td>
<td>16.0</td>
</tr>
<tr>
<td>Zinc</td>
<td>2.3 mg</td>
<td>2.5 mg</td>
<td>2.7 mg</td>
</tr>
<tr>
<td>Sugar</td>
<td>36.0 g</td>
<td>59.0 g</td>
<td>19.5 g</td>
</tr>
<tr>
<td>Dietary fibre</td>
<td>2.7 g</td>
<td>8.9 g</td>
<td>5.45 g</td>
</tr>
<tr>
<td>Energy from fat</td>
<td>32.0 %</td>
<td>44.0 %</td>
<td>51.0 %</td>
</tr>
<tr>
<td>Sodium</td>
<td>1.5 g</td>
<td>0.95 g</td>
<td>0.77 g</td>
</tr>
</tbody>
</table>

No Vit. C, sugar quite high, fibre low. Low Vit. C, high sugar (coca cola, cheese), low Vit. C. High fat (crisps, fibre good (peanut butter - contributes to fat content).
### Table 5.40 Meals from a boys school off-premises lunches

<table>
<thead>
<tr>
<th>Nutrients</th>
<th>Lowest energy 5% RDA</th>
<th>Highest energy 49% RDA</th>
<th>Highest fat 64% energy from fat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy</td>
<td>5.0</td>
<td>49.0</td>
<td>36.0</td>
</tr>
<tr>
<td>Protein</td>
<td>5.0</td>
<td>17.0</td>
<td>22.0</td>
</tr>
<tr>
<td>Thiamin</td>
<td>0.0</td>
<td>18.0</td>
<td>20.0</td>
</tr>
<tr>
<td>Riboflavin</td>
<td>3.0</td>
<td>18.0</td>
<td>9.0</td>
</tr>
<tr>
<td>Nicotinic acid</td>
<td>11.0</td>
<td>26.0</td>
<td>28.0</td>
</tr>
<tr>
<td>Folate</td>
<td>0.0</td>
<td>5.0</td>
<td>3.0</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>0.0</td>
<td>54.0</td>
<td>12.0</td>
</tr>
<tr>
<td>Vitamin A</td>
<td>0.0</td>
<td>1.0</td>
<td>36.0</td>
</tr>
<tr>
<td>Vitamin D</td>
<td>0.0</td>
<td>0.0</td>
<td>23.0</td>
</tr>
<tr>
<td>Calcium</td>
<td>5.0</td>
<td>39.0</td>
<td>30.0</td>
</tr>
<tr>
<td>Iron</td>
<td>4.0</td>
<td>26.0</td>
<td>22.0</td>
</tr>
<tr>
<td>Zinc</td>
<td>0.5 mg</td>
<td>1.0 mg</td>
<td>1.5 mg</td>
</tr>
<tr>
<td>Sugar</td>
<td>18.0 g</td>
<td>199.0 g</td>
<td>10.0 g</td>
</tr>
<tr>
<td>Dietary fibre</td>
<td>0.0 g</td>
<td>0.0 g</td>
<td>0.0 g</td>
</tr>
<tr>
<td>Energy from fat</td>
<td>38.0%</td>
<td>25.0%</td>
<td>64.0%</td>
</tr>
<tr>
<td>Sodium</td>
<td>0.32 g</td>
<td>0.25 g</td>
<td>1.14 g</td>
</tr>
</tbody>
</table>

**Nutrients:**
- Lowest protein, thiamin, folate, iron, all nutrients < 20% RDA
- High energy due to: high sugar, protein, high thiamin, folate, sausage roll
- High fat due to: riboflavin, thiamin, riboflavin, Vit. C
- Low fibre & zinc: < 20% RDA, v. low fibre

26 g pork sausages
350 g lemonade
162 g chips
100 g boiled sweets
204 g sausage roll
119 g mars bars (2)
330 g coca cola
170 g cup of tea
119 g mars bars (2)
Table 5.40 Meals from a boys school off-premises lunches

<table>
<thead>
<tr>
<th>High fat from fat</th>
<th>Low fat from fat</th>
<th>High sugar</th>
</tr>
</thead>
<tbody>
<tr>
<td>102 g sausage roll</td>
<td>180 g cheese &amp; pickle roll</td>
<td>75 g cake</td>
</tr>
<tr>
<td>68 g Mars bar</td>
<td>25 g chips</td>
<td>68 g Mars bar</td>
</tr>
<tr>
<td></td>
<td>330 g coca cola</td>
<td>330 g coca cola</td>
</tr>
<tr>
<td></td>
<td></td>
<td>30 g ice lolly</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Nutrients</th>
<th>% RDA</th>
<th>% RDA</th>
<th>% RDA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy</td>
<td>28.0</td>
<td>23.0</td>
<td>43.0</td>
</tr>
<tr>
<td>Protein</td>
<td>15.0</td>
<td>27.0</td>
<td>20.0</td>
</tr>
<tr>
<td>Thiamin</td>
<td>12.0</td>
<td>20.0</td>
<td>16.0</td>
</tr>
<tr>
<td>Riboflavin</td>
<td>10.0</td>
<td>14.0</td>
<td>17.0</td>
</tr>
<tr>
<td>Nicotinic acid</td>
<td>22.0</td>
<td>32.0</td>
<td>31.0</td>
</tr>
<tr>
<td>Folate</td>
<td>1.0</td>
<td>12.0</td>
<td>7.0</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>0.0</td>
<td>8.0</td>
<td>54.0</td>
</tr>
<tr>
<td>Vitamin A</td>
<td>18.0</td>
<td>18.0</td>
<td>31.0</td>
</tr>
<tr>
<td>Vitamin D</td>
<td>11.0</td>
<td>1.0</td>
<td>21.0</td>
</tr>
<tr>
<td>Calcium</td>
<td>30.0</td>
<td>74.0</td>
<td>42.0</td>
</tr>
<tr>
<td>Iron</td>
<td>17.0</td>
<td>24.0</td>
<td>27.0</td>
</tr>
<tr>
<td>Zinc</td>
<td>0.7 mg</td>
<td>3.0 mg</td>
<td>1.4 mg</td>
</tr>
<tr>
<td>Sugar</td>
<td>45.0 g</td>
<td>49.0 g</td>
<td>110.0 g</td>
</tr>
<tr>
<td>Dietary fibre</td>
<td>0.0 g</td>
<td>3.0 g</td>
<td>0.75 g</td>
</tr>
<tr>
<td>Energy from fat</td>
<td>56.0 %</td>
<td>24.0 %</td>
<td>50.0 %</td>
</tr>
<tr>
<td>Sodium</td>
<td>0.66 g</td>
<td>1.5 g</td>
<td>0.42 g</td>
</tr>
</tbody>
</table>

High fat & sugar (sausage roll & Mars bar), protein folate, Vit.D, Vit A, Vit. C, iron < 20 % RDA.

Lowest energy from fat, sugar high.

High sugar & fat, low protein, thiamin, riboflavin, folate.
High Fat Meals.

These contained several moderately high fat items or one very high fat item. Meals containing sausage rolls, or cream horns, obviously had very high fat contents, both these items consisting of flaky pastry combined with a high fat filling. If, however, the flaky pastry is combined with apple (as in apple puffs which appeared in several meals) the proportion of energy from fat is reduced, and as long as the meal does not contain another moderately high fat item, the overall proportion of energy from fat is not too high.

Victoria sandwich with butter icing and shortbread biscuits are other items which raise the fat content of the meal. Biscuits were often placed near the cash desk where several were purchased with any spare money.

Several of the meals selected as having fat contents near the recommended level included items such as frankfurters, or beef-burgers in rolls, and chips, indicating that if enough carbohydrate is also included, the proportion of energy from fat is reduced; this is particularly true if baked beans are also included. All these foods, rolls, chips, and baked beans, contribute dietary fibre. This illustrates the importance of balancing a food containing fat with one containing carbohydrate, (but not high in sugar).

High Sugar Meals.

These were those where more than one pudding was eaten, or a pudding plus a milk shake; many milk shakes have a very high sugar content.

Food choice in Non-school Meals.

The meals selected illustrate clearly the types of meal often consumed as alternatives to school meals. The off-premises lunches very frequently contained foods with a low nutrient density, that is those with a high energy content from fat or more particularly sugar, but a low content of protein and other nutrients. Packed lunches containing bread do not fall into this category, but the addition of one or more packets of crisps does raise the proportion of energy from fat of the whole meal, as does a very large piece of cheese, as included in one meal.
These points arising from the discussion of meals at either end of the range of intakes, particularly of energy, fat and sugar, illustrate that while items are available in the cash cafeteria which will make up a well balanced meal, there is considerable need for guidance of children's choice in this system, this will be discussed more fully in Chapter Six.

5.5 SUMMARY OF STUDY

5.5.1 Effects of change to cash cafeteria Service.

In view of the concern expressed over the long term effects on childrens' health, of a change to a cash cafeteria system for school meals, one of the objectives of the study was to compare the nutritional value of meals consumed in the traditional service and cash cafeteria system.

Time and resources have allowed only a small number of schools to be studied in detail, although the schools chosen were typical of those in the ILEA. Also, while the immediate period of change from traditional service to cash cafeteria service was avoided, it is not known how the children's choice of items from the cash cafeteria will change over a long term period, as the system becomes more established.

Nevertheless, the findings of this research clearly merit further work being carried out.

The main features of a cash cafeteria service which are likely to affect the nutritional value of the meals are:

- a change in the pricing structure of the meal - instead of a fixed price traditional 'meat and vegetables, pudding and custard' meal for 35 pence, a selection of individually priced items are available from which the children select and pay for items which make up the meal. However, within the cash cafeteria system 'the meal of the day' is available for 35 pence. How the amount of money available affects childrens' selection of items was not determined.

- a change in the type of foods served - while in the traditional service system, items such as filled rolls, salads, sausage rolls, chips, were often available as part of the fixed price meal, in the cash cafeteria, as well as the 'meal of the day' option, many more 'fast food' items are usually available such as beefburger and frankfurters in rolls, pizza, cakes, biscuits, jelly, yoghurt, fresh fruit. As the results show,
a well-balanced meal in the current nutritional sense can be made up from these items if carefully chosen.

These changes have given children a much greater freedom of choice over which foods and how much (or how little) they eat, which is reflected in the range of nutritional values of the meals from the cash cafeteria. Choice is also a feature of the traditional service meals, but to a lesser extent; results of the analysis of these meals have shown smaller variations in nutrient intake.

Therefore, two main factors affecting the nutritional value of the meals consumed in the cash cafeteria (also, to a lesser extent, in the traditional service system) can be identified;

- the food provided by the caterer – it could be suggested that the mean values for the nutrient content mainly reflect the type of food provided by the caterer.
- the food chosen and eaten by the child – it could be suggested that the distribution and range of intakes mainly reflect the element of choice.

The findings of the survey must, therefore, be viewed in this light, and the conclusions and discussion of the implementation of nutritional guidelines must recognise the interaction of both these factors.

Energy

Mean values for energy content of school meals compared well with the standard, indicating adequate provision of food. In the case of the girls school traditional service meals, food provision was adequate but less food was eaten, presumably because it was not liked very much.

The change to a cash cafeteria system led to an increase in the mean values for energy intakes, indicating that children were eating more. The greater freedom of choice in the cash cafeteria led to an increase in the range of intakes.

Fat, Sugar, Dietary Fibre.

These nutrients are particularly emphasised in the dietary guidelines (discussed in Chapter Two). Mean values for the percentage of total energy from fat for all school meals except those in the girls school
traditional service, were too high compared with the standard.

The mean values for sugar content for all meals were also too high compared with the standard. This was particularly true in the boys school.

Mean values for dietary fibre contents were also too low.

The change to cash cafeteria meant an overall increase in sugar intakes and an increase in the fat intake in the girls school (in the boys school fat intake actually decreased, but the traditional service meals were very high in fat). Dietary fibre intakes did not change significantly.

The freedom of choice in the cash cafeteria again led to a wide range of intakes. The meals providing intake at the ends of the ranges for fat, sugar and dietary fibre, indicate the importance of wise choice if a balance between fat, carbohydrate and protein is to be achieved.

Protein, Vitamin and Minerals.

Mean values for most of these nutrients for most school meals compared well with standards if enough food was eaten to meet energy needs. Low mean values for some of the nutrients in the girls school traditional service meals were mainly due to low food intakes. The range of intakes of most of these nutrients reflect variations in overall food intake.

The range of values for Vitamin C, however, was from zero to several times the RDA, mainly depending on whether orange juice was chosen in the cash cafeteria.

The different types of foods served in the cash cafeteria may affect intakes of riboflavin, folate, and vitamin A. These will need to be monitored carefully as some meals showed low values for these nutrients. It was suggested in Chapter Three that intakes of calcium, iron and zinc may also need to be monitored.

5.5.2 Comparison of school meals and non-School meals.

School meals in almost all cases compared very favourably with the alternatives. Mean values for energy and all nutrients were, in almost all cases lower in both off-premises lunches and packed lunches than in school meals. Mean values for fat intakes were higher in these meals also, and many meals showed high sugar intakes.
5.6 CONCLUSIONS TO STUDY

The main argument of this thesis is that the school meal still has an important contribution to make to the nutrition of school children in the 1980's. A comparison of the nutritional value of the school meal and that of the food consumed by the children who do not have the school meal supports this argument.

In order to ensure that this important role is fulfilled it is suggested that the government should once again assume responsibility by replacing the previous nutritional standards by guidelines on nutritional aspects of school meals. Such guidelines could incorporate or give guidance in the following areas:-

- quantified dietary goals, for school meals.
- dietary guidelines in terms of foods.
- the importance of nutrition education to guide choice.
- the importance of liaison between the nutrition educator and the school caterer.

These guidelines were discussed in detail in section 4.4.

The main aim of this study was to assess the need for and the feasibility of such guidelines. It is suggested that the need for such guidelines has been clearly shown.

As was discussed above the nutritional value of the meal consumed by school children depends partly on the foods provided by the caterer. Quantified dietary goals and dietary guidelines would clearly give important guidance in menu planning and food purchasing. This will be discussed in more detail in Chapter Six in relation to implementing dietary guidelines. The quantified dietary goals can also be used to monitor the nutritional value of school meals.

In addition the nutritional value of the meal consumed depends on the combination of items chosen by the child. This study has clearly shown the need for nutrition education to guide children's choice. While this is mainly the responsibility of those involved in nutrition education, it is suggested that the school caterer should be considered and involved as an important member of the nutrition education team. This area is discussed further in Chapter Six.

The feasibility of the suggested guidelines on the nutritional aspects of school meals can only be determined by further studies designed to evaluate the implementation of these guidelines.
The study, therefore, has not only clearly shown the need for guidelines on nutritional aspects of school meals, but has also given some clear indications as to how these guidelines could be implemented. The implementation of these guidelines will be discussed in Chapter Six.
REFERENCES - CHAPTER FIVE

Bender, A.E.: (1979), British Medical Journal 2, 732,


Department of Health and Social Security: (1979), Recommended Daily Amounts of Food Energy and nutrients for Groups of People in the United Kingdom, London: HMSO.


6.1 INTRODUCTION

It was suggested at the end of Chapter Four that guidelines on nutritional aspects of school meals should be formulated to replace the nutritional standards which applied before the 1980 Education Act. Such guidelines should include not only dietary goals to be used in the planning and monitoring of school meals, but also guidance for those involved in their implementation - school caterers and nutrition educators. It was suggested that particular emphasis should be placed on the importance of liaison between these two groups of people.

It is also argued that that the implementation of the guidelines on nutritional aspects of school meals discussed in Chapter Four should be seen as part of the overall strategy for achieving dietary goals for the population as a whole. Thus this chapter examines some aspects of the problem of implementing these guidelines for school meals in the context of strategies suggested for achieving dietary goals in the United Kingdom.

In Chapter Two the distinction between dietary goals and dietary guidelines was discussed. It was suggested that dietary goals should be seen as an end, in terms of changes in nutrient intake; and dietary guidelines, as suggested changes in food consumption needed to achieve this end. Chapter Two also discussed the suggestion put forward by many nutritionists, that a set of officially recognised dietary goals was the first step towards a national Nutrition or Food and Health Policy, the aim of which should be to co-ordinate government Food, Agriculture, and Health Education Policies to facilitate the achievement of dietary goals. It was suggested also, that dietary guidelines would provide practical guidance for caterers and others involved in feeding people, and thus form the basis of nutrition education.

It was suggested in Chapter Two that since the Committee on Medical Aspects of Food Policy is the official channel through which the government receives advice on dietary matters, government action required to implement such advice is likely to be based on these recommendations. However the consensus of opinion amongst nutritionists would seem to be
that, while the COMA recommendations relate specifically to the prevention of cardiovascular disease, and thus are concerned mainly with dietary fat, the complexity of the inter-relationships between diet and disease would indicate the need for recommendations relating to the diet as a whole. Thus the use of the recommendations made in both the NACNE (1983) and COMA (1984) Reports as the basis of dietary goals for school meals was discussed in Chapter Four.

The suggestions made by Hollingsworth (1979), Eating for Health (1978) and others for qualitative changes in food consumption (dietary guidelines) needed to achieve dietary goals were discussed in Chapter Two, as were the quantified changes in consumption of the main sources of fat in the diet as suggested by the COMA Report. The quantified dietary guidelines suggested by Walker (1983) and Passmore (1979) were also compared in this chapter. Dietary guidelines for achieving dietary goals in school meals were discussed in Chapter Four.

It was emphasized in Chapter Two that many dietary patterns may be compatible with a given set of dietary goals, this point will be discussed in more detail in this chapter. Following the publication of the NACNE and COMA Reports there have been a number of media attempts to communicate the translation of these dietary guidelines into recipes, meals and diets. (Maryon-Davies and Thomas, 1984; Robbins, 1985 and BBC, 1985). The JACNE publication (1985) also translates the recommendations of the COMA Report into 'everyday language', and makes suggestions for changes in food consumption. The role of the media and the problem of communication in nutrition education will be discussed in a later section of this chapter.

This chapter will discuss some of the strategies for implementation of these dietary guidelines. The complexity of the issues involved in these strategies were discussed in Chapter Two, some of these issues will be discussed in more detail in this chapter.

6.1.1 Defining the problem

As has been discussed above, changes in consumption of food will be required in order to achieve the suggested changes in nutrient intake. Thus strategies for implementing dietary guidelines depend firstly on a knowledge of current food consumption patterns, and secondly on a knowledge of the different factors which affect or determine eating behaviour.

It is suggested in the report by the Centre for Agricultural Strategy (CAS Report, 1979) that the factors affecting eating behaviour can be
divided into two groups, those which affect the supply or availability of food to the consumer (exogenous factors) and those which affect the individual's choice of food (endogenous factors); strategies for implementation of dietary guidelines thus depend also on a knowledge of the inter-relationship and the relative importance of these two groups of factors.

Since the process of implementation of dietary guidelines implies a change or modification of eating behaviour, a knowledge of how food habits are acquired or formed and knowledge of how food consumption patterns change and thus how they can be influenced to change in line with dietary guidelines are necessary prerequisites. This knowledge provides the basis for nutrition education.

This chapter will therefore, examine the suggestions that there are considerable gaps in knowledge in all these areas, and thus a need for further research. Some of the recent papers discussing both the state of knowledge and the need for further research will be reviewed.

There has been much discussion of strategies for achieving dietary goals following the publication of the NACNE (1983) and COMA (1984) Reports, and a number of moves have already been made towards this end. This chapter will also discuss some of these suggested strategies and some of the initiatives already taken, in the light of existing knowledge and the need for for further research.

The dichotomy of views revealed by this debate was discussed in Chapter Two; on one hand there are those who believe that the consumer determines food production through informed demand and that the creation of this demand depends on nutrition education (Darke 1979); on the other hand, there are those who believe that the consumer's choice is directed for him by agencies over which he has little influence, and that 'education on its own, so often advocated by government and industry, will not enable the individual to choose a healthier diet unless the food supply is modified accordingly' (CAS Report 1979).

Those who hold the first view, therefore, favour an educational strategy, and those who hold the second, a legislative or regulatory strategy. These two seemingly opposing strategies reflect differing views on the relative importance of the two sets of factors which affect eating behaviour.

This dichotomy of views was reflected in the title of a paper given by Widdowson (1985) 'Better Health through Nutrition - Legislation or Education'. While recognising the validity of legislative strategies,
Widdowson clearly favours an educational strategy in the present situation, 'legislation and education are not alternatives. They are both essential means of promoting better health through nutrition. In times of food shortage, legislation is virtually essential but in times of peace and plenty it is only by educational channels of all kinds that good nutrition messages can be within reach of all people'.

One way of illustrating the inter-dependence of the two sets of factors is shown diagrammatically in Figure 6.1. The stages and agencies involved in the food supply chain are indicated in this diagram; these represent the exogenous factors affecting eating behaviour, or agencies determining the availability of food. This chapter will discuss some aspects of the role of the food industry and of the government in ensuring availability of foods from which the consumer can choose a healthy diet.

This diagram also shows the endogenous factors which are subsumed in the beliefs and attitudes which determine acceptability and influence the consumers choice of food. This chapter will also examine the use of findings from behavioural research as the basis for nutrition education.

In addition, this diagram illustrates that the eating behaviour of the consumer is determined by the interaction of these two sets of factors.

The argument put forward in this thesis is that a combination of strategies reflecting the inter-dependence of these factors is the only one likely to be successful in achieving dietary goals. A supply of suitable foods must be ensured, but at the same time, consumer demand must be created through education.

It is suggested that the role of the government should be to co-ordinate both aspects, by means of a Food and Health Policy, and balance the interests of all those involved to ensure that supply and demand coincide. This chapter will also discuss the role of government policy in co-ordinating strategies for implementing dietary guidelines.

The situation in school meals is exactly analogous; this chapter will discuss the role of the school caterer in the provision of suitable foods from which children can choose a balanced diet, the role of those involved in nutrition education in creating a demand for such foods, and the importance of liaison between the caterer and the nutrition educator. It is suggested that guidelines on the nutritional aspects of school meals as discussed in Chapter Four, set at government level, would help to co-ordinate supply and demand and thus facilitate the achievement of dietary goals in school meals.
Figure 6.1 Factors affecting food choice
(from Fallows, 1985 and ILEA 1985)

THE FOOD INDUSTRY

PRODUCER

Agricultural practice

BASIC PROCESSOR

Government policy & legislation

MANUFACTURER

CATERER

RETAILER

AVAILABILITY

FOOD AVAILABLE AT A PRICE THE CONSUMER CAN AFFORD TO PAY

ACCEPTABILITY

Culture

Knowledge & information

Peer group influences

Income

Social conventions

Individual taste preferences

Religion

Psychological factors

Ethics, moral & political beliefs

Advertising

Status

Lifestyles

Family influences

INDIVIDUAL CHOICE
The problem of changing eating behaviour is a complex one, involving a knowledge of the various factors which determine eating behaviour and their interactions. In addition, the implications of these changes are far reaching.

A detailed examination of all the areas of knowledge, the issues involved and the implications of changing eating behaviour are beyond the scope of this thesis. As is discussed below, there are many gaps in this knowledge, and further research and discussion is needed before a successful strategy can be formulated. This chapter can only provide an overview of the problem and identify areas where further research is needed. This overview is needed to provide the context for the discussion of the implementation of dietary guidelines in school meals. In the words of Garrow (1985) 'I ask these questions, but provide no answers, because I am a nutritionist, not an economist or sociologist'. This in particular, stresses the need for a multi-disciplinary approach to the problem of changing food habits to achieve dietary goals.

6.1.2 Necessary knowledge and need for further research

As was discussed above, implementing dietary guidelines implies a change or modification of food or eating behaviour. Thus, a necessary prerequisite is not only a knowledge of the food behaviour of the population or group, but also a knowledge of the factors determining this behaviour and the inter-relationship between these factors; a knowledge of how food habits are acquired or formed, and knowledge of how food consumption patterns change and thus how they can be influenced to change in line with dietary guidelines.

Gifft et al (1972) identify certain questions, the answers to which need to be found and taken into consideration by anyone who wishes to influence the formation of good food habits or motivate change to improve the nutritional quality of diets.

- Why do people eat what they do?
- How and when are eating patterns and attitudes about food established?
- What are the various roles that food plays in their lives?
- Why do they cling with persistence to their established eating patterns?
- Why do these patterns occasionally undergo change, and how can beneficial change be facilitated?
- How is food behaviour related to behaviour in other areas of life?

Giff et al (1972) suggest that such knowledge is a necessary prerequisite for effective nutrition education, 'nutrition education strives to transform knowledge (about the nutritional needs of people and the nutritive value of foods) into eating practices that will promote health and well-being, thus becoming immediately involved with the behaviour patterns of individuals'.

It has been emphasised by a number of authors that knowledge in this area is far from complete.

It was suggested in Chapter One that, until recently, this was an area of knowledge neglected by many nutritionists whose attention was focused on physiological aspects of nutrition, and, more recently, on the role of diet in the aetiology of degenerative diseases. With increasing evidence to support the latter area, the need to change or modify the food habits of the population in the UK and other Western countries became evident. It is suggested that more effective progress can be made towards achieving dietary goals when there has been considerably more research in the areas outlined above, and the results of such research have been applied specifically to the problem of influencing eating behaviour to change in the direction suggested by the dietary guidelines.

This idea is supported by the authors of the CAS report (1979) 'there is inadequate understanding of the determining factors (of food consumption patterns) and how they interact'; also by McKenzie (1980) 'whilst our understanding and appreciation of the problems and solutions to changing food habits is constantly growing, a great deal of work needs to be done'.

This is also the theme of an article by Anderson in the Times (12-3-85) who suggests that nutritionists know 'next to nothing' about why people buy and eat the (unhealthy) foods they do, 'all the knowledge in the world about polyunsaturated fats is worth nothing if the puzzle is about why people eat sticky buns'. While the extreme views of this author are somewhat unpalatable, there is some truth in this statement.

A British Nutrition Foundation survey (1982) on eating behaviour and attitudes to food, nutrition and health, concluded that, despite the existence of an 'enormous amount of information' in this area, there were some 'important gaps' in the data. The main gaps identified were;

- on eating behaviour; a lack of quantitative data on total food consumption and expenditure including food eaten outside the home; also a lack of data relating to the planning and structure of meals.
- on attitudes to food; on what the factors are that determine the
choice of food, and perhaps, more importantly, how housewives balance in their minds these various factors. Specifically, there was a need for more information on
- perception of relative prices and values.
- the food culture, norms, influences and regional differences.
- food and family relationships.
- healthy living and the part food plays in it.
- planning meals and diet, how all these factors are taken into account for oneself and the family.
- on the link between attitudes and behaviour; there is no data on how these ideas about food and the influences on its choice are related to actual meal planning and eating behaviour.

It is, however, the argument of this thesis, that to wait for research to provide an infallible guide to changing food habits would take too long (as with waiting for proof of a causative role for fat in coronary heart disease). The task of attempting to change food habits in line with dietary guidelines must proceed on the basis of existing knowledge, with recognition of the fact that there are many gaps in this necessary area of knowledge.

This is also the view expressed by McKenzie (1980) 'but we can hardly neglect the nutritional health of an individual or community until our knowledge of the problems associated with change and our ability to overcome them becomes all embracing. Something needs to be done, albeit imperfectly, now'.

This chapter will attempt to define some of the terminology used in this area, will review some of the recent papers discussing both the state of knowledge and the need for further research in some of the areas outlined above, as a preliminary to examining the role of nutrition education in changing food habits in line with dietary guidelines.

**Strategies for implementing dietary guidelines**

A number of strategies which could be employed to facilitate the achievement of dietary goals have been suggested, usually in the context of a discussion of the need for, and role of a government nutrition, or food and health policy.

The formulation of a government food and health policy employing and balancing these strategies is an extremely complex task, with many issues to be taken into account, involving ethical, political, scientific and
economic considerations. A number of papers have been written discussing various aspects and implications of such a policy; there are as many suggested strategies and ideas on the role of a government food policy as there are views on these issues. An effective national food policy involves considerable further research and discussion amongst economists, sociologists and nutritionists. At present, discussions are hampered by a lack of knowledge of the effects of some of these strategies, and of the means of putting them into practice, and also by differences in ethical and political views.

Some of these suggested strategies are examined below as a background to the discussion, in this chapter, of the role of nutrition education in changing eating behaviour, and the role of the food industry and the government in implementing dietary guidelines.

Nicholls (1983) examines the three major strategies for change identified by Chin and Benne (1976), and relates them to the military derivation of the term 'strategy', 'science and art of planning and directing operations against an enemy'; this author therefore, suggests that a strategy for change implies 'a planned and systematic attack on a problem'. A common element in all three major strategies for change identified by Chin and Benne and others cited by Nicholls, is the conscious utilisation and application of knowledge which is used to help to understand the behaviour of groups.

Nicholls discusses three major groups of strategies:

- empirical-rational strategies, - these strategies are based on the assumption 'that man is rational and will follow his rational self-interest, once this is revealed to him'. This approach sees the main obstacles to change as ignorance and superstition, and education as the means of disseminating scientific knowledge and of 'freeing man from the shackles of superstition' and the main task of those wishing to bring about change is to present the validity of the change in terms of the gains to be achieved by adopting it. Nicholls suggests that this strategy is the one most widely used in attempting to bring about changes in eating habits, and cites a number of studies which indicate a poor record of success. She suggests that research is needed to ascertain whether an empirical-rational strategy can be effective, and if so 'with whom, under what conditions and in what circumstances'.

- normative - re-educative strategies - this group of strategies are based on the argument that patterns of action and practice (behaviour) are supported by socio-cultural norms and commitments; and that advocates of
this approach base their strategy on such understanding as there is, of the forces that motivate behaviour. While not denying the importance of knowledge, the importance of non-cognitive determinants of behaviour should also be recognised. Nicholls cites the argument of Chin and Benne, 'changes in a pattern of practice or action will occur only as the persons involved are brought to change normative orientations to old patterns and develop commitments to new ones; and changes in normative orientations involve changes in attitudes, values, skills and significant relationships, not just changes in knowledge, information or intellectual rationales for action and practice'. Nicholls cites the methods used by organisations such 'weight watchers' as an illustration of this strategy; the author also cites studies which question the long term effectiveness of these methods (Ashwell and Garrow 1975), and suggests that again there is a need for research to establish how, when, and with whom such strategies might be effective.

The question of whether the nutrition educator should merely provide information (empirical-rational strategies) or should attempt to change behaviour (normative-re-educative strategies) is discussed in section 6.4.

- power-coercive strategies - Nicholls suggests that this group of strategies, unlike the other two, emphasise political and economic sanctions, and the use of moral power, 'the strategists of change deciding which goals are desirable'. Also that such strategies were the basis of government nutrition policy during the Second World War. Nicholls quotes both Hollingsworth (1979), 'good was done by stealth .... and the public benefited without having to make conscious effort', and McKenzie (1977) 'government regulations in terms import controls, price manipulation and rationing would of great importance if fundamental changes are required'. Nicholls, however, suggests that 'in a democratic society, and in the absence of a national emergency, power-coercive strategies are unlikely to be unacceptable to many people, even in the light of their past effectiveness in relation to changing the nation's eating habits for the good'.

This is also the view expressed by both Darke (1979), and Hollingsworth (1979) (discussed in Chapter Two) and of Widdowson (1985) (discussed above) 'legislation about food has primarily concerned rationing in times of shortages and war .... actions can be taken in wartime which would be impossible in times of peace and plenty .... (in
such times) a reduction in consumption of foods freely available can only be brought about by education and persuasion'.

Nicholls suggests once again that research is necessary to establish the potential effectiveness and acceptability of power-coercive strategies in the light of the current need to change eating habits.

Sanderson and Winkler (1983) also suggest that 'formulating an effective national food-health policy involves a complex balancing of many interests and several strategies',

- an education strategy - would induce people to change their diets through 'provision of information, exhortation, instruction and example'.
- a substitution strategy - would use healthful commodities in place of harmful ones; 'the logic underlying this substitution strategy is that consumers still have an unrestricted choice but whatever they choose for reasons of taste, price or attractiveness, they leave the shop with healthful food'.
- a pricing strategy - would induce switching from harmful to healthful commodities by altering their relative prices.
- a provision strategy - would directly alter consumption by improving the meals offered in government institutions.
- a regulatory strategy - would structure the availability of foods through legislative and administrative controls.

Of these strategies the first would seem to belong to the empirical - rational, or possibly the normative - re-educative, group of strategies discussed by Nicholls (1983).

Sanderson and Winkler point out 'the ineffectiveness of the educational strategy' and suggest that 'food-health policy will have to involve more than the individual consumer-patient ... that to be effective 'nutrition policy must move beyond educating individual consumer-patients toward a balanced strategy involving all interested parties'.

The other strategies suggested by Sanderson and Winkler would appear to belong to the power-coercive group of strategies discussed.

This chapter will therefore, firstly, examine some of the steps that may be taken by the food industry to ensure a supply of foods from which a diet may be chosen to achieve dietary goals. It will also examine the role of the school caterer in the supply of foods from which children may choose a balanced meal.

The following sections will examine the role of nutrition education
in the implementation of dietary guidelines, and discuss the importance of
nutrition educators considering how children in schools may be helped to
choose wisely from the supply of foods available.

The final sections of this chapter will examine the role of the
government in co-ordinating the supply and demand for foods from which
a balanced diet can be chosen, and discuss the importance of liaison
between school caterers and those involved in nutrition education in
schools towards the implementation of the suggested guidelines on the
nutritional aspects of school meals.

6.2 IMPLEMENTATION OF DIETARY GUIDELINES - THE INFLUENCE OF THE FOOD
INDUSTRY ON THE AVAILABILITY OF FOODS

It was suggested in section 6.1 that the factors influencing food
behaviour could be divided into two inter-related groups - those which
affect the supply or availability of food to the consumer (exogenous
factors), and those which determine the acceptability of the food to the
individual (endogenous factors). It was suggested that strategies for the
implementation of dietary guidelines depended on the inter-relationship
and relative importance of these two sets of factors.

This section is concerned with the main function of the food
industry, that is the supply of food from which a balanced diet can be
chosen. While some examples of food industry activity in the area of
nutrition education will be described in this section, the much debated
role of the food industry in this field will be discussed in section 6.4.

The food industry, however, cannot be considered in isolation. As
will be discussed in this section, government and EEC policy and
legislation influences, for example, the availability or nutritional
composition of food. The role of government policy co-ordinating the
implementation of dietary guidelines will be discussed in section 6.7.

The authors of the NACNE Report recognised that their recommendations
would have considerable implications for the food industry, as did a
number of authors discussing the implementation of these and other dietary
recommendations, (Turner and Gray, 1982; Sanderson and Winkler, 1983).

The economic implications for the food industry of changes in food
habits were discussed at a symposium held by the Nutrition Society in
1985; Marsh discussed 'The economic implications of a health policy' and
Jones discussed 'Nutrition and economic pressures on agriculture'. While it is recognised that the recommendations of the NACNE and COMA reports will have considerable economic implications, a discussion of these is outside the scope of thesis.

Fallows (1985) considers the role of the food industry in implementing dietary guidelines; he suggests that either (or both) of the following two strategies can be applied;
- radical alteration of the diet to exclude certain established foodstuffs and include other less familiar foods,
- modification of existing foodstuffs to produce new varieties which fit more closely with recommendations.

It is accepted by most workers in this field that the scope for application of the first strategy is limited, few completely new products are developed by the food industry. However, its partial application, that is the alteration of the balance of food commodities consumed is implicit in the redefinition of the concept of 'a balanced diet' and would have considerable implications for the food industry.

There is, however, considerable potential for application of the second strategy at all of the stages in the food supply chain, and a number of the initiatives already taken by the food industry are applications of this strategy. This second strategy is similar to the 'substitution strategy' of Sanderson and Winkler (1983), discussed in section 6.1.

Fallows also discusses educative strategies which may be employed by the food industry.

This section will also discuss recommendations to the food industry, made by the COMA report (DHSS, 1984) for the implementation of their dietary recommendations.

The various stages and agencies in the food supply chain are identified in Figure 6.1., the primary producer, the basic processor, the food manufacturer and the retailer or caterer. The potential role of each sector in the implementation of dietary guidelines will be discussed in turn.

The Primary Producer.

Fallows (1985) defines this as 'the basic extractive industry' and suggests that this is the stage at which the principle characteristics of
basic food commodities are determined. It is this stage that the fat content of meat and milk can be reduced by the farmer. However, farmers will only take this action if it is commercially feasible; current commercial, government and E.E.C. incentives tend to run counter to the encouragement of the production of both meat and milk with lower fat contents.

It is estimated by the National Food Survey (1984) that in the UK diet about one quarter of the fat and saturated fatty acids are obtained from meat and meat products.

For some time, nutritionists have been recommending practical measures to reduce this such as cutting the fat off meat before cooking. Fallows (1985) points out, however, that it is more efficient not to produce the fat in the first place than to discard it at a later stage in the system. The farmer can reduce meat-fat production by breeding leaner varieties of animals or by altering feeding and management methods.

Fallows (1985) cites the example of the pig industry as one where there have been moves towards the production of leaner meat - moves yet to be followed by the beef and lamb producers, due almost certainly to lack of government and EEC promoted commercial incentives.

The COMA report on makes recommendations to the government that 'consideration should be given to ways and means of encouraging the production of leaner carcasses in sheep, cattle and pigs (for example by adjustments to the operation of the carcass grading systems)'.

Jones (1985) suggests that the short term NACNE recommendations could be met by the alteration of the slaughter weight of livestock and this could be done without altering the energetic efficiency of lean meat production. There would, however, need to be a change in the application of the present day subsidies, particularly in those for lambs which tend to favour high live weights at slaughter which are associated with high fatness. Jones also suggests that further reductions can only be met by changes in processing and butchering methods and these will only be effective if the fat is subsequently withdrawn from the human food chain.

Other measures suggested by nutritionists to reduce the fat intake from meat, - eating more of the leaner meats such as poultry and game, also fish, instead of red meats such as beef, pork or lamb, or replacing some of the meat in the diet by vegetables, cereals or pulses - will involve changes in consumer food habits, and thus changes in food production and food supply.
An additional one-fifth of the fat and saturated fatty acids in the UK diet are obtained from milk and cream.

Current payment schemes encourage farmers to aim for high fat levels in milk - Milk Marketing Board payments to farmers depend on the demand for milk constituents. At present the demand for milk-fat is artificially elevated by EEC intervention schemes for butter.

The COMA report makes recommendations to the government that 'consideration should be given to ways and means of removing from the Agricultural Policy those elements of it which may discourage individuals and families from implementing the recommendations for dietary change'. Amendment of the intervention scheme could limit the demand for milk-fat and thus encourage farmers to switch to breeds which produce milk of lower fat content.

Jones (1985), however, suggests that there seems to be little opportunity to reduce the consumption of butterfat from the dairy industry. The reduction of butterfat in milk by selection of breeding stock is likely to be a long term process, and the manipulation of butterfat by nutritional means would increase farmers'costs.

Groups representing both the food producer and the government, such as the Meat and Livestock Commission (MLC) and the Milk Marketing Board (MMB) also have an educative function, both in the provision of information and in the formation of attitudes to food and health. The current advertising campaign for milk illustrates this function in action.

The publication 'Meat: The Health Issue in Perspective' (MLC, 1985) outlines the response of the MLC to the COMA Report, suggesting that 'the industry ... will continue to adapt to changing market requirements both in its production patterns and merchandising practices'. This publication recognises that, 'meat and meat products have an important part to play in the balanced diet' (despite the widely reported, alleged swing towards vegetarianism) and while encouraging, by various means, production of leaner meat, efforts will have to be made to ensure that reduction of fat levels in meat do not have an adverse effect on palatability. The role of the consumer is also stressed, 'meat consumption can remain at current average levels provided individuals choose wisely from the wide range of meat cuts and products available, avoid excess visible fat, cook the chosen meats in an appropriate manner and serve them with carefully selected supporting dishes'.

The government has a clear role in this area, that of ensuring that
the interests of the producer and the consumer are not incompatible - the
MLC was specifically charged 'to have regard to the interests of
consumers'.

As can be seen from Figure 6.1 the primary producer can supply food
directly to the consumer's table via only the caterer or the retailer.
Only 25 per cent of household food purchases, however, are provided
directly by the primary producer (CSO 1981); three-quarters of household
expenditure on food being on processed food.

The Basic Processor.

Fallows (1985) describes basic processing as 'the first stage in the
conversion of agricultural commodities into foodstuffs edible by man', and
gives as examples the milling of grain into flour, and the heat treatment
and packaging of milk to prevent spoilage. Processes such as freezing,
devaporation, or canning which are applied to preserve food can also be
considered as basic processing.

At this stage, also, the nutritional value of the commodity is
determined - liquid milk can have all or some of the fat removed to
produce a milk of lower fat content for supply to the consumer. The
increased availability of milks of lower fat content illustrates the
response of the milk processors to increased consumer demand, reputedly
stimulated by a television programme on coronary heart disease ('World in
Action', March 1984). Flour of higher extraction rate and thus of high
dietary fibre content is also increasingly available indicating the
response by flour millers to increased consumer demand.

The use of both these products is an example of the substitution
strategies discussed above - both can be used in a diet to help towards
achieving dietary goals with minimum disruption to established meal
patterns. Some skill, however, is required in the use of these products,
particularly flour of higher extraction rate, before high consumer
acceptance is achieved. This is an important aspect of nutrition
education.

The effect on the food industry, of the increased demand for these
products must also be considered; little is achieved if the fat removed
from milk appears on the market as butter, non-food uses for this fat need
to be found; bran removed during the flour milling process is used in the
production of animal feedstuffs, adjustments will need to be made by the
animal feedstuffs industry.

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The basic processing of foods to prevent spoilage also affects nutritional value — sugar and salt have been used as preservatives for many years. Because of their association with product palatability, they continue to be used in greater quantities than are consistent with good health, despite the fact that modern methods of food preservation have long since removed the need for their use for preservation. However, increasing availability of canned products without added sugar and salt illustrates the response to consumer demand.

The increased availability of frozen foods, particularly of fruit and vegetables is partly in response to a demand for products with increased storage life with minimum change in palatability and nutritional value.

Some nutritionists have advocated the increased use of pulses to increase dietary fibre intake. Many feel, however, for reasons of consumer acceptability and convenience, that this is unlikely to occur. The increased availability of pulses in a canned form may encourage their greater use.

The Food Manufacturer.

Fallows (1985) defines food manufacture as 'a process which involves the use of several basic commodities to yield a food product ready for sale to the final consumer'. He suggests that a feature of this sector of the food system is the combination of several ingredients to produce goods of higher value.

Much has been made by some authors of the 'added value' principle in food manufacture. The example quoted by Cannon and Walker (1984) is the production of 270 lb. of potato crisps from 1,000 lb. of potatoes — potatoes thus processed cost forty or fifty times as much as those unprocessed. The authors point out that the added ingredients are those of which nutritionists are encouraging reduced consumption — fat and salt. Other nutrients such as vitamin C and dietary fibre are removed — the 'added value' is in economic terms, the manufacturer's profit. However, the increase in consumption of potato crisps and decrease in consumption of potatoes referred to in Chapter Two indicates where the consumers' preference lies.

A detailed account of the economics of the food industry is outside the scope of this thesis. However, the importance, and thus the influence on nutrition, of the food processing and manufacturing industry has been stressed by a number of authors; Turner and Gray (1982) cite figures from
statistical reports which indicate that in terms of gross output, the food and drink industries produce some 16 per cent of all UK manufacturing output, making it by far the largest industry. In addition, the food and drink industries together directly employ some 587,000 people in the preparation, packaging, advertising and distribution of the manufactured product.

Three quarters of household expenditure on food is spent on processed foods. The considerable growth in this sector of the food industry in recent years has been attributed to a number of factors.

Turner and Gray (1982) suggest that the major reason for processing is to provide large urban populations with an adequate and varied supply of food.

Fallows (1985) attributes this growth to the fact that tasks formerly undertaken in the home have now been industrialized.

Wardle (1977) relates this latter factor to increasing employment of women outside the home creating a demand for 'convenience' foods. Undoubtedly, all these factors, also a number of other social and economic changes which have occurred in recent years, have contributed to the growth in importance of the food processing and manufacturing industry. Economic factors such as the narrowing of price differentials between fresh and, for example, frozen foods have also contributed.

The nutritional significance of manufactured foods, relates not only to their proportion of the total diet but also to their nutritional composition.

An example of the way in which the manufactured product can differ in nutritional value, often adversely, from the unprocessed or only lightly processed product is well illustrated by the example of potato crisps already given. A considerable proportion of the fat (often containing a high proportion of saturated fatty acids) sugar and salt in the UK diet is contributed by manufactured foods - often referred to as 'hidden' fat, sugar or salt.

In addition the manufacturing process often uses refined products, or involves the refining process, and thus, in the case of refined cereal products there is a reduction in the dietary fibre content of the manufactured food.

Nutritionists have, for the above reasons, been advocating a reduction in the proportion of manufactured foods in the diet. However,
given the importance of the factors discussed, contributing to the recent growth in the manufacturing sector of the food industry, this is unlikely to occur to any great extent.

Instead, it is suggested that the food manufacturing industry should produce foods which are more in line with dietary guidelines than many of their current products. This will require changes in the formulation of products or the development of new products, which will only occur if the food manufacturer can be reasonably assured that not only is there consumer demand for such changes, but also that such changes will result in products that are acceptable to the consumer. It is suggested (Marsh, 1985) that a government food policy should encourage the food manufacturers to make these changes.

Fallows (1985) suggests four strategies which the food manufacturer could adopt in order to assist the consumer to meet dietary guidelines. The first two are 'substitution' strategies (Sanderson and Winkler 1983).

Firstly, the development of alternatives to existing foods, involving the production of foods which are similar to established foods 'in terms of function, major organoleptic attributes and social aspects' but which, in terms of nutritional composition, are closer to dietary guidelines. The increased availability of a number of products in this category illustrates the response of the food manufacturer to consumer demand;

- reduced fat alternatives, such as low fat spreads, low fat cheeses, low fat sausages and beefburgers, with approximately half the fat content of the traditional foods,

- reduced sugar alternatives, such as fruits canned in fruit juice rather than in sugar syrup, reduced sugar 'jams',

- reduced salt alternatives, such as canned vegetables without added salt. Other products with reduced salt levels are, so far, uncommon on the British market. However, while not strictly a food product, the development of a substitute for table salt containing potassium instead of sodium can also be included in this category.

- increased fibre alternatives - the increased availability of wholegrain products such as wholemeal bread or flour, wholegrain pasta, brown rice and less refined products such as wheatmeal bread or flour, indicates the response of the food industry to increased demand for unrefined or less refined products. The use of added cereal bran or dietary fibre extracted from pulses has enabled the food manufacturer to respond to the demand for products such as increased fibre 'white' breads and 'bran' breakfast cereals with a higher consumer acceptability than is
often associated with wholegrain products. There are those, however, who feel that the nutritional desirability of such products is questionable on the grounds that many of these products such as the 'bran' breakfast cereals also contain more sugar and salt than is desirable, also that wholegrain cereals contain a number of important nutrients which are not obtained if only the cereal bran or fibre extracted from pulses is used.

Secondly, the development of completely new products - it has already been suggested that the scope for product innovation, particularly if it has to meet the constraints of conforming to dietary guidelines, is more limited than is often imagined. Such innovation often requires substantial investment in research and development, and in marketing. In addition, constraints will be placed on the manufacturer by the ability of the agricultural industry to supply, the machinery and packaging industries to adapt and supply, and the willingness of the distributors to stock, (Turner and Gray 1982). Thus the investment will only be made, and the constraints only overcome if the manufacturer can be assured that a product can be made that is acceptable to the consumer in terms of palatability and price and that there is a demand for the product. Thus, at present, it is only when there is a demand from the consumer for the food manufacturer to consider the additional constraint of the nutritional value of the product, that this will occur.

As was discussed in section 6.1, on the one hand, there are those who feel that education of the consumer to create the demand for the food manufacturer to consider the nutritional value of his product is all that is needed; on the other hand, there are those who feel that this should be ensured by government legislation or policy. The role of nutrition education and government policy/legislation in this area remains a matter of debate, in the words of Garrow 'we can but wait and see'. Nevertheless, with increasing interest in nutrition and health it is likely that there will be an increasing number of products developed in line with dietary recommendations.

The 1984 COMA report made recommendations to producers, manufacturers and distributors of food and drink and caterers, 'where appropriate, foods or food products with lower contents of saturated plus trans fatty acids and/or common salt than is at present customary should be made available to the general public'. Suggested examples were milk, meats, and meat products such as sausages, hamburgers and minced meats, margarines (trans fatty acids), and breads and other cereal products.
The report also made recommendations to the government to the effect that 'consultations should take place between the relevant Government Departments and the producers, manufacturers and distributors of food and drink and caterers ... which will lead to the provision of alternative preparations of some foods with lower contents of saturated and trans fatty acids and/or common salt'.

The Food Policy Unit at Bradford University (1985, 1986) has published a number of reports discussing the response of the food industry to the recommendations of the NACNE and COMA reports. As Richardson (1985) suggests 'companies who are responsive to market trends are intensifying their efforts to develop foods that make it easier for people to adhere to the recommended diets'.

The third and fourth strategies suggested by Fallows (1985) are 'educative' strategies, (Sanderson and Winkler, 1983).

Fallows suggests that food manufacturers could package and label foods to inform consumers of their nutritional value, and accept the responsibility to educate consumers to select foods in line with guidelines, pointing out that, at present, 'there is little consistency of approach and different manufacturers highlight different nutrients and use different styles of presentation'.

The 1984 COMA report made recommendations to producers, manufacturers and distributors of food and drink concerning the information that should be given to consumers about foods.

The report also made recommendations to the government concerning legislation and codes of practice with respect to labelling foods and drinks, 'consultations should take place between the relevant Government Departments and the producers, manufacturers and distributors of food and drink and caterers which will lead to legislation and to Codes of Practice to improve public knowledge of the composition of foods'.

The issue of nutritional labelling will be discussed in section 6.4.

Richardson (1985) discusses some of the difficulties of the food manufacturer who 'has to operate through a system of highly detailed regulations and in a research environment which only recently recognised the need to reverse the trend of declining research and development expenditure by UK firms. Unfortunately, industry and government have been slow to inject more funds into product orientated research and development'.

This author sees the current interest in 'healthy eating' as having a
beneficial effect, 'the consumer demands for aids to purchase, including
nutrition labelling, will result in a revival of interest in the
composition of foods, in improved methods of analysis ... and (interest
in) the best ways to communicate the scientific dietary advice into
practical guidelines for the general public'. Richardson concludes that
'the food industry, therefore, has a significant role to play in nutrition
research and in the promotion of nutritional awareness and education, as
well as to preserve and enhance the traditional values, product quality
and consumer satisfaction upon which its future depends'.

As can be seen from Figure 6.1 the last link in the food supply chain
between the primary producer, the basic processor, the food manufacturer
and the food on the consumers' table is either the retailer or the
caterer. These agencies also have a role in implementing dietary
guidelines.

The Retailer

It has been suggested that this is perhaps the most important link in
the food supply chain, 'the major retailers are able to exert a
considerable influence over the foods available to the consumer ... the
success or failure of individual food products depends on purchase by the
major supermarket chains' (Fallows, 1985).

Sanderson and Winkler (1983) cite Grant (1983) who suggests that 'the
purchasing power of the large supermarket groups gives them a dominating
position from which to commission more healthful products for their
complete range of normal goods'.

Fallows suggests three strategies that can be employed by the food
retailer, the first a substitution strategy,
- the retailer can demand the development of 'own label' foodstuffs.
Fallows notes that these products account for one quarter of all packaged
groceries sold in Britain, and in the case of some retailers the
proportion is even higher (Sainsbury - 53.3% and Waitrose - 47.7%). He
suggests that this could make a positive contribution to the achievement
of dietary guidelines, 'if the purchasing power of the major multiple
retailers was directed towards better nutrition then significant progress
could be achieved'.

The second and third are 'educative' strategies, the retailer can,
- motivate consumers, at point of choice, to select those foods which
favour the dietary changes recommended. Fallows cites the scheme developed by P & C Food Markets in New York in conjunction with the American Heart Association, where shelf edges are tagged with coloured coded labels. Fallows notes the problem of lack of consistency between different supermarkets, and thus customer confusion.

- provide detailed information about the foods sold and of the need for dietary changes, in the form of nutritional labelling, or possibly of leaflets or posters assisting consumers in their selection, or authoritative booklets at nominal charge or free. Fallows suggests that 'clear information on and about foods' while 'unlikely to affect total sales throughout particular stores, could have an impact on the sales of individual commodities'.

The provision of nutritional information by Tesco as an aspect of marketing, reinforcing the credibility of the company, will be discussed in section 6.4. A number of other major retailers (Presto, Boots, Bejam, Sainsbury, Safeway) also produce nutritional material. The issue of the responsibility of the food industry for nutrition education (as opposed to the provision of information) will be discussed in section 6.4 and the importance of a clear and consistent message being transmitted by all involved, stressed. There is the danger that this proliferation of nutritional information and advice will, before long, produce the 'not another 'healthy eating' booklet' reaction from the beleaguered consumer. The need for an independent body to co-ordinate the nutritional information and nutrition education material from all sources will be discussed in section 6.4.

Fallows concludes that 'the major retailers are no longer passive purveyors of goods; today such companies have the ability to make a significant contribution towards the achievement of the published nutritional targets, if so motivated'.

The Caterer.

The important role of the caterer is emphasized by Dyson (1985) at a conference 'to explore the practicalities and problems of providing a healthy diet in the catering industry today'. Dyson suggests that 'the catering industry is the third largest industry in the UK, every day thousands of men, women and children will have at least a snack, maybe a three course meal, outside the home provided by caterers'.

Fallows (1985) also notes the potential contribution to the total
diet made by food provided by caterers, 'the catering industry in Britain has 300,000 outlets, and includes a wide variety of establishments - fast-food take-aways, large hotels and restaurants, industrial catering in factory canteens, and public establishments such as hospitals'.

Lawson et al (1983) divide the catering industry into three sectors, depending on their financial aims or profit-making characteristics, (Figure 6.2). The contribution to the total diet, and thus the nutritional importance to the individual, of foods provided by caterers in the different sectors will vary. These authors suggest that 'foods provided by the caterer will obviously be important to the nutrition of 'captive' consumers (eg. hospital patients, residents of various institutions) and to some extent to that of 'partially captive' groups (eg. schoolchildren, industrial workers). The role of the school caterer will be discussed in section 6.3.

Fallows, however, suggests that 'potential exists within all categories for action to assist consumers towards a better diet'. This point was also made in a BNF Briefing Paper (1985), 'customer's demands of catering establishments, in both commercial and public sectors, have changed with the recent upsurge of public interest in health and nutrition. The catering manager should now feel responsible for providing clients with alternatives to traditional dishes that are low in calories, fat and salt, and high in fibre'.

At a recent conference it was suggested that 'the NHS (and other public sector areas such as the prison service and the armed forces) has great purchasing power, and supplies officers could utilise this power in laying down specifications for the nutritional quality of foods'.

Fallows again suggests two strategies that may be employed by caterers, the first, a 'substitution' strategy,
- the caterer could 'give consumers the opportunity to select in accordance with dietary guidelines, if they so desire'. Fallows cites the example of Crest Hotels offering skimmed milk in response to customer demand, a number of other initiatives are mentioned below.

Sanderson and Winkler (1983) suggest that the government might employ a 'provision' strategy which would 'directly alter consumption by improving the meals offered in Government institutions', pointing out that 'the government is the country's largest catering organisation' (hospitals, day centres, creches, old people's homes, prisons, military bases and office canteens).
Figure 6.2 Categories of Catering/food service operations according to their profit making characteristics

(from Lawson et al, 1983)

Catering/Foodservice Industry

- Direct Profit-Making Operations
  - e.g.
    - Hotels
    - Restaurants
    - Fast Food outlets
    - Takeaways
    - Retail store operations
  - e.g.
    - Workplace feeding
    - School/college feeding
    - Hospital feeding

- Indirect Profit-Making Operations
  - e.g.
    - Welfare establishments (old people, children's homes)
    - Armed Forces
    - Prisons
    - Schools/colleges
    - Hospitals
    - Workplace feeding

- Non-Profit-Making Operations
The second strategy suggested by Fallows is 'educative',
- the caterer could indicate on menus 'those selections believed to be the most appropriate for good health ... a simple symbol placed against 'healthy choices' can assist the consumer faced with a variety of composite meals'. A number of catering organisations do provide nutritional information about their products (Gardner-Merchant, Mcdonalds). This will be discussed with reference to school meals in section 6.6.

There have been a number of moves made by caterers towards the implementation of dietary guidelines.

Lawson et al (1983) cite the Port of Liverpool Heart Health Campaign where the catering manager in the Mersey Docks and Harbour Company is aiming to influence the eating habits of the dock workers. The authors express the hope that 'the initial success of this scheme will hopefully encourage other caterers with the appropriate nutritional knowledge to attempt similar schemes elsewhere'.

Wenz (1985) cites two projects in which the Coronary Prevention Group (CPG) participated, involving workers at the BBC and Harrods. The Harrods project involved liaison between occupational health staff, caterers and the local Health Authority, and focussed on a fortnights healthy eating campaign in the staff restaurant.

A large number of local Health Authorities now have nutrition and health policies, an aspect of which is the promotion of a healthier diet for staff and patients in hospitals and in some cases other institutions also.

Caterers for the Armed Services and the Prison Service have also adopted a 'provision strategy'.

Lawson et al (1983) cite the example of programmes in Finland where caterers have been closely involved in the large scale measures to improve the diet of the nation in an attempt to reduce the incidence of coronary heart disease.

Cole-Hamilton (1986) describes a scheme which operated in GLC restaurants in County Hall where menus gave 'star ratings for healthy foods', there were also posters 'urging diners to choose wisely'.

There is therefore evidence that caterers are giving a great deal of consideration to the problem of implementing dietary guidelines. At a recent conference the 'demand emerged for better guidelines and clear information from the DHSS and the DES. Many caterers within the National
Health Service asked for clearer guidance on recipes'(Wenz, 1985).

The need for better training in catering colleges and schools also emerged, 'delegates believed there was a need to revise current syllabuses to reflect current nutritional thinking'. The importance of caterers using their expertise to provide food which people would enjoy eating was also emphasized, 'there was no reason why superbly cooked and presented food should not be both healthy and a gastronomic delight. It is in no one's interest to leave the customer with the image of healthy food as boring or, even worse, 'cranky'' (Wenz, 1985). This will be discussed with reference to school meals in section 6.3.

James (1985) concluded the conference, 'it is clear that there is a need for greater co-operation and co-ordination between the various sectors of the catering industry and equally clear that caterers felt the need for better training in nutrition , with the opportunity for updating training once in service'.

6.3 IMPLEMENTATION OF GUIDELINES ON THE NUTRITIONAL ASPECTS OF SCHOOL MEALS - THE INFLUENCE OF THE SCHOOL CATERER ON THE AVAILABILITY OF FOODS

It was suggested in Chapter Five that in a cash cafeteria system where there is considerable freedom of choice, the nutritional value of the meal consumed depends not only on the foods provided by the caterer, but also on the foods chosen by the child.

This problem was first recognised in the DES (1975) report 'Nutrition in Schools' (discussed in Chapter One). The Working Party discussed the educational role of schools meals and the responsibility of the school caterer. It was felt that the difficulty of providing a meal of set nutritional standard in an 'a la carte' system 'did not relieve the authorities of the responsibility of ensuring, as far as they could, that pupils receive suitable meals'. It was suggested that guidance could be given in the form of 'indicating that certain combinations of dishes will give a balanced diet'.

It is the argument of this thesis not only that the school meal should still retain an educational role but also that, in providing a situation where children are choosing food, the school meal is also an important nutrition education resource.

The role of nutrition education in schools in guiding children towards wise food choice is discussed in section 6.5. and the importance of liaison between the school caterer and those involved in nutrition
education is discussed in section 6.6. The aim of this section, however, is to discuss the role of the school caterer in the provision of foods from which a balanced meal can be chosen.

In Chapter Four it was proposed that the suggested guidelines for the nutritional aspects of school meals should include both dietary goals to be used for planning and monitoring the nutritional value of meals, and dietary guidelines, suggesting changes in food provision which could be made in order to achieve dietary goals.

It is emphasised, (as was discussed in both Chapters Three and Four) that the suggested dietary goals for school meals can only be provisional until further research has been carried out to determine whether these goals can be achieved, and at the same time childrens' energy and nutrient needs also met.

It is also emphasised that none of the suggested changes will be successful unless the foods produced are those which the children like and enjoy. It is suggested that the expertise of the school caterer is particularly important in this area.

The authors of the NACNE report recognised that the achievement of dietary goals will require 'the joint efforts of a large number of bodies in addition to nutrition educators', pointing out that the dietary changes 'will need to be expressed in terms of foods before they can be seen as compatible with a diet that is varied and acceptable'.

Hollingsworth (1979) was one of the first nutritionists to point out the need to discuss how these changes could be put into practice in the form of a diet which people would enjoy eating, suggesting that 'we should

- find a diet which accommodates personal preferences and in no way detracts from the pleasure of eating - if the change for nutritional benefits is to be permanent it must be pleasurable,
- find ways of translating nutrition into value for money in view of still rising food prices'.

These two points are particularly relevant in the case of school meals where children will no longer take them if they do not provide the food they like, and where costs have to be tightly controlled.

In order to achieve these dietary changes nutritionists will have to recognise the specialised expertise with foods that is possessed by the caterers, who in their turn must ensure that the practice of this expertise is compatible with current nutritional recommendations.
The important role of the caterer in the implementing of dietary guidelines has been recognised by several authorities.

While the NACNE report does not specifically mention caterers, it quotes from the Royal College of Physicians' Report on Obesity. This report calls for 'substantial changes in the meals provided by schools, works' canteens and other catering outlets. Organisations have a particular responsibility to ensure that a varied menu is provided, with a choice of dishes that contain less fat and sugar than those currently being served'.

The authors of the monograph 'Implementing Dietary Guidelines' (BNF, 1982) suggest that the 'catering industries would be well advised to take account of dietary guidelines in their current practice and forward planning'. They also emphasise the need for 'development of the nutrition component of training courses for the catering professions, based on dietary guidelines, and the development of nutrition-related work of these professions in the community.

Lawson et al (1983) suggest that 'the appropriately educated caterer could, and should, have an important practical role to play in implementing sound nutritional principles in the provision of meals to the customer'.

As has been shown in this study (discussed in Chapter Five), the main attraction of the cash cafeteria system is the freedom of choice given to children to choose and make up their own meals from the items that they like. While many of the items now available on the cash cafeteria, if wisely chosen, will make up a well-balanced meal, many of the foods that children choose are too high in fat and sugar. Therefore the skill and expertise of the caterer must be brought to bear on the problem of providing items which children like and enjoy, and which meet their needs for energy, nutrients and fibre, but at the same time, are not too high in fat and sugar. This expertise will need to be concentrated on the problem of encouraging children to increase their consumption of foods such as bread and other cereals and potatoes, which provide energy in the form of starch, rather than in the form of fat and sugar. Caterers will also need to consider how children may be encouraged to increase their consumption of fruit and vegetables.

While recognising the skill of the caterer in this field, the report of the study described in Chapter Five, ('The school meals service in the
Inner London Education Authority - Part III - Nutritional aspects of school meals, 1984) suggested a number of changes that could be made in the foods provided in the cash cafeteria in order to meet current dietary recommendations. These are outlined below.

**Reduction of fats and sugary foods**

Whilst not suggesting that cakes, biscuits and puddings should be removed from the menu, recipes are available which use less fat and sugar than many of the traditional ones. These could be introduced. Many recipes are also available which use at least a proportion of wholemeal flour and other whole grain cereals such as oats, which would contribute dietary fibre. Many of these recipes are very palatable as the popularity of 'whole food' restaurants and snack bars indicates.

Similarly, puddings which provide less fat and sugar, such as some yogourts, fruit and milk jelly, could be more widely available and their consumption encouraged.

Many pastries have a high fat content, and therefore should be combined with a low fat filling such as fish or fruit, rather than a high fat food such as sausage. Recipes for pastry with a lower fat content and made partly with wholemeal flour are also available and make a very palatable pastry combined with the right filling.

While recognising the economics of the situation, many of the cheap meats and meat products are high in fat. An approach which would be more beneficial nutritionally is to find recipes which use smaller quantities of lean meat, combined with a carbohydrate food such as rice, pasta, vegetables or pulses. Many such recipes form part of the traditional cookery of this and other countries.

Items such as beefburgers and frankfurters are high in fat, if, however, they are served in a roll, as is usually the case, the proportion of energy from fat is balanced by the carbohydrate in the roll. It is recommended that these items should not be served on their own.

Poultry and fish are low fat foods and can be used to replace some of the meat. Many recipes using these foods are available.

**Increased consumption of bread and cereals**

If the energy from fat and sugar is reduced, it should be replaced by energy from starch, remembering that some adolescents have very high energy requirements. This is provided by foods such as bread, cereals such
as rice and pasta, and also potatoes. These foods contribute other important nutrients including dietary fibre, but have long been regarded as fattening foods, so this will be a particularly difficult message to get across to adolescent girls. It is therefore important that these foods are served in a form which children will enjoy.

Many foods based on bread, such as pizza, filled rolls, beefburgers and frankfurters in rolls, are now very popular items in the cash cafeteria. Recipes incorporating other cereals such as rice, pasta, oats, could be also introduced. While it must be remembered that white flour does provide some dietary fibre, it is strongly recommended that at least some of the bread available is made from at least a proportion of wholemeal flour, also that some of the flour used in other cooking is wholemeal. This will increase the dietary fibre intake. While many recipes are available, this will require the exercise of particular skills by the caterer to ensure that these products are liked and enjoyed by children.

**Increase in consumption of fruit and vegetables, including potatoes**

**Potatoes**

Potatoes, like bread, are a staple food and contain important nutrients. These are obviously very popular as chips, which if cooked properly, do not in fact contribute as high a proportion of energy from fat as is often imagined, and, if eaten with another item which is low in fat, can provide an appropriate balance of energy from different sources.

Baked potatoes, however, could be served more frequently as an alternative. These are often found to be particularly popular in schools where there is a local baked potato 'take-away'. Baked potatoes served with a small amount of filling such as cheese, or chopped bacon, will form the basis of a well balanced meal, (while these foods are high in fat, the energy from starch can balance that from fat).

Other ways of cooking potatoes, not involving the use of too much fat could also be introduced.

**Fruit and vegetables**

Persuading children to like and eat vegetables is traditionally a difficult area. Bull and Buss (1983) found that, to adolescents, texture is an important feature of foods. Dislike of the texture may well contribute very considerably to dislike of vegetables. Taking this into
account, raw vegetables grated or cut into strips are often more popular than cooked ones. 'Whole food' salad bars, where a large variety of raw and cooked vegetables are combined as salads, often with rice and pasta, are becoming very popular.

It is recommended that caterers should use their expertise to serve vegetables in a form that children enjoy and that the consumption of these foods from the cash cafeteria should be encouraged.

The consumption of fresh fruit should also be encouraged.

Obviously the introduction of such ideas for implementing dietary guidelines can only be carried out over a period of time, as this will involve trying and testing suitable recipes and training of cooks.

It is recommended that there should be in-service training, involving both knowledge of current nutritional ideas, and suggestions for the implementation of nutritional guidelines.

In addition, while some children are interested in food, and willing to try new foods, many are extremely conservative in their approach - the 'I don't like it because I've never tried it' theme is a familiar one to most caterers. New recipes would have to be introduced gradually to children, with encouragement to sample them.

In many parts of America, schools have 'school meals committees' involving children, catering staff and teaching staff. These committees are often used as an opportunity to sample new recipes. In addition, those involved in nutrition education have a part to play in encouraging children to try and enjoy new foods.

It can be seen, therefore, that if dietary guidelines for school meals are to be implemented, the role of the caterer is a very important one. The nutrition educator also has a part to play and it is recommended that the caterer should see it as an important part of their role to cooperate with those involved in nutrition education to help to ensure that children chose a well balanced meal from the items available at the cash cafeteria.

Following the submission of the report to ILEA, a circular was sent to all heads of kitchens and other catering staff in the authority recommending a number of changes in food provision and menu planning. A copy of this circular can be found as Appendix 2 of this thesis.
6.4 THE ROLE OF NUTRITION EDUCATION EDUCATION IN THE IMPLEMENTATION OF DIETARY GUIDELINES

6.4.1 Introduction - defining nutrition education

It was suggested in Section 6.1 that implementation of dietary guidelines would involve changes in food consumption. Nutrition education clearly has an important role in this process.

Giffet et al (1972) suggest that 'nutrition education strives to transform knowledge (about the nutritional needs of people and the nutritive value of foods) into eating practices that will promote health and well-being, thus becoming immediately involved with the behaviour patterns of individuals' and that 'the fundamental task of nutrition education is to reduce the time lag between the discovery of nutrition knowledge and its application to food practices'.

These authors contrast the development of nutritional knowledge 'in the controlled atmosphere of the laboratory' with the task of putting this information into practice which involves the 'complex nature of man and his total environment'; and suggest that 'man changes his habits slowly unless immediate benefits are evident', and in the area of eating behaviour 'potential future gains are often obscured by the immediate rewards of not changing'. Thus the nutrition educator must not only keep up to date with new facts as they develop but he must also 'learn to skilfully recognise and utilize human motivation'.

Griffin and Light (1975) suggest that 'nutrition education is an innovative force facilitating adjustment to contemporary problems and conditions'. It thus aims to reduce the gap between current nutrition knowledge and the dissemination and application of such knowledge.

Lennon and Fieldhouse (1982) suggest that health and nutrition education are concerned with prevention, and can act the level of primary, secondary, or tertiary prevention 'primary prevention is concerned with promoting behaviours which are conducive to good health, thus it includes the establishment of healthy food practices during childhood, in order to avoid nutritional disorders in later life'.

6.4.2 Necessary knowledge and need for further research.

It was suggested in section 6.1 that there are certain areas of knowledge which must form the basis of nutrition education. Among these
are a knowledge of current food consumption patterns, and perhaps more important, how these are changing over a period of time, and the factors associated with these changes. A knowledge of the factors influencing eating behaviour and their inter-relationship is also a necessary prerequisite. These areas will be discussed briefly in this section.

This is a very large area of knowledge, which McKenzie (1980) defines as 'social nutrition' - 'the study of the social, psychological and economic factors that determine food habits, and of the means by which future choice may be influenced in the interests of better nutrition'. A detailed study of this area is outside the scope of this thesis.

Food consumption patterns and trends

The failure of traditional nutrition education methods to change food consumption patterns is often attributed to the supposition that these are difficult to change. There is evidence however, that food consumption patterns do change, often rapidly. A number of authors (King, 1983 and BNF, 1982) have discussed the acceleration in the rate of change in food consumption patterns from the mid 1970's onwards - King (1982) points out that the year to year variations in consumption of main food categories in the 1970's was double that in the 1960's.

A number of authors (BNF, 1982; Richardson, 1982; King, 1983; Thomas, 1983; Kraushar, 1985;) have attempted to relate these changes to the rapid socio-economic changes of the 1970's. Buss (1984) points out that some the trends in food consumption are in the direction advocated by the dietary recommendations; though several authors question whether these changes are due to increasing knowledge and awareness of the connection between food and health, or whether they are due to other socio-economic changes, such as changes in price or availability, or changes in lifestyle.

McKenzie (1980) suggests that a study of the changes in food habits that have already taken place can give important information on how to change future food habits, 'an examination of the determinants of past food habits and the identification of factors that may influence change in the future is a key feature of social nutrition'.

Salmon (1979) also suggests that if one wishes to change food consumption patterns it is important to know in which direction changes are already occurring and why.

Both Salmon (1979) and McKenzie (1977) suggest that this sort of information, obtained by market research, is the basis of the advertising
and marketing of products by the food industry. Salmon suggests that nutritionists should use similar methods to 'market nutrition education', 'if the dietitian wishes to market nutrition education successfully this must be done by taking food habits into consideration, influencing them perhaps, but not attempting to reverse trends'.

McKenzie (1977) suggests that 'since for a multiplicity of reasons food habits are changing of their own volition, any recommendation which recognizes these changes and works with them is more likely to succeed than one that attempts to go against them'.

Information on these trends in food consumption patterns is incomplete. The extent of these changes is only partially revealed by NFS and CLE figures, (the inadequacy of the information provided by consumption level estimates (CLE) and national food survey (NFS) figures as the basis of epidemiological studies was discussed in Chapter Two), partly due to the fact that many of the changes are in foods eaten outside the home as snacks and meals, and partly due to changes in meal structure, for example, changes in breakfast habits; evidence of these changes is also provided by market research data.

Approaches to nutrition education in schools are discussed in section 6.5, where different 'food grouping' schemes are described. It is suggested that the lack of success of traditional methods of nutrition education using such schemes can partly be attributed to the fact that few of them are based on a knowledge of eating patterns, such as in what forms different foods are eaten, and how different foods are grouped together as meals or snacks. The authors of a BNF survey (1982) point out the inadequacy of available data in this area. They suggest that the NFS provides 'trend data on aggregate domestic consumption' and data on eating out, but that the two sets of data cannot be linked, and while data on the structure of meals is available from the Taylor-Nelson family food panel, this cannot be related to other spending or consumption, 'what is missing from any research on eating behaviour is any quantitative data on total food expenditure and consumption - eating in, eating out, and eating between meals, and data relating to the planning and structure of meals'.

A number of authors (CAS Report, 1979; Salmon, 1979; Richardson, 1982; Gallup, 1985; Kraushar, 1985) note changes in types of meals and forms in which foods are eaten, such as changes in changes in breakfast eating habits, changes in the relative importance of meals, an increase in meals eaten outside the home, particularly in public houses and take-away
meals, and the breakdown of formal meal occasions and the increase in consumption of snack meals.

These authors also note a number of trends in food consumption; however, as data are collected from a number of different sources, there is little evidence to relate increasing consumption of a specific food or type of food to decreasing consumption of another, therefore no means of assessing effect on nutrient intake.

It has been noted by a number of authors that the overall trends in food consumption are in the direction recommended by the dietary guidelines. Wenlock and Buss (1984), comparing nutrient content of UK food supplies in 1980 and 1982 suggests that 'it is interesting to note how many of the changes in the national food supply statistics parallel those recommended by many nutritionists'.

It is not clear, however, whether concern with nutrition, or merely the relative costs of different foods were responsible for the changes. Southgate (1984) comments that 'how far these changes in the food supply of the nation as a whole are reflected in the diets of different sections of the population remains to be determined. They may be mainly reflected in the diets of interested people'. This author also points out that 'it is, however, difficult to assess changes in actual intake of food from estimates made at commodity level ... the changes in CLE figures suggest that the UK diet may be changing in the direction recommended by NACNE, but it is preferable to seek evidence for change at the actual level of intake'.

The difficulty of separating the effects of a concern for health and with the nutritional value of foods from the effects of other factors is noted by several authors.

Kraushar (1985) suggests that 'when trying to assess trends and future developments in the food market, one must put health in its place. Consumer views on health are an important factor, but only one of the many which affect trends in food consumption'. This author notes that not all trends are consistent with an increasing interest in health, and some of the trends illustrate the many misconceptions about what constitutes a healthy diet; there would appear to be confusion between concepts such as 'natural', 'fresh' and 'healthy'.

Kraushar(1985) suggests that the decline in consumption of beef and lamb and increase in consumption of poultry is as much for reasons of price as concern for health; similarly the concern for health would lead
one to expect a substantial increase in fresh fruit and vegetable consumption, which has not occurred.

On the other hand Kraushar suggests that interest in 'freshness', 'natural' or 'healthy' foods, and 'fibre' are associated with the trend towards an increased consumption of foods such as chilled foods, salads and salad dressings, and fresh food, ('freshness'), breakfast cereals, baked beans, and wholemeal bread, (fibre), vitamins, fruit juice, yogourt, cereal bars, and cooking oil, (natural, healthy), interest in low fat products with skimmed milk and low fat and soft margarines.

It is suggested, however, that the increased consumption of these foods would have been less marked if it had not also been compatible with other socio-economic trends.

Kraushar also points out the significant increase in consumption in chocolate, crisps and savoury snacks, also soft drinks, which is incompatible with increased interest in health, but is associated with the breakdown in formal eating occasions.

King (1983) discusses the 'healthy eating' hypothesis, and examines a number of surveys which attempt to relate knowledge of nutrition to eating behaviour and concludes that 'there may well be some interest in healthy eating, but with so much muddle, scepticism and desire for commonsense solutions, it is difficult to see how it could be responsible for much of the discontinuities in eating habits'.

Richardson (1982), however, notes the response of the food industry to the increasing interest in health and fitness, 'health and fitness have become major considerations in many product launches. Almost all the rapidly growing markets are those which are promoted on a platform which not only draws the consumer's attention to freshness and overall quality but which also emphasizes health and nutrition'.

A number of authors discuss other socio-economic trends associated with these changes in food consumption patterns.

Thomas (1983) and Kraushar (1985) discuss a number of demographic changes, 'the UK population is static and ageing, with considerable growth in various ethnic groups, and growth in small households consisting of only one or two people' (Kraushar 1985). Thomas (1983) relates the growth in one person households to increased mobility within the population, the increasing elderly population, and greater independence of the young. Both these authors (and Wardle, 1979) also note the continuing trend for women to go out to work.

Economic trends associated with changing patterns of food consumption
are discussed by McKenzie (1979), Thomas (1983), King (1983) and Kraushar (1985). King (1983) examines the relationship between changing prices and consumption of various commodities, and concludes that price is not a major factor, 'relative price seems less important than it used to be'. Kraushar (1985) also suggests that better education, increased leisure time, 'a far greater knowledge of international customs and foods' resulting from easier and cheaper travel abroad, are also factors which will effect food patterns. Salmon (1979) and several other authors note the increasing popularity of 'foreign' foods such as pasta, pizza, curry and rice, and chinese food.

King (1983) suggests a 'social change hypothesis', 'the social change which has affected so many other areas of life - work, leisure, the home, attitudes to authority, dress and so on' is also affecting eating habits. King examines these different aspects of social change and attempts to relate them to changes in eating habits, he admits that 'this view of changes in eating habits is impressionistic' but concludes that 'the most powerful factor affecting the discontinuities in food consumption is the new individualism - the move from formal, respectful, traditional, inherited values to discovered, personal, experimental, informal values'. Related to this McKenzie (1977) and Thomas (1983) note the dichotomy or distinction which has appeared between formal meals and casual meals.

It can, therefore, be seen that, as suggested by Richardson (1982) 'major changes in the food market indicate that people are increasingly interested in health, diet and nutrition, and that they are prepared to change long established eating habits if particular foods or ingredients are perceived to be unhealthy and an acceptable alternative available'. It is, however, also important to take into account changes that are already occurring in food consumption patterns and the factors associated with these changes when attempting to change eating behaviour in the direction indicated by dietary guidelines.

Factors influencing eating behaviour

It was suggested in section 6.1 that an understanding of the factors affecting or forces underlying eating behaviour and the inter-relationship and relative importance of these factors is a necessary prerequisite for changing or modifying eating behaviour. It was also indicated that this knowledge is incomplete, particularly in the area of the inter-relationship and relative importance of these factors.

However, it has been recognised for some time that these factors are
very varied and their inter-relationship complex; there have been many attempts to classify them and to represent them diagrammatically to rationalise discussion; Figure 6.1 is one such attempt.

The complexity of this area is pointed out by Fieldhouse (1986) who suggests that 'various models of food choice processes have been proposed over the years - some have emphasized environment, others have concentrated on internal motivation. Each has contributed to an understanding of the factors which shape our food choice, whilst at the same time leaving many questions unanswered. Indeed it seems unlikely that the plethora of factors which impinge on food choice can be codified in a single paradigm'.

Lennon and Fieldhouse (1982) discuss the determinants of food choice. They suggest that choice will be limited by a number of factors which operate at different stages during the choice process and that a hierarchy of determinants of food choice can be constructed; this is shown in Figure 6.2.

![Figure 6.2 Hierarchy of determinants](from Lennon and Fieldhouse, 1982)
This figure shows the main factors shaping food choice, those nearer the bottom of the hierarchy are more a function of individual circumstances, while nearer the top reflect wider societal influences and often beyond the immediate control of the individual.

A number of authors (Giff et al, 1972; CAS, 1979; ILEA, 1985; Fieldhouse, 1986;) discuss two groups of factors affecting eating behaviour, those influencing availability, and those influencing acceptability. Figure 6.1 is based on this view.

The authors of the ILEA Nutrition Guidelines (1985) suggest that 'individual choice is not free choice. It is likely to be influenced or controlled in many ways'. These factors influencing individual choice of food are expressed diagrammatically in Figure 6.1. This material (discussed in more detail in section 6.5), for use in schools, illustrates the importance of considering not only the 'nutrition message' or 'knowledge' in nutrition education but also the socio-economic factors which may influence the way in which this message or knowledge is received and responded to.

The authors of the CAS Report (1979) discuss exogenous factors such as disposable income, price, availability, ease of preparation, all of which, except for disposable income, are determined by those involved in the food supply chain; and endogenous factors, which arise from the attitudes, beliefs, values and the psycho-sensory preferences of the individual, and are cultural, social or psychological in origin. It is suggested that the area where there is greatest need for research and information is on the relative importance of the two sets of factors and how they interact to determine eating behaviour; upon this will depend the balance between educative and regulatory or legislative strategies.

These authors suggest that the exogenous forces are more immediate and produce 'rapid if transitory, changes in behaviour'. This would seem to suggest that manipulation of these forces is the simplest route to modifying eating behaviour to achieve dietary goals. The availability of foods, from which a balanced diet can be chosen, at a price which the consumer can afford to pay, and are easy to prepare is an obvious prerequisite for the modification of eating behaviour in the direction recommended. On one hand, the food producers, manufacturers and retailers are interested in increasing or maintaining the consumption of the foods they produce, manufacture or market; on the other hand, the government...
controls to a limited extent the nature of the foods available through a
number of means such as food composition, food standards and food
labelling legislation; also, through subsidies and advertising
legislation, the mechanism for encouraging their consumption and the
prices at which they are sold. The government through various forms of
income controls and taxes influences both the level of disposable income
and the relative prices of goods, which in turn affect patterns of
consumption. Thus, these factors operate on the supply side, determining
the availability of foods from which the individual can make his choice.

The role of the food industry in ensuring a supply of suitable foods
from which the individual can choose a balanced diet was discussed in
section 6.2, and that of school caterers in section 6.3.

The authors of the CAS Report point out that there is little overall
co-ordination of the agencies which activate these exogenous forces. The
role of government policy in co-ordinating the interests of all those
involved towards the achievement of dietary goals is discussed in section
6.7.

However, the second set of forces, the endogenous factors, also
interact; the consumer's beliefs and attitudes concerning food and health,
and his psycho-sensory perceptions of foods also influence eating
behaviour. The food industry obtains knowledge of these factors from
market research, and uses this as the basis of marketing and advertising
their products. The argument of this thesis is that an understanding of
these factors is also the basis of nutrition education. The socio-cultural
and psychological basis from which arise values, attitudes and beliefs
about food and health are discussed below.

Both Giffit et al (1972) and Fieldhouse (1986) discuss models based on
distinguishing between factors affecting availability, and factors
affecting acceptability (Figure 6.3)

Fieldhouse (1986) suggests that there are 'clusters of influences
which can be grouped together for convenience of study, and which operate
at different stages of the food choice process'. The author suggests that,
unlike the hierarchy model of food choice determinants (Lennon and
Fieldhouse, 1982), this model does not claim that a particular factor
operates exclusively at one level, or that all the factors identified have
equal importance for all human groups.
Fieldhouse suggests that availability of foods is determined by economic, geographical, political and technological factors, (Table 6.1); factors influencing selection from the food available are economic, cultural, religious, and socio-psychological; influences which lead to satisfaction of individual physiological needs and taste preferences come into play only when other conditions of acceptability have been met (Table 6.2).

Factors influencing acceptability of food - the psycho-socio-cultural background to eating behaviour

A number of authors have discussed various social, cultural, or psychological factors influencing eating behaviour. Gifft et al (1972) suggest, however, that any understanding of man's behaviour involves studying that behaviour from all three perspectives; the authors therefore discuss various sociological, cultural and psychological concepts which they regard as useful in the study of food habits, but at the same time, emphasize the inter-relationship of these concepts.

Gifft et al distinguish between the terms 'society' and 'culture'; 'society' referring to social organisation, and 'culture' referring to customs or rules for behaviour. They suggest that when 'sociologists speak of social structures or organisations they refer to a complex system of inter-related positions and their accompanying roles that define the behaviour of individuals and their relations with one another'. The

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### Table 6.1 Elements of food selection
(from Fieldhouse, 1986)

#### AVAILABILITY

<table>
<thead>
<tr>
<th>Physical</th>
<th>Political</th>
<th>Economic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land availability</td>
<td>Agricultural policies</td>
<td>Price</td>
</tr>
<tr>
<td>Water availability</td>
<td>Subsidies</td>
<td>Farm costs</td>
</tr>
<tr>
<td>Climate</td>
<td>Business controls</td>
<td>Marketing costs</td>
</tr>
<tr>
<td>Type of soil</td>
<td>Legislation</td>
<td>Packaging</td>
</tr>
<tr>
<td>Pest &amp; plant control</td>
<td>Distribution</td>
<td>Processing</td>
</tr>
<tr>
<td>Transportation</td>
<td>Welfare programmes</td>
<td>Transport</td>
</tr>
<tr>
<td>Storage facilities</td>
<td>Rationing</td>
<td>Storage</td>
</tr>
<tr>
<td></td>
<td>Nutrition policies and guidelines</td>
<td>Consumer demand</td>
</tr>
<tr>
<td></td>
<td>Government sponsored research activities</td>
<td>Income</td>
</tr>
<tr>
<td></td>
<td>Trade and aid policies</td>
<td>Patterns of</td>
</tr>
<tr>
<td></td>
<td>tariffs and quotas</td>
<td>expenditure</td>
</tr>
</tbody>
</table>

### Table 6.2 Elements of food selection
(from Fieldhouse, 1986)

#### ACCEPTABILITY

<table>
<thead>
<tr>
<th>Cultural &amp; Religious</th>
<th>Individual Choice</th>
<th>Socio-psychological</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ideology</td>
<td>Preference</td>
<td>Prestige</td>
</tr>
<tr>
<td>Cuisine</td>
<td>Tast</td>
<td>Status</td>
</tr>
<tr>
<td>Myths</td>
<td>Therapeutic needs</td>
<td>Friendship</td>
</tr>
<tr>
<td>Superstitions</td>
<td>Personality</td>
<td>Communication</td>
</tr>
<tr>
<td>Taboos</td>
<td>Beliefs</td>
<td>Reward &amp; punishment</td>
</tr>
<tr>
<td>Ritual</td>
<td>Personal values</td>
<td>Emotions</td>
</tr>
<tr>
<td>Morals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Doctrine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prohibitions</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
authors also discuss the inter-relationship of society and culture, 'each society possesses a culture, a set of customs and traditions that designate appropriate or required ways of acting, thinking and feeling'.

Society, however, is made up of individuals who act and behave differently, who have different personalities, and who are motivated by different factors; thus a psychological perspective is also necessary, 'societies and cultures can only be studied by noting how individuals act or behave; and they behave differently. The psychological perspective must therefore be added to the sociological and cultural when observing and speculating on the reasons that underlie human behaviour' (Giffit et al., 1972). These authors suggest therefore that 'man's nature, his society, and his culture should be perceived not as three separate entities, but as a single whole .... any phenomenon of behaviour can be viewed as a social process, as a custom prescribed by the culture, or as a consequence of the structure and dynamics of the personality ... or a combination of all three perspectives'. The authors therefore take a combined or socio-cultural approach to the study of food habits.

In this section the concepts of values, beliefs and attitudes are discussed in relation to their influence on eating behaviour. The authors of the CAS Report (1979) suggest that 'these attitudes to food have their origins in culture, prestige values to attached to food, religious taboos, faddisms, and psycho-sensory factors'. The psycho-socio-cultural background to these attitudes must therefore be studied if eating behaviour is to be understood.

This was recognised by Mead in 1944, when she defined food habits as 'the culturally standardised set of behaviours in regard to food manifested by individuals who have been reared within a given cultural tradition'; thus 'behaviours are systematically inter-related with other behaviours in the same culture'. It is suggested therefore, that 'to understand food habits we must be aware of the social structures, culture and religions of the society in which we are studying the food habits'.

Murcott (1983) also points out the importance of viewing eating in its sociological context, 'eating habits are viewed as a matter of culture, a product of codes of conduct, and of the study of social relationships ... what and how people eat and drink may usefully be understood in terms of a system where coherence is offered by the social and cultural organisation with which it is associated'. This author, however, comments on the lack of information in this area, 'sociologists,
especially in Britain, have paid the matter (the social significance of food and eating) virtually no sustained attention'. As a result, 'there is, then, no identifiable sociological literature dealing with British culinary practices, menus and manners, with beliefs and concepts about food and its value, with the social organisation of the provision of meals.' A similar point was made by King (1982).

McKenzie (1980) also recognises the importance of studying the social, cultural, and psychological background to food habits before attempting to change them, 'if we are to understand the situation (factors influencing or inhibiting change in food habits) ... we must apply some of the basic laws of sociology, psychology, and anthropology ... such studies reveal the fundamental role that food plays within society ... food has become an integral part of our culture and many social events in our lives take place round the meal table ... food also fulfills many of our basic psychological needs'.

The study of behaviour

The study of human behaviour is an important aspect of psychology; the study of the behaviour of the individual in relation to his social environment is social psychology. These areas also involve the study of how behaviour changes or how it may induced to change. Thus, the nutrition educator wishing to change eating behaviour, must be aware of some of the theories and concepts developed by social psychologists, and be able to apply them to the problem of understanding and changing this behaviour. However, these areas are complex and dynamic, and a detailed examination of their concepts and theories is beyond the scope of this thesis.

The way in which a person will respond or behave in any given situation will be the result of the complex interaction of all the innate and acquired or learned forces which influence human behaviour.

Gifft et al (1972) cite the work of Lund and Burk (1969) who suggest that behaviour results from the interaction of motivational forces, which arise from the needs and wants of the individual, and cognitive forces, which arise from the knowledge, attitudes, beliefs and values of the individual. In turn these forces are derived from the personality of the individual and the culture of the society to which he belongs. Tones (1979) also distinguishes between two systems influencing behaviour, but slightly differently; this author suggests that behaviour is influenced by two interacting systems - a 'belief system' which is mainly
concerned with knowledge, and a 'motivational system', involving both 'values and their subordinate attitudes together with basic 'drives'.

There is clearly some discrepancy of views in this field; however, in order to devise a model for nutrition education, the inter-related influences on behaviour, of knowledge, beliefs, attitudes, values, basic needs, wants and drives must all be taken into account.

Tones (1979) proposes a 'health action' model based on the approach suggested by Fishbein and Azjen (1975) in which he distinguishes between cognitive (or belief) elements and affective (or motivational) influences on behaviour. This model proposed by Tones is discussed below and is used as the basis for discussion both of the role of nutrition education in the implementation of dietary guidelines in this section and of nutrition education in schools in section 6.5.

**Attitudes and behaviour**

It is first of all necessary, however, to examine the approach of Fishbein and Azjen upon which this model is based. This approach attempts to define the relationship between attitudes and behaviour and, in turn, depends on the three component view of attitudes held by many social psychologists.

Behavioural scientists suggest that attitudes are a major force influencing behaviour, thus implying that this an important area of knowledge for those wishing to change eating behaviour through nutrition education.

Stevens (1977), suggests that most social scientists view attitude as a 'complex, multidimensional concept', having the following aspects,

- a cognitive aspect - beliefs or ideas about an object,
- an emotional or affective aspect, which embodies positive or negative feelings about the object in question;
- a conative aspect - a tendency to behave in a particular way towards it.

Stevens, however, does point out that there are social psychologists who restrict the use of the term 'attitude' to the affective aspect; using the term 'belief' for the cognitive aspect and the term 'behavioural intention' for the conative aspect. This group of social psychologists suggest that their terminology is more useful as 'feelings, beliefs and behaviour relating to the same object do not necessarily correlate'.
In addition to the concept of attitudes and their relationship to behaviour, the concept of 'values' is also used by social psychologists in this context. The view that nutrition education in schools should involve the provision of knowledge and the clarification of values relating to food and health (Tones, 1978) is discussed in section 6.5. An understanding of this concept is, therefore, also important to those involved in nutrition education.

Elms (1976) suggests that 'values are the individuals major criteria for judging whether a particular object is good or bad .... a value could be said to be a ranking device for beliefs which sorts out priorities, leading us to adopt definite behavioural patterns'.

Giffet al (1972) suggest that values have the most central function in guiding behaviour, and are the most stable of the three concepts. They suggest that values are developed through socialisation, a concept embracing the actions of imparting culturally valued norms' (Tones et al 1978).

Probably the most contentious area in the field of attitude research concerns the link between attitudes and behaviour.

A number of authors (Tones, 1979; Lennon and Fieldhouse, 1982; Shepherd and Stockley, 1985) cite the work of Fishbein and Azjen, (1975), who suggest that attitudes are linked to behaviour, 'the belief set of an individual regarding the consequences of a particular behaviour (i.e. expectations) determine his attitude towards performing that behaviour ... attitudes themselves are precursors of intentions to indulge in a behaviour, and intention is translated into action with the provision of a suitable stimulus'.

Fishbein and Azjen (1975) propose a model, based on the three component view of attitudes discussed above, in which attitudes are assessed in relation to behaviour rather than objects.

In this model (Figure 6.4) the conative component or behavioural intention is the decision to act in a certain way and is expected to predict the occurrence of the behaviour (Shepherd and Stockley, 1985).

In turn, the behavioural intention is predicted by two components.

Firstly, the attitude to the behaviour which, in turn also, is predicted not only by beliefs about the outcome of the behaviour, for example whether a particular eating behaviour will relieve hunger, give pleasure or cause ill-health, but also by the evaluation of that outcome in terms of whether for example, relief of hunger, pleasure, or ill-health
Figure 6.4 Conceptual framework for the prediction of specific intentions and behaviour

(from Lennon and Fieldhouse, 1982)

Beliefs about consequences of behaviour → Attitude toward behaviour → Intention to perform behaviour → Behaviour

Normative beliefs about behaviour → Subjective norm concerning behaviour

Influence

Feedback

are seen as good or bad, i.e. in relation to values.

Secondly, the subjective norm concerning the behaviour, which, in turn, is predicted not only by normative beliefs about whether specific people or groups think that an individual should perform that behaviour, but also by the individual's motivation to comply with what people think.

In this model both the individual's beliefs and the normative beliefs concerning the behaviour are reinforced or weakened by feedback resulting from performing the behaviour.

Tones (1979) suggests that this model is useful to the health educator as it distinguishes between the terms 'attitudes' and 'beliefs'. This author points out that the term 'attitude' as it is often used confuses the cognitive and affective aspects, 'it will sometimes refer to a psychological attribute having to do with knowledge, and on occasions be concerned with values, feelings and motivation ... a belief, on the other hand, is a statement of subjective probability, and may range from a tentative hypothesis to a statement of total conviction'. Tones, therefore, suggests that it is important to distinguish between the 'belief' system and the 'motivational' system concerned with values, feelings and motivations - the affective aspect.

Tones' 'health action' model, based on the model of Fishbein and Azjen, relates these two systems to health behaviour and also includes the influence of both general norms and people significant to the individual.

On the other hand, however, Elms (1978) questions the widely accepted definition of attitudes, discussed above, which, in identifying behavioural intention as a major component thus implies a direct link between attitudes and behaviour. He cites a number of studies to illustrate that the link between attitude and behaviour is often rather tenuous.

Discrepancy between overt behaviour and attitude has been noted by other workers. Stevens (1978) cites a number of studies which have demonstrated that there may be little relationship between the verbal expression of an individual's attitude and his overt behaviour towards the object of the attitude.

There have been a number of recent surveys (BNF, 1984; Fallows and Gosden, 1985) which have attempted to ascertain current attitudes to food and health in the UK. While there are indications that there is an increasing awareness of the relationship between food and health there is little indication of how this is related to changes in eating behaviour as
revealed by the trends in food consumption (discussed above) as few of these surveys have attempted to relate attitudes directly to eating behaviour. There are, however, some indications that there is discrepancy between expressed attitudes and actual behaviour.

A survey carried out by Bejam/NOP (1984) found discrepancy between 'awareness' of measures for healthy eating and actually incorporating them into the family diet.

A BNF survey (1984) suggested that 'a large number of people reported having decreased their intake of foods generally thought of as less healthy - wishful thinking may have influenced their responses'. This survey found discrepancy between attitudes to 'proper meals' and actual behaviour.

Shepherd and Stockley (1985), carried out a study to test attitude-behaviour associations in relation to foods with a high fat content, within a clearly formulated attitude model (Fishbein and Azjen, 1975). This study found that measured attitudes to food high in fat were good predictors of frequency of consumption of individual foods, and of total fat intake. On the other hand, questions on pleasantness of the foods correlated slightly higher with frequency of consumption than did questions on how beneficial the foods were.

There may be a number of reasons why positive attitudes to food and health in terms of expressed behavioural intentions do not always lead to actual behaviour. Situational factors such as absence of appropriate environment and conditions, lack of appropriate skills or knowledge may intervene, or other attitudes may be more important than health considerations in the choice of food.

Elms (1977) discusses possible reasons for the lack of consistency between attitudes and behaviour, suggesting that in some cases situational factors such as lack of skills, social pressure from other members of the group play a more important part than attitudes in determining behaviour.

The authors of the CAS (1979) Report suggest that there is no empirically established relationship between attitudes to food, and eating behaviour expressed in actual purchases and consumption of food. The authors cite evidence (Kemp, 1978) of data which demonstrates that purchases are often diametrically opposed to attitudes. The authors of the CAS Report also suggest that a possible explanation of this discrepancy could lie in the influence of the exogenous factors on the extent and manner of achieving the satisfaction of 'tastes and preferences'.

Lennon and Fieldhouse (1982) cite Tones (1978) who suggests that in
order to progress from intention to behaviour, certain enabling factors must be present; these may include a favourable and supportive environment, and the possession of appropriate knowledge and skills.

Tones (1979) suggests that 'behavioural intention will only materialise in appropriate environmental conditions.

A number of recent surveys (Bejam/NOP, 1984; MLC, 1984; BNF, 1984) give some indications of situational factors, but the picture is far from complete.

Several of these surveys found that the taste of food is 'of prime importance' (BNF, 1984) as are family preferences, 'everyone should like the food they are given' (Bejam, 1984); 'value for money' (MLC, 1984) is another important factor. It is also important that 'any modification of behaviour should not damage lifestyle' (McKenzie, 1979) or 'food must fit into life and not vice versa' (BNF, 1984).

The implications of these findings, and the findings of other recent surveys, for those involved in nutrition education are discussed below in relation to Tones' 'health action' model.

There is clearly, therefore, a need for further research which applies the theories and models of behavioural scientists specifically to eating behaviour.

Important priorities for research, can be identified (this area was discussed also by King, 1982)
- firstly, to provide more information on attitudes to food and health,
- secondly, to attempt to establish the link between these attitudes and eating behaviour,
- thirdly, to identify the enabling factors which need to be present before changed attitudes lead to changed behaviour.

Research findings in these areas are important prerequisites to establishing methods by which eating behaviour can be changed or modified in the implementation of dietary guidelines.

6.4.3 Aims of nutrition education

Both Giff et al (1972) and Tones (1978) outline the stages in the planning of studies or projects in health or nutrition education, based on the application of knowledge and techniques from behavioural sciences. Both these authors discuss the importance of the first stage in the planning of the programme, that of deciding on the aims and objectives.
An essential first step towards formulating nutrition education strategies for implementing dietary guidelines is to decide on the aims of nutrition education.

From the current discussion on the implementation of dietary guidelines have emerged a number of different views on the aims of nutrition education and therefore on the strategies which should be used to achieve these aims.

On one hand, there are those who hold the view that the aim of nutrition education is to change behaviour and therefore strategies which hope to achieve this will need to be employed. Those who hold this view will evaluate the success of these strategies in terms of their effectiveness in bringing about the desired change in behaviour.

On the other hand, there are those who feel that nutrition education strategies should be aimed at producing a consumer so informed as to be able to make his own health decisions.

A number of authors have discussed this dichotomy of views on the aims and objectives of nutrition education.

Tones (1979) discusses the choice of criteria for evaluating the success of health education, suggesting that this will depend on the desired outcome, whether this is a change in knowledge, attitudes, or behaviour. This author discusses the arguments of the two opposing schools of thought, 'workers in preventative health will undoubtedly judge success in behavioural terms, their concern is behavioural change and they will employ various persuasive techniques to achieve this'. On the other hand 'there are, however, many with moral scruples who believe that such manipulation is unethical; people, they say, must be educated for choice. They should be free to choose ill-health if they so wish'.

Lennon and Fieldhouse (1982) suggest that the fundamental dilemma of the nutrition educator 'lies in deciding how far to go in trying to influence people: whether to present the facts so that each individual can make his own decision, or to actively persuade people to adopt new health values. These authors suggest that there is a school of thought which saw that any form of health education should confine itself to providing the facts, so that an individual has a rational basis for making his own decisions (cf. empirical-rational strategies – section 6.1), and that those belonging to this school justify their view on the grounds that there is a danger of 'the middle class educator' imposing his values on other groups, 'it is easy to believe that nutrition education is concerned
with persuading people to act in their own interests, but it is not always clear what those best interests are'. On the other hand, 'mere provision of information is no guarantee that behaviour change will ensue ... certainly there is evidence that the mere acquisition of knowledge will not automatically lead to changes in attitudes and behaviour, even if the information is accepted and comprehended'.

Williams (1984) also discusses two models for the health educator, related to different aims, - the 'medical model' and the 'educational model'.

This author suggests that the aim of the 'medical model' is to get the population to conform to given recommendations, 'the thinking goes - we are the experts and we do know what we are talking about, so for us, health education is about getting people to agree that we know best and conform to our recommendations'. Williams suggests that this model is the basis of the recent trend towards health promotion.

In the 'educational model' 'the ultimate aim is that people should take control of (and responsibility for) decisions about their own health'. Williams suggests that 'if following the educational model we should teach people how to weigh evidence, (what to take into account and what to discard) in making decisions which are in their own best interests'.

Two approaches to nutrition education can therefore be identified, related to different aims - the so called 'informed choice' (or decision-making) approach, where the nutritional information is provided in the context of a knowledge of the motivational and situational factors which influence eating and health decisions to enable the consumer to make his own decisions about health (cf. Williams 'educational model', also Tones 'health action' model- discussed below) and the approach which uses techniques of persuasion to change attitudes and behaviour (cf. Williams 'medical' model). It is also perhaps necessary to distinguish between the traditional approach to nutrition education (discussed below) which involved only the provision of information and the 'informed choice' approach described above.

A number of authors put forward views in favour of one or other aim and approach.

Salmon (1984) and Newsome (1986) argue in favour of an 'informed choice' approach, both on ethical grounds.

Salmon suggests that 'it would appear that some of the more zealous
campaigners are taking the view that people must be made to alter their dietary habits in order to live longer. Does anyone have the right to this approach; surely, in this country, the most any one should try to do is to present information about food and health in a way that easily understood, thus ensuring that people are aware of the risks (or benefits) of various actions, leaving it to them to make their own choices.

Newsome, in response to those who express concern over the 'seeming lack of success (of nutrition education) in affecting the food behaviour of adolescent pupils', poses two fundamental questions;
- do we, as nutrition educators, have the right to change the behaviour of others?
- is trying to change attitudes and behaviour compatible with respecting the individual's freedom?

The view of this author is clearly stated 'personally, I think not'.

Lennon and Fieldhouse (1982), cite two WHO reports, which define the aims of nutrition education in terms of health decisions, 'to equip people with the skills and knowledge that they can use to solve their own health problems' and 'to make health a valued community asset' (WHO, 1954) and 'the focus of health education is on people and action. In general its aims are to persuade people to adopt and sustain health services available to them, and to take their own decisions, both individually and collectively to improve their health status and environment' (WHO, 1969).

On the other hand the Cohen Committee Report (1964) (cited by Lennon and Fieldhouse) suggests that health education should do more than provide information 'it must also seek to influence people to act on the advice and information given and must seek to counter pressures which are inimical to health'.

Both Thomas (1979) and Whitehead (1979), citing the Government White Paper 'Prevention and Health' (1977) and discussion booklet 'Eating for Health', discuss what appears to be the official Government view of nutrition education. Thomas suggests that the view of successive British governments is that 'food policy should be determined by the demands of a public exercising an entirely free choice'. The role of government being limited to 'the dissemination of accurate information, in the light of which individuals can form their own views and take their own decisions'. The role of the government in nutrition education and in the implementation of dietary guidelines is discussed in section 6.7.

Garrow (1985), discussing the JACNE publication (1985), would appear to favour aiming for a change in behaviour via the provision of information, 'if the consumer is well informed, and knows that his or her
intake of saturated fatty acids is excessive, it is reasonable to expect that (given adequate food labelling) he or she will seek out the appropriate food ... I do not know if advice to the consumer will be enough to achieve the desired changes in diet, or if alternative methods are needed or justifiable in our present state of knowledge. It seems obvious that informing the consumer is an essential first step and with luck it may be all that is necessary'. This view would appear to be based on the 'health belief' model discussed below.

Tones (1979), however, suggests that there may be a place for both approaches to nutrition education, consistent with the differing functions, aims and ideals of the educational system on the one hand, and the health service on the other, 'we need to consider two overlapping and sometimes competing systems of health education, in which schools concentrate on the provision of knowledge and the exploration of values, while the health services focus on prevention, which may involve attempting to change behaviour'.

This section will consider both these approaches in these two contexts.

This thesis argues in favour of an 'informed choice' or 'decision making' approach to nutrition education in schools. This view is supported by a number of authors.

The Schools Council (1977) suggest that 'there is a need not only to provide children with the information that they will need to make health decisions, but equally important to put them through a positive process of decision making in order to prepare them for later vital decisions'.

White (1976) (cited by Lennon and Fieldhouse, 1982) suggests that nutrition education should 'equip the individual with the ability to make judicious food choices for health ... and to evaluate the nutrition information he receives'.

Newsome (1986) suggests that this approach is consistent with the ideal of education, 'I believe that the aim of nutrition education is to help pupils to make food choices responsibly. Leave out the words 'nutrition' and 'food' and we are left with the aim of education'.

On the other hand, Moody (1982) suggests that 'the aim of the nutrition scheme for all school groups should be to orientate food choice in line with its role in health, ie. bring about a change in behaviour'.

Hogarth and Hadley (1985) also put forward this view, 'the teaching of nutrition .... aims not only to impart knowledge, but more importantly
to reinforce satisfactory eating habits and to change those which are unsatisfactory'. The authors do not explain their criteria for 'satisfactory' or 'unsatisfactory'.

Gillespie (1981), however, puts forward the view, that 'persuasive communication is consistent with our educational values as long the attempts to change attitudes and/or behaviour stress the reasons why recommended behaviours are desirable and consider the strength of the evidence supporting the change; audience involvement in the decision to change is also important'.

A number of authors point out that the 'informed choice' approach to nutrition education involves more than the provision of information it must also consider and take into account values relating to food and health.

Newsome (1986) suggests that 'teaching for decision making must take into account approaches designed to explore and clarify attitudes and values'.

Giff et al (1972) suggest that nutrition educators are often reluctant to do this, citing Harmin et al (1970) who point out that 'educators may consciously avoid value issues because they are so afraid to impose their values on others. Yet the teacher is really omitting an important part of the educational task if he does not help people to clarify their own values'.

Tones (1979) also suggests a reason for this reluctance, 'attempts to change values would cause some concern in case the ensuing 'culture clash' between home and school should be traumatic for either child or family'. The importance of the nutrition educator taking into account the interaction between home and school is discussed below and in section 6.5.

It is argued below that further research is needed to validate the suggested models for nutrition education, and to assess the effectiveness and acceptability of some of the suggested strategies. While both favouring a 'decision making' approach to nutrition education, both Tones (1979) and Newsome (1986) point out the need for research in this area.

Tones suggests that 'it is by no means clear how we achieve effective decision making'. Newsome suggests that this 'is a matter of much concern to those involved in nutrition education in school'. The use of Tones 'health action' model as the basis of a 'decision-making' approach to nutrition in schools and the 'Nutrition Guidelines' material (ILEA, 1985) 'designed to enable children to make an informed choice about the food
they eat' is discussed in section 6.5.

The other approach to nutrition education which attempts to change health behaviour, consistent with the preventative aims of the health service, is more a matter of debate.

This thesis argues that the resolution of this debate will need to await the results of further work involving the application of some of the findings of behavioural research to the problem of changing eating behaviour. The different strategies for change discussed by Nicholls (1983) were examined in section 6.1. Nicholls makes the point that empirical research is needed to assess the effectiveness and acceptability of these different strategies or approaches, applied to changing eating behaviour under different conditions, and in different circumstances. The need to base nutrition education strategies on change theory is discussed in section 6.4.5.

It is tempting, when considering the use of different methods to change behaviour, to draw parallels between the strategies which could be used to change eating behaviour and those which have been used to change other behaviours, such as smoking, or the wearing of seat belts. However, the complexities of eating behaviour and the issues involved in changing it, are such that comparisons would be unhelpful. Research in this field needs to be applied specifically to the problem of changing eating behaviour.

The following section will examine some suggested models for nutrition education in relation to the aims discussed above and any evidence relating to their effectiveness.

6.4.4 Models for nutrition education

The models discussed below, are based on views of the relationship between attitudes and behaviour, discussed in section 6.4.2. It must be emphasised that there has been little empirical research evaluating the effectiveness of these models, and that this area is an important priority for research.

The relationship between the provision of nutritional knowledge and changed eating behaviour.

Traditional methods of nutrition education have been based on the
provision of nutritional information. Thomas suggests that much nutrition education today relies on 'the hope that there is a direct relationship between knowledge of the principles of nutrition and food choice. By increasing factual knowledge food habits can be changed in such a way as to improve health'.

Thomas (1979) cites Den Hartog (1946) 'popular education in nutrition should have as its aims to give so much information that the consumer knows what he eats and why; then he can choose his food and his meals to provide an optimum mixture'.

A number of authors (Nicholls, 1983; Moody, 1982, citing Kirk, 1980, and Tay, 1980), however, point out that such methods of nutrition education are largely ineffective in bringing about change in eating behaviour.

A number of studies provide evidence of the relationship between nutritional knowledge and eating behaviour. Thomas (1979) cites studies, carried out between 1947 and 1977 all of which found positive correlation between nutritional knowledge and variously, 'better family feeding practices', 'good food practices', 'careful food shopping practices', and 'better diets'. However, a number of studies, including a DHSS (1968) study on the nutrition of pre-school children, found that general level of educational attainment appeared to be the factor most consistently related to adequate performance in family feeding.

Gifft et al (1972) also discuss this area, concluding that evidence relating nutrition knowledge to dietary practice is conflicting and also complicated by other variables.

Thomas (1979) also cites a number of studies in which attempts to change eating behaviour through a change in nutritional knowledge were evaluated.

Hatcher (1940) showed that definite improvements in food habits could be obtained when methods of instruction were appropriately designed. Teachers who guided pupils to analyse their diets to decide what they need to do to improve them and to check on their progress, were able to obtain striking improvements. When teaching was of the traditional type where the teacher decided what should be studied and how it should be done and made the evaluation, there was no significant improvement in the diets at the end of the period of instruction.

A study by Bell (1973) also showed a difference in knowledge between test and control groups, together with a change in behaviour.
Thomas cites other studies which, not only found a clear improvement in knowledge in test groups, but also found that within these groups, those who had changed their eating habits were those who had the largest increase in nutritional knowledge. This author points out that the programme was one of high pupil involvement, and concludes that the relationship between changing knowledge and changing eating habits will depend to a large extent on the groups' involvement in the educational activities. The implications of these findings for nutrition education in schools will be discussed in section 6.5.

On the other hand, Thomas also cites a number of studies in which nutrition education programmes have changed nutritional knowledge without effecting any change in eating habits. This author, however, points out the observation by McKenzie and Mumford (1965) that many studies in this field are poorly designed.

Thomas concludes that 'it seems clear that food practices do not change just because people are in possession of factual knowledge. On the other hand, often people making the wisest food choice are those with the highest levels of knowledge—sound facts are the basis for rational decisions'.

Giffet et al (1972) also cite studies to show that, although change rarely occurs because of knowledge alone, knowledge 'can promote beneficial change when perceptively applied'.

The health belief model

It was suggested in section 6.1 that 'empirical-rational' strategies are based on the assumption that 'man is rational and will follow his rational self-interest, once this is revealed to him' (Nicholls, 1983). In this approach, the main task of those wishing to bring about change 'is to present the validity of the change in terms of the gains to be achieved by adopting it'. Nicholls points out that this is the basis of most approaches to nutrition education.

Both Lennon and Fieldhouse (1982) and Tones (1979) cite the 'health belief' model put forward by Becker (1974), which attempts to predict the factors which will give rise to preventative health actions.

Lennon and Fieldhouse suggest that one of the first tasks, in attempting to change food habits is 'to provide knowledge and correct misconceptions' this is a necessary preliminary to attitude change and thus behaviour change.
This model suggests that an individual will not undertake a health action unless he believes:

1. that he is susceptible to the particular disease to be prevented or that his current behaviour poses a health threat to him;
2. that this threat or disease is serious;
3. that effective measures are available to relieve the threat;
4. that the advantages of this measure outweigh any costs, physical or psychological, and that the action involved is not disadvantageous to him.

Finally, some 'trigger factor', critical incident or stimulus to action may be necessary to goad the now motivated individual into action. An individual will only change his behaviour if he expects it to be beneficial to do so, people learn to perform behaviours which are expected to lead to positive gains.

Tones suggests however, that inherent in this model is a confusion of attitude and belief, which detracts from the model's predictive value; 'perceived seriousness' is an attitudinal or motivational factor whereas 'perceived susceptibility' is a belief.

King (1983) also suggests, on the basis of evidence from a number of surveys, that the links between attitudes and behaviour (discussed in section 6.4.2) are 'considerably more subtle' than are implied by this model.

The 'health action' model

Nicholls (1983) suggests that 'normative - re-educative' strategies, while not denying the importance of knowledge, also recognise the importance of non-cognitive determinants of behaviour. This approach therefore will involve changes in attitudes, values, skills and significant relationships, not just changes in knowledge, information or intellectual rationales for action and practice.

Tones (1979) suggests that 'those who believe that it is the concern of health education to promote responsibility for health will not be satisfied merely with the clarification of values, they will want to see health adopted as a valued community asset. Where attitudes are inconsistent with such an aim they will want attitudes changed as part of the preventative endeavour of health education'.

This author uses Fishbein's model relating attitudes to behaviour
(discussed above) as the basis of his own 'health action' model. 
Fishbein's model distinguishes between belief and attitude, which Tones 
suggests is of great importance in preventative health actions, and 
includes also the influence of norms in general and of 'significant 
others' in particular.

In this 'health action' model (Figure 6.4) Tones views a desirable 
health action as one of a range of hypothetical choices open to an 
individual (X, Y, Z, ), others of which may be judged by the health 
educator to be unhealthy, and may include the choice to take no action at 
all. When faced with a choice of actions (or inaction), the individual 
will have to make a decision.

This model attempts to predict the factors which will determine what 
the individual's decision will be, and can therefore be used as the 
basis of a decision-making approach to nutrition education (discussed in 
more detail in section 6.5.). Tones, does however, point out and include 
in this model the idea that some health actions are routine and therefore 
do not involve decision making.

Tones' model distinguishes between, but recognises the interaction of 
the motivational system (or the attitudinal or affective components) and 
the belief system (or cognitive components) in the formation of the 
behavioural intention. Tones suggests that a low level of motivation or 
beliefs held without conviction will result in a behavioural intention to 
do nothing, or to continue with existing practices.

This model also recognises the influences of other people, which Tones 
suggests is of the highest importance in the decision making process. This 
influence may range from the general effect of norms - ie. what 
individuals believe that people like them are expected to do - to the 
powerful effect of the influence exerted by 'significant others' - husband 
or wife, mother, or perhaps some local source of wisdom. Tones cites 
Friedson (1973) who calls this the 'lay referral system'. Sources of 
nutritional information, revealed by recent surveys are discussed below. 
The influence of norms and significant others involves both the cognitive 
and affective aspects, that is - it is not just a matter of an individual 
believing that others think that he should take a certain action, the 
individual may also care what other people think. The importance of the 
nutrition educator taking into account the influence of others, such as 
the peer group when working with schoolchildren is discussed in section 
6.5.

Finally, this model recognises the intervention between behavioural
Figure 6.4 'Health Action' Model
(From Tones, 1979)

**HEALTH ACTION**

<table>
<thead>
<tr>
<th>X</th>
<th>Y</th>
<th>HEALTH ACTION</th>
<th>Z</th>
</tr>
</thead>
</table>

**DECISION**

- Appropriate environment and conditions eg. availability of suitable foods
- Relevant skills & knowledge eg. knowledge of nutritional value of foods

**BEHAVIOURAL INTENTION**

- Attitudes to food and health
- Knowledge eg. of relationship between food and health

**INFLUENCE OF NORMS AND SIGNIFICANT OTHERS**

**MOTIVATIONAL (affective) SYSTEM**

**BELIEF (Cognitive) SYSTEM**
intention and decision, of situational factors such as appropriate environmental conditions, and relevant skills and knowledge. Tones suggests that behavioural intention will only materialise in appropriate environmental conditions. The nutrition educator must firstly therefore identify the situational factors likely to promote the desired health action, and then ensure their presence. Situational factors, revealed by recent surveys were discussed in section 6.4.2.

An examination of this model, therefore reveals that, before a decision can be made towards a desirable health action, the belief set, the motivational elements, the influence of norms and people important to the individual must be favourable to the formation of the appropriate behavioural intention; in addition, environmental conditions, knowledge and skills must be favourable to the translation of behavioural intention into a decision to act. This model does, however, omit the effect of feedback resulting from the outcome of behaviour which is a feature of almost all other decision making or behavioural models, and must be accounted for by the health educator.

Tones points out that health education may aim to have an effect on one or all of the elements in the model;
- it may attempt to modify or create beliefs eg. about the relationship between diet and heart disease;
- it may attempt to create decision making skills to facilitate the action after clarifying beliefs and values;
- it may try to influence the lay referral system by community development approaches;
- it may have a long term effect on general norms;
- it may provide the skills and knowledge necessary to translate behavioural intention into action;
- it may attempt to change a value system and modify motivation;

Tones suggests that while this last is the most difficult of the health educators tasks, 'much may be done by removing motivational barriers or redirecting existing motivation'.

It is suggested that the ineffectiveness of past nutrition education could be due at least in part, to the tendency to concentrate on only one element of the model - the belief system. It may be that in order to be successful, nutrition education will have to employ strategies which recognise the interaction of all the elements in this complex model.
In order that effective nutrition education strategies can be
developed, the empirical validation of this model in relation to food –
health decisions therefore emerges as an important research priority.

This model will be used as the basis for discussion of the role of
nutrition education in the implementation of dietary guidelines in this
section, and for discussion of nutrition education in schools in section
6.5.

6.4.5 Nutrition education – change theory and changing eating habits

A number of authors discuss the application of change theory
(Nicholls, 1983) or communication of innovation theory (Lennon and
Fieldhouse, 1982) to the problem of changing eating behaviour. Gifft et al
(1972) view nutrition education as planned change.

Nicholls examines various strategies for change (discussed in section
6.1), stages in the process of change, characteristics of change, and the
reasons for resistance to change.

Lennon and Fieldhouse also examine these areas and in addition
discuss the channels and social system through which change or innovations
are communicated.

Gifft et al. examine the stages through which change occurs and some
of the factors which influence the potential for change.

Lennon and Fieldhouse suggest that communication of innovation is
specifically concerned with the spread of messages that lead to new
practices being adopted, 'communication of innovation theory, by examining
the nature and characteristics of the elements involved, offers a
theoretical explanation of why a projected change may be adopted or
rejected. It therefore aids an appreciation of the difficulties facing a
change agent and has obvious implications for the educator concerned with
promoting changes in health behaviour'.

Both Lennon and Fieldhouse (1982) and Gifft et al. (1972) distinguish
between different sorts of changes.

Lennon and Fieldhouse (1982) suggest that change may occur through
forces acting within the social system, (immanent change), or may be
derived from external sources or 'contact', (selective or directed
change). Directed contact change is brought about by outsiders who
deliberately seek to introduce new ideas to achieve defined goals. The
health educator is usually concerned with planned or directed change.
Giff et al (1972) distinguish between planned change which occurs by design, and spontaneous change which occurs as a corollary to other modifications; and suggest that nutrition education should be seen in terms of planned change, whereby there is a deliberate attempt to improve eating habits through intervention. These authors also suggest that both spontaneous and planned change have certain characteristics in common, and roughly similar phase of development; they suggest that the nutrition educator should be aware of these phases.

As discussed (section 6.4.2) both King (1983) and McKenzie (1980) suggest that a study of the changes that have already occurred (ie. immanent or spontaneous) and the factors associated with them give useful guidance to those deliberately seeking to change behaviour.

This section will therefore discuss the stages in the process of change and the need to apply this theory to the problem of implementing of dietary guidelines.

Stages in the process of change

A number of authors (Giff et al. 1972; Lennon and Fieldhouse, 1982; Nicholls, 1983) suggest that change should be regarded not as a single event, but as a process which occurs over a period of time. All these authors cite other workers in the field who identify various stages. While there are a number of different views on these, there are points of agreement.

Most workers agree that the first stage involves the nutrition educator creating an awareness or knowledge of an idea or practice and suggesting or presenting possible courses of action. It is suggested that many unstructured approaches to nutrition education are rarely planned or proceed beyond this stage. A number of recent surveys (Woodward, 1984; Fallows and Gosden, 1985) indicate that, while there is an increased awareness and interest in the relationship between diet and health, there is evidence (discussed in section 6.4.2) that this does not always lead to changed eating behaviour.

Different workers variously identify the next stage as one of 'interest' where there is the active seeking of information to determine its possible usefulness and application, and 'evaluation' where there is weighing and sifting of the information (Lionberger, 1960, cited by
Nicholls, 1983). During this phase the process of persuasive communication (discussed in section 6.4.6) can be used to develop 'a receptive framework for learning' (Lippet et al., 1958, cited by Gifft et al.). During this phase the individual may form a favourable or unfavourable attitude towards the change.

There then may be a 'trial' or tentative trying out of the new idea or practice or acquisition of new information, for example there may be tasting of an unfamiliar food, or trying out a suggestion for buying or preparing food. Gifft et al point out that the educator should recognise the importance of adequate preliminary preparation and of providing active support and guidance during this stage. It is also important that the learner should understand that he has the right to make mistakes and to make adaptations when necessary.

Gifft et al stress the importance of the next stage - the 'reinforcement' phase, during which learning gained during the trial period is strengthened by applying necessary adjustments revealed by the trial, also by transfer of learning to similar situations, and by appropriate repetition. The authors also stress that opportunities for reinforcement should be consciously planned as part of any educational effort, and that this phase of the process requires time and imagination if it is to be interesting and not merely repetitious. They suggest that the importance of this phase is often underestimated in educational programmes.

Gifft et al. suggest that ensuring the appropriate conditions for these two stages - trial and reinforcement - is only possible where interpersonal channels of communication are used rather than mass media ones, (discussed in section 6.4.6).

Some workers (Lionberger, 1960; and Lippit et al, 1958) suggest that the final stage is the full scale adoption of the practice. Gifft et al suggest that a change is adopted when it has become a functional part of the audience's pattern of perception, belief or action, such as a change in attitude towards a food, or a change in food practice. The characteristics of the change (or message) which will influence whether or not it is adopted are discussed in section 6.4.6.

On the other hand, Rogers and Shoemaker (1971) (cited by both Nicholls and Lennon and Fieldhouse) criticise this five stage adoption
process on the grounds that it implies that the process always ends in a decision to adopt. These authors propose that the process of change proceeds in four stages with evaluation occurring throughout the process. After a phase of 'knowledge' and 'persuasion' there is a phase of 'decision' where the individual engages in activities which lead to a choice to adopt or reject a new idea or practice, and a phase of 'confirmation' where the individual seeks reinforcement for the decision he has made, but he may reverse his decision if he is exposed to conflicting messages about the change.

Giffet et al note, however, that change rarely proceeds as systematically as this discussion implies, one phase may overlap another so that the specific sequence may be difficult to determine. The authors suggest that the nutrition educator might initiate the process from the beginning, or might intervene at any stage. If the nutrition educator is intervening after the the process has started, the importance of knowing exactly what has gone on before is emphasised.

Here again, there clearly needs to be further research applying change theory to the problem of changing eating behaviour and the implementation of dietary guidelines. Nicholls (1983) suggests that there is need for considerable research in this area, and that new investigations are needed in the area of eating habits to 'test, corroborate, or generate change theory'.

Communication of change through a social system

Lennon and Fieldhouse (1982) suggest that there is often a considerable time-lag between exposure to a new idea and its ultimate rejection or acceptance. The rate of adoption of an innovation by a social group will vary with circumstances and is usually measured by the length of time required for a certain percentage of the group to adopt the innovation.

These authors cite Rogers and Shoemaker (1971) who suggest that individuals can be categorised according to the speed with which they adopt an innovation:

- innovators - the venturesome 3 per cent willing to take the risk of trying something out first, these tend to be younger, of higher social status and more affluent,
- early adopters - 13 per cent - younger, more creative, and more mobile than the group below.
- early majority - 34 per cent - above average in social and economic standing
- late majority - 34 per cent - more sceptical, adopt under economic necessity, or pressure from peers, older and below average in social and economic status
- laggards - 16 per cent - tradition bound, highly suspicious of innovation, older and at the lower end of social and economic scales.

This can be seen in a recent market research survey by Allen, Brady and Marsh (1985), in which the respondents fell into three groups according to their interest in, and commitment to the idea of healthy eating;

- 'the Unconcerned' who have made no changes in their eating habits in spite of recent thinking,
- 'the Aware' (60-70 % of all housewives) 'characterised by traditional values but also a willingness to change behaviour if persuaded to do so. Most housewives in this group are aware of the health issues, but confused by the conflicting ideas presented to them. They tend to compromise between the latest ideas, their own pragmatic commonsense and their knowledge of what will be acceptable to their family'. These housewives shop mainly in supermarkets rather than specialist 'health food' shops'.
- 'the Believers, 'a small but dedicated band', mainly well-educated, middle class and 25-40 years old. They form the 'committed hard core' of consumers and make up about a fifth of housewives; roughly the same proportion as 'the Unconcerned'.

Lennon and Fieldhouse suggest that higher social status groups would accept innovations more rapidly than lower groups; social class differences in nutritional knowledge, attitudes and behaviour were found in several recent surveys (Bejam, 1984; Flora, 1985). These authors also suggest that different social groups react to different channels of communication (discussed in section 6.4.6) Mass media channels, as external sources of new ideas, have their greatest effect on early adopters; the early adopters then act as interpersonal channels for the later adopters. This suggests that early adopters are more 'change orientated' and require less active persuasion to change.

Robinson (1986) also suggests that there is in some cases a two stage flow of information, in that certain people expose themselves to media more readily than others; these people then transmit ideas so that the transfusion of the communication is by a combination of personal influence
Both Salmon (1984) and Robinson (1980) discuss the importance of the nutrition educator being able to identify the target audience (discussed in section 6.4.6).

Salmon (1984) points out that 'defining the audience as precisely as possible is the pre-requisite of any communications effort' and suggests that since social change begins in the social class ABC1 and filters through to the other classes, this may be the group with which to start, even though it may not be the most in need.

Robinson (1980) suggests that this approach depends on being able firstly, to identify the innovators, and secondly to devise an appropriate strategy to appeal especially to the target audience. This author cites a number of studies which have been carried out in an attempt to identify the innovating groups, but points out that their interpretation needs care, especially as they have mostly been carried out in relation to products other than food. This again emphasises the need for research specifically relating to innovation in eating behaviour. McKenzie (1981) suggests that the nutrition educator could make use of extensive market research data in this field.

Lennon and Fieldhouse also distinguish between different types of innovation decisions in relation to social systems:

- optional or individual decisions are those made by an individual regardless of others, and are thus adopted more quickly than collective ones. The authors suggest that health education is most usually concerned with optional decisions - 'though some lobbies would press for more authoritative control'.

- a collective decision is a consensus decision of a social group; communication of innovations theory provides a description of the processes occurring in a community when a change is proposed or a new idea introduced. Application of this theory may be useful in predicting the barriers likely to be encountered when a new idea is introduced, and is thus helpful in the design and implementation of programmes. Knowledge of population characteristics helps to define the type of social system and its likely change orientation. Methods can be selected on the basis of knowledge of the relative effectiveness of mass media and inter-personal channels of communication, and opinion leaders can be identified and 'recruited'. Appropriate strategies can be identified to maximise the chances of successful change.
- Authoritative decisions are those dictated by a 'governing' body, and are those adopted most quickly, possibly through fear of sanctions for non-compliance; the authors cite the work of Festinger (1971) on cognitive dissonance theory, who points out that forced compliance is frequently followed by a change of personal attitudes to reduce cognitive dissonance.

These can be related to some of the suggested strategies for the implementation of dietary guidelines, discussed in section 6.1.

**Resistance to change.**

This is discussed both by Nicholls (1983) and Gifft et al (1972) in relation to eating habits.

Gifft et al suggest that resistance to change is normal, particularly in the area of eating habits, due to the 'intricate social and emotional acculturation' through which food patterns are developed.

Nicholls cites the work of Roland and Serville (1976) who suggest that a negative attitude to changes in diet is partly due to the resistance and inertia of habit, but also to the need for security in a traditional diet. Gifft et al suggest that 'experimentation with the unfamiliar is a stimulating challenge for some but creates the discomfort of insecurity for others'.

Gifft et al. suggest that the complexity of the change (discussed below) is perhaps the strongest determinant of the speed and extent of adoption, for example persuading a person to use more of a food he already eats is less complex and therefore easier to accomplish than inducing him to use one he has never tasted. These authors cite the work of Lippet et al who suggest that in a complex situation a 'leverage point' should be looked for, that is, a change relatively easy to begin with because it is 'accessible'—reasonably uncomplicated, or highly motivated; Lippet (1958) also stress the importance of a 'linkage', that is a potential line of progress between the leverage point and the ultimate objective.

Nicholls cites Igoin (1976) who suggests that there is a need for a study to investigate the nature of resistance to change in eating habits.

6.4.6 Nutrition education - the process of communication.

While the application of communication theory to nutrition education is usually discussed in the context of changing eating behaviour, it is argued in this thesis that a knowledge of this theory is also important when the aim is 'informed choice'.
A number of authors (Gifft et al. 1972; Robinson, 1980; Lennon and Fieldhouse, 1982; Gillespie, 1982) discuss the application of communication theory to nutrition education.

Gifft et al stress the relationship between education and communication 'education and communication have a common purpose; both include a conscious attempt to influence the ideas or actions of a person or a group, thus the teacher is a communicator in the most ideal sense, his purpose is not to transmit information but to affect the behaviour of the learner in terms of how the learner thinks acts or feels'.

Gillespie (1982) suggests that communication theory offers guidance for designing both nutrition education strategies and nutrition education research, 'the field of communication has a great deal to offer ... providing theories and frameworks to aid in developing a systematic approach ... to nutrition education ... communication processes are central to nutrition education; perhaps for what we do the term nutrition communication would be a more precise label than nutrition education'. Gillespie defines nutrition communication as 'persuasive communication about nutrition with the intention of changing attitudes, knowledge and/or behaviour with respect to nutrition and food practices'.

Robinson (1980) studies the process of communication mainly with reference to the marketing and advertising of food products, but points out the importance of 'those involved in education, legislation or industry' taking into account 'food communication effects' ... for those seeking to promote dietary change considerable value may be gained by studying the problem using factors concerned with source, media, message, and audience'.

Lennon and Fieldhouse (1982) discuss the process of persuasive communication and suggest that persuasive techniques may be used to change attitudes and behaviour.

Persuasive communication is the basis of marketing strategies used by the food industry. A number of authors (McKenzie, 1977; Salmon, 1979; Robinson, 1980; Gillespie, 1981.) suggest that nutrition educators should study the use of persuasive communication techniques used by the food industry, and apply similar techniques to nutrition education.

McKenzie (1981) suggests that material derived from very large commercial market research expenditure 'may be used to aid our general understanding of patterns of food consumption and how these may be influenced in the interests of better health and nutrition'. He goes so far as to suggest that 'the techniques related to issues such as product
testing, consumer attitude, behaviour measurement, have achieved a depth and quality of technique as a result of commercial intervention which did not exist and could not have been developed from the relatively limited level of academic endeavours in these fields in the past.'

McKenzie (1977) also suggests that from an analysis of studies of how eating behaviour has changed in the past it is possible to build up a set of basic 'rules' or guidelines which would appear to be necessary prerequisites for changing eating behaviour. While McKenzie does not specifically mention communication theory, these rules illustrate its application to nutrition education, 'if one can identify consumer attitudes and attitudes and needs and their ramifications on future choice, then there should be opportunities to devise appropriate new products that take cognisance of these criteria and reflect that climate'.

Salmon (1979), while again not referring specifically to communication theory, compares nutrition education to marketing a new product, 'a marketing man has to be in touch with the people he wants to buy his goods, ... dietitians also have a product to sell and can take a valuable lesson from marketing techniques'. This author traces the stages in product development from finding the gap in the market, 'the analysis of social change often points to marketing opportunities', through market research, testing ideas for a new product, to eventual development, factory production, test marketing and advertising and suggests that nutrition educators need to go through some of these stages when attempting to change food habits; Salmon suggests that 'nutrition theory has not been translated into the kind of food people want to eat'. 'Nutritionally perfect products - even if they existed - would not sell to anyone - not even nutritionists - unless they also tasted good'.

It is suggested that nutrition education might be more effective if those involved spent somewhat less time deploring the success of the food industry in selling products that they perceive as 'harmful' and more time enquiring why they are so successful, 'whether from a nutritional point of view you like some of the foods or not makes little difference to the fact that they are successful. We can learn why they are successful and use those facts to our own ends to make change in eating habits more effective ... if the dietitian wishes to market nutrition education successfully this must be done by taking food habits into consideration, influencing them perhaps but not attempting to reverse trends' (Salmon, 1979).

Gillespie (1982), however, points out the difference between
nutrition communication and advertising communication.

Firstly, there is the complexity of the message, 'in order to make rational judgements, people need more than isolated facts presented in short single concept messages; as nutrition educators we need to undertake the much more difficult task of helping them to develop a more holistic understanding of nutrition'. The nutrition education message in the current context is discussed below.

Secondly, 'nutrition educators are usually trying to do more than sell a specific product; we are trying to change the eating patterns which are ingrained in members of the target audience and the groups of which they are part. Food patterns are also related to basic goals and values, many of which have been inculcated from an early age and thus are difficult to change. The objectives of nutrition communication therefore potentially require much more of the receivers than do the objectives of advertisements'.

This section will therefore discuss the application of communication theory to the problem of implementing dietary guidelines.

Variables in the process of communication

Lennon and Fieldhouse (1982) identify three sets of variables whose interaction determines the outcome of communication, and which can be controlled and manipulated to assist in promoting change:
- sender or source variables,
- message variables,
- recipient or audience variables.

Giffit et al (1972) consider similar elements in the development of a receptive framework for learning which will have an important influence on whether or not the process of change proceeds;
- the feasibility of change,
- the prior perceptions of the audience
- who communicates the message.

Robinson (1980) defines communication as 'the transmission of meaning', and suggests that 'meaning represents a stimulus which may initiate behaviour'. He questions the 'telegraph model' of communication in which 'what is transmitted is received', and resulting behaviour or attitude change is what is expected, suggesting that this sees communication only from the 'source point of view'. This author studies
the inter-relationship of source, media, message and audience variables and suggests that factors concerned with all these variables have to be taken into account when planning communication strategy.

Robinson suggests that in any communication system there are both participants and functions or activities. In a simple system, the participants are
- the source
- the transmitter (sender)
- the channel (medium) which links the source to the audience
- the receiver
- destination (audience).

The activities or functions of the system are 'source controlled'; the source has to
- conceive an idea,
- transform this into a code capable of transmission (using words, pictures or symbols),
- transmit via a medium or media.

Audience controlled activities are; to receive, sense, decode and give meaning to the transmission.

Robinson points out that it is the audience that gives meaning to the communication, 'which may not necessarily coincide with that intended'. Recent surveys of attitudes to food and health have revealed a number of confusions and misconceptions, (discussed below). These are perhaps evidence of this.

Nutritional labelling, as a specific communication problem is discussed in section 6.4.10. It is suggested that particular attention needs to be given to providing this information in a form in which it has meaning to the audience.

These participants and functions of a communication system will be discussed separately in relation to the problem of implementing dietary guidelines. Their inter-relationship must also be recognised.

**Sender or source variables**

Robinson (1980) distinguishes between the source and the sender, 'the source of a communication is thought of as its point of origin ... however in a complex network there is no true beginning ... all communications can
be identified as reactions to some stimulus that has gone before'.

This author suggests that 'there is quite frequently a chain of individuals or organisations involved in the communication process, for example, researchers - government policy makers - designers of communication - media. Noise occurs at each step in the chain so that the end result may be very much modified'. The JACNE publication (1985) is clearly the end result of such a chain.

Robinson also identifies 'gatekeepers' in the communications sense as people controlling the flow of information to others. It is suggested that senders in some cases act as 'gatekeepers' in this sense, by selecting the research findings which are communicated.

The marketing communications of the food industry provide an example of senders acting as 'gatekeepers'. Robinson (1980) cites an example, 'the makers of Flora Margarine will point out studies with findings indicating that consumption of polyunsaturates reduces the chance of heart disease, while the Butter Information Council will point out discrepancies in research and quote research with alternative findings and conclusions'.

The mass media also form part of the communication network, in this case it is the producer or journalist who may act as the 'gatekeeper'.

In the context of nutrition education, it might be useful to distinguish between the nutritionist and the nutrition educator.

The nutritionist has the knowledge of nutrition, and in this sense is the source, however as Robinson suggests 'in a complex network there is no true beginning'; in practice the true sources are the research findings of a large number of nutrition and medical researchers. Much of the current confusion has arisen through the different interpretations by nutritionists of these research findings, which are then communicated by different nutrition educators to the audience; at each stage there is potential for differences in perception of the meaning of the message, (distortion or 'noise').

The nutrition educator, in these terms, may be thought of as the sender, and must, in addition to knowledge of nutrition, have expertise as a communicator. Gillespie (1981) suggests that 'nutrition educators must be well versed in the 'science' of nutrition as well as in the process of nutrition education'.

Lennon and Fieldhouse (1982) suggest that characteristics associated with the communicator such as his credibility, experience, trustworthiness, attractiveness, sincerity, and status will influence the
receiver's confidence in the message, and therefore affect the probability of its acceptance.

These authors discuss the use of other agencies to validate or reinforce the communicator's credibility. They discuss the concept, important in communication of innovation theory, of opinion leadership, suggesting that in any social group, certain members function as opinion leaders, providing information and advice about innovation to many others in the system. It is suggested that these opinion leaders have certain characteristics, they enjoy high social status, are more cosmopolite, more exposed to external communications, and they are more able to influence other peoples attitudes or behaviour with relative frequency because of their social respectability rather than through any formal authority or power. These authors suggest that such opinion leaders are useful contacts for the external agent seeking to bring about a desired change within the system; they cite as examples the use of disc-jockeys and footballers in safety campaigns.

Robinson (1980) suggests that it is the recipient's perception of the source, rather than of the sender, that affects the outcome of the communication process' and cites behavioural research to illustrate the effects of source characteristics upon message acceptance and response. The credibility of a message depends on the degree to which a source is perceived as being expert and trustworthy, hence the use by senders such as mass media journalists or the food industry, of doctors, nutritionists, scientists or other 'food experts' as sources to give credibility to their message. It is almost always possible for a sender to find an appropriate source to give his particular message credibility. The credibility of nutritionists is, at present a matter of debate among nutritionists themselves (Nutrition Society, 1985, 1986), whereas dietitians have a professional qualification and professional body, nutritionists do not, consequently many can call themselves nutritionists.

A number of recent surveys (MLC, 1984; BNF,1984) reveal consumers' perceptions of doctors as trustworthy and expert. Teachers were perceived neither as expert in matters of food and health, nor as effective communicators, (Kraft, 1978; MLC 1984).

Recipient or audience variables.

A number of authors (Gifft et al, 1972; Robinson, 1980; Lennon and Fieldhouse, 1982) stress the importance of the communicator taking into account audience variables or characteristics.
Both Gifft et al (1972) and Lennon and Fieldhouse (1982) suggest that characteristics such as age, sex, intelligence, self esteem, personality, relevant knowledge and attitudes, interests, social background, purposes and needs of the audience will need to be considered by a communicator.

Gifft et al and Robinson both discuss the use of findings from behavioural research and point out the importance of the communicator not only understanding the factors influencing behaviour (discussed in section 6.4.2) but also taking into account existing knowledge, beliefs and attitudes.

Robinson points out the importance of understanding the forces motivating behaviour - 'people behave because they are motivated, that is, drives exist which are reduced by the achievement of goals'. He suggests that as food consumption is important in psychological, social and economic terms as well as being a physiological necessity, 'it is very difficult to disentangle motivating forces in an audience'.

Robinson suggests that while message characteristics play an important part in determining the outcome of communication, existing characteristics of the audience are likely to be even more important; attitudes that are extreme, strongly held, or have links with other attitudes are hard to change; also it is likely that it will be harder to change attitudes towards a neutral position than away from it; the consumer has a 'powerful array of protection devices in the form of selective attention, perception memory and distortion'.

Gifft et al discuss the importance of taking into account the already existing beliefs, attitudes and practices of the adopter which will influence the process of education. The authors suggest that 'initial attitudes may range from strongly interested to apathetic, from friendly to hostile, from optimistic to pessimistic'; they cite the examples of a child feeling negative to nutrition education because of previous exposure to dull teaching, and the diabetic resenting his disease and thus also his dietary instruction.

Thus it is suggested that the communication process should 'start where the audience is' rather than 'where the communicator/nutrition educator thinks they ought to be'.

The nutrition educator must be able to translate his message into codes which convey meaning to his audience in relation to their knowledge, beliefs, attitudes, needs and interests. A necessary prerequisite, therefore, is a knowledge of the beliefs, attitudes, values and
'situational factors' which influence the eating behaviour of the audience. Tones 'health action' model (section 6.4.4) provides a framework for collecting this information.

A number of recent surveys, give some indications in this area; these must be the starting point for the communication process. It is emphasised that the picture is far from complete, and further research is needed in these areas to ensure more effective communication.

The message must be presented in relation to the nutritional knowledge possessed by the audience. Nutritionists can only talk in terms of nutrients if people understand the terms used. Recent surveys, (Thomas, 1979; King 1983; Woodward, 1984; Fallows and Gosden 1985; MAFF/CA, 1985) suggest that while there is increasing awareness of, or superficial familiarity with nutritional terms, there is a poor level of understanding and also poor knowledge of sources of nutrients and effects of different methods of cooking.

Thus the encoding of the nutritional message in terms of nutrients in foods will convey little meaning to many to people. The MAFF/CA (1985) survey recognised this, and concluded that 'terminology should be as simple as possible', and that 'any scheme of nutritional labelling needs to be accompanied by a general programme of public information'. The use of food labels to give nutritional information is a specific communication problem which will be discussed in section 6.4.10.

Giff et al (1972) suggest that 'there is a need to refute erroneous information about nutrition before new learning can be initiated'.

Recent surveys revealed a number of common misconceptions about food and health.

The CA/MAFF survey found that the concept of 'energy' was the subject of confusion - being regarded as 'vitality' and thus should be increased, calories, on the other hand should be strictly controlled. Woodward (1984) found that there is a view that there was only a need for concern if one was overweight.

The nutritional message must also be related to the attitudes of the audience.

Recent surveys (King, 1983; Millar, 1985) have indicated that many people thought in terms of foods as being 'good for you' or 'bad for you'.

Millar (1985) found that other socio-cultural attributes were also
clustered with each group of foods. In this study foods could be seen to polarise according to their 'perceived fat content' into a 'high fat food group' and a 'low fat food group' with other attributes such as 'fattening' 'tasty' 'bad for you' 'special' 'expensive' frequently being associated with the foods previously grouped together as 'high fat foods', and attributes such as 'good for you' 'cheap' 'good value' 'basic' 'don't like' more frequently associated with the foods in the 'low fat' group. Millar concludes that 'consumer health education seems to be based on the belief that if most consumers know (ie. are told) what is 'good for health' and what is 'bad for health', then they will cease to eat foods which are 'bad' and, now re-educated, consume instead those which are 'good' (cf. empirical-rational strategies, and Garrow, 1985). This author suggests that 'this view overlooks the greater importance of the relevance, in social and cultural terms, of the choice of particular foods for certain eating occasions'.

The idea of a 'balanced diet' was also present (McKenzie, 1979; King, 1982; BNF, 1984). While few people were able to explain what was meant by this, it was seen in general terms of 'eating in moderation', or 'a varied diet', or incorporating both ideas, 'concentrating on the foods that are 'good for you' and trying not to have too much of the foods that are 'bad for you''. The formulation of the nutritional message in terms of 'a balanced diet' is discussed below.

Another prevalent attitude revealed by recent surveys (McKenzie, 1979; King, 1983; BNF, 1984)) was a belief in the importance of a 'proper meal'; yet the modern trend is towards informal snack meals (section 6.4.2). The nutritional message must therefore be communicated in relation to existing eating habits.

Recent surveys (Kraft, 1979; McKenzie, 1979; King, 1982; Bejam/NOP, 1984; MLC, 1984; BNF, 1984) also revealed that 'situational factors' such as the taste of food, family tastes, likes and dislikes, the importance of food 'fitting in with life' and not vice versa, were an important influence on eating behaviour. Such factors often ranking as more important than a desire for, or an interest in 'healthy eating'.

Recent surveys also revealed on the one hand, 'an interest in' and an awareness of the importance of 'healthy eating' (King, 1983; Bejam/NOP, 1984; Fallows and Gosden, 1985), and on the other a disaffection with and negative attitudes towards nutritional information and nutrition educators - 'disinterest in nutritional detail, and occasionally
antagonism towards the ways in which nutrition information is traditionally presented' (King, 1983), - 'a strong reaction against what people consider to be an overload of information from experts' (BNF, 1984) - 'nutritionists do not know what they are talking about because they are always changing their minds' (McKenzie, 1979) - 'in my opinion you hear too much about eating healthy foods these days' (Bejam/NOP, 1984) - 56 per cent agreed with this statement.

A number of conclusions are drawn from the findings of these surveys.

King (1982) suggested that nutritional knowledge was not being used because it was not being received in a usable form, and that consumers were looking for simple rules to follow.

McKenzie (1979) suggests that the consumer needs 'help to help themselves to choose a diet that is in the best interests of nutrition and health, and to make it as palatable as possible', this 'enters an area of activity which we are at present ill-equipped to handle'.

The Consumers Association (1986) concluded that 'it is not enough to give dietary advice which is correct in nutritional and medical terms, we also need to ensure that this advice is both understandable and usable'. The authors suggest that this requires more dietary studies.

Therefore, it is important that those involved in nutrition education should either work in conjunction with those who have an expertise in communication, or they, themselves should have not only an up-to-date knowledge of nutrition, but also some knowledge of the process of communication. Gillespie supports this latter view, arguing against the team approach, where nutritionists with understanding of the content work with communicators who understand the process, favouring instead 'nutritionists who are also conversant with the relevant theories and strategies of communication and related fields'.

Relationship between source/sender and audience/recipient.

Robinson emphasises the complex inter-relationship between sender and audience.

The sender is a receiver of information from his audience (communication should be a two way process), he is also a receiver of information (or audience for communication) from other sources. In addition, both source and audience are receivers of communication from their respective environments, which will, in turn, influence the way in

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which they will take part in a particular communication process.

This is perhaps one of the greatest difficulties faced by nutrition educators at present; they are receiving conflicting messages from those communicating research findings; nutrition educators then have to transform these messages into ones which will have meaning to their audience, who in turn are receiving other, often conflicting, messages from other sources such as the media and the food industry. It is perhaps not surprising that there is such confusion and disaffection with sources of nutritional information in the minds of many people; the nutrition educators themselves often feel confused.

Robinson suggests that when the receiver has to contend with many messages competing for attention at the same time, this leads to selection, so that only 'some pieces of communication get through'. Nutritional messages in the supermarket or any other situation where food choice operates are only one type of message being communicated. Unless nutrition educators communicate their message effectively it will not be received.

In order to convey meaning to his audience, the idea or message has to be transformed into a code or consensus of symbols which can be interpreted by the senses.

Robinson suggests that for a code to have meaning for both sender and receiver, there must be an overlap of experience between them, and the greater the degree of intersection, the more effective the communication or understanding is likely to be. Source and audience should be 'talking the same language' - barriers of culture, education, and economic status are therefore likely to be powerful.

This author suggests, therefore, that good communicators need to be good encoders - 'we can only describe something in terms familiar to our audience'. A perceptive audience is a good decoder.

The way in which nutrition educators encode their nutritional messages to transmit their meaning may also be responsible for some of the confusion and misconceptions discussed above. The importance of finding the best way to encode nutritional information on food labels is discussed in section 6.4.10.

Robinson warns also that there is also likely to be loss or distortion of the message in both encoding and decoding with 'the inevitable result that what is actually conveyed is not quite what is intended'.

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Lennon and Fieldhouse also point out that source or sender and audience or receiver interact to influence the process of change, therefore it is difficult to study them in isolation. Lennon and Fieldhouse discuss communication between individuals with attributes such as similar beliefs and values, education or social status, (homophily) and suggest that this type of communication is more likely to be effective as problems of social distance and incompatible values are minimised.

These authors suggest, however that 'in communication of innovation theory it is almost axiomatic that some degree of heterophily will exist between the sender and the receiver, that is knowledge, beliefs and values will differ' and that social distance and transcultural barriers increase heterophily leading to difficulties in effective communication.

Lennon and Fieldhouse cite the work of Fishbein and Ajzen (1975) who discuss discrepancy between the view of the communicator and the view of the receiver as an important variable; the greater the discrepancy the less the chance of acceptance. The discrepancy is minimised when the receiver has low initial confidence in his beliefs and the communicator is highly credible.

Nicholls (1983) cites the work of Havelock (1969) who distinguishes between the activities of the person who is trying to bring about the change - the change agent or in this case the nutrition educator, and the person who is to change - the change adopter, and shows the links at each stage of the process (Table 6.3). Nicholls suggests that there is a need to test empirically whether or not these activities are relevant to the changing of eating habits.

<table>
<thead>
<tr>
<th>Change Agent</th>
<th>Adopter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Promote</td>
<td>Awareness</td>
</tr>
<tr>
<td>Inform</td>
<td>Interest</td>
</tr>
<tr>
<td>Demonstrate</td>
<td>Evaluation</td>
</tr>
<tr>
<td>Train</td>
<td>Trial</td>
</tr>
<tr>
<td>Help</td>
<td>Installation</td>
</tr>
<tr>
<td>Service</td>
<td>Adoption</td>
</tr>
<tr>
<td>Nurture</td>
<td>Integration</td>
</tr>
</tbody>
</table>

Table 6.3 Relationship between Change agent and Adopter
(from Nicholls, 1983)
Giff et al cite the work of Lippet et al (1958) who suggest that the change agent should be at the same time, able 'to understand and empathize with the needs and values of the audience, and also be 'sufficiently different from them to give confidence in his ability to help'. Thus the nutrition educator must establish both credibility and acceptance.

A number of nutrition educators or senders of nutrition messages can be identified - health professionals, teachers, the food industry, including caterers, and the mass media. In the case of the mass media, the producers or journalists can be considered as the senders using a particular mass media channel. The role of each of these in the implementation of dietary guidelines will be discussed below. In each case the sender's nutritional knowledge and sources of nutritional information must be considered, and also their expertise as communicators. In addition, each must be considered in relation to their audience, and to their use of different media or channels of communication.

Media or channels of communication

The channel or medium is the link between the sender and the audience - the message is transmitted through a channel of communication. Lennon and Fieldhouse distinguish between mass media channels and inter-personal channels and compare their characteristics (see overleaf).

Mass media and interpersonal channels can be combined to advantage, for example the use of television programmes as a basis for group discussion in teaching. Gillespie (1981) suggests that 'the current state of knowledge regarding channel effects suggests that approaches for nutrition education should whenever possible link inter-personal channels to mass channels'. It is, therefore, important that a nutrition education programme should be planned so that make best use is made of both sorts of channels.

Different mass media channels are identified and the role of the mass media is discussed below. Health professionals and teachers mainly make use of inter-personal channels of communication. Lennon and Fieldhouse suggest a number of organisations such as ante-natal classes, pre-school, youth or womens' groups, or adult education classes through which interpersonal channels may be set up.
Table 6.4 Characteristics of mass media and inter-personal channels of communication (based on Lennon and Fieldhouse, 1982)

<table>
<thead>
<tr>
<th>Mass media channels</th>
<th>Inter-personal channels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Involve a mass medium.</td>
<td>Involve a face-to-face exchange between two or more people.</td>
</tr>
<tr>
<td>More important at creating knowledge and spreading information.</td>
<td>More effective in persuading, or changing attitudes.</td>
</tr>
<tr>
<td>Allow two way exchange of ideas; the receiver is able to obtain clarification or additional information about the innovation from the source individual.</td>
<td>Problems of selective exposure perception and retention can be avoided.</td>
</tr>
<tr>
<td>Can be effectively used for disseminating health knowledge</td>
<td>More effective in bringing about change in attitude or behaviour.</td>
</tr>
<tr>
<td>Almost exclusively cosmopolite i.e. outside the social system</td>
<td>New ideas originate within the social system - localite.</td>
</tr>
</tbody>
</table>

Robinson suggests that each medium is characterised by a particular set of symbols which creates differences in the message which can be transmitted, for example the pictures and movement of television can communicate a different message from a poster. The importance of using the symbols appropriate to the channel is also stressed. 

Robinson also points out that media can also exhibit source effects, some of which are more prestigious and influential than others. 

Each medium is also characterised by a specific target audience which selects itself, therefore presumably assumes that the communication comes from a credible source, for example a 'quality' newspaper will have a bias towards certain groups, and television will reach a broader
spectrum; a women's magazine may reach a smaller total number of people than television, but will have a readership almost entirely composed of people who are substantial purchasers of food. As suggested above, in some instances there is a two step flow of information, certain people will expose themselves more readily to a media than others, and then transmit the ideas, so that diffusion of information is by a combination of personal influence and direct mass media influence.

Message variables (characteristics of the innovation or change)

Central to the process of communication is the nutrition education message. It was suggested above that recent surveys had revealed confusion and a number of misconceptions, a discrepancy between behavioural intention and actual behaviour, and a disaffection with nutrition educators and the way in which nutritional information is presented.

This may be due in part to different messages being communicated by different senders, related to their own differing interests (the actual and potential role of different senders of nutritional information is discussed below), and also due partly to the nutrition educators not relating the message to the attitudes, interests and needs of the audience and situational factors influencing eating behaviour.

Salmon (1984) stresses the importance of considering the objectives and methods of nutrition education in relation to the needs and interests of the audience, pointing out that the way in which nutritional information is often presented is inappropriate, 'are we not trying to tell people what a balanced diet is in order to help them make the right food choices — do they really need detailed knowledge of individual nutrients?'... 'are we not in danger of arguing about what is good for them to such an extent that people become inclined to ignore totally all the information about food and health? The picture of a healthy diet all too often remains one of misery and self denial — of fat, sugar and salt needing to be eliminated'. Salmon suggests 'that is not what we intend telling people but it is very often what they hear'.

A number of authors (Giffet et al, 1972; Robinson, 1980; Gillespie, 1981; Lennon and Fieldhouse, 1982; Nicholls, 1983) discuss the need to apply communication of innovation theory to the presentation of the nutritional message, that is to consider the attributes or characteristics of the message itself and its presentation in relation to these and to the beliefs, attitudes, needs and interests of the audience.
Lennon and Fieldhouse (1982) define an innovation as 'an idea, object or practice perceived as being new by an individual' and suggest that variables associated with the message such as order of presentation, validity of arguments, emotional or rational content, high or low fear arousal, and clarity will influence the adoption of the change.

Robinson suggests that the aim of communication is to transmit meaning, and that in order to do this the sender has to transfer his message into a code (words, pictures, symbols) - the sum of the meaning being derived from the symbols used in the message.

In order to gain meaning, the symbols of communication have to gain attention and be organised into patterns; attention comes from variables such as novelty and contrast, size, movement and colour.

The perception of the message depends on the recipient's store of beliefs, attitudes and values. This author points out however, that because of the different fields of experience of the source and audience, the message may have different meanings for each, and that the effect of the message depends on the meaning derived by the audience, rather than that assumed by the source. It is possible that some of the current misconceptions and disaffection with nutritional information may be due to the nutrition educator not transmitting his message in a code which has meaning to his audience, due to an insufficient overlap of experience between them. This necessary overlap of experience may relate either to knowledge or attitudes.

Both Lennon and Fieldhouse and Nicholls (1983) cite the work of Rogers and Shoemaker (1971) identifying five attributes or characteristics of the change itself which determine the rate of adoption of the innovation.

- relative advantage - the greater the relative advantage of an innovation the more rapid is its rate of adoption.
- compatibility - this is the degree to which an innovation is perceived as being consistent with existing values, past experiences, and needs of the receivers.
- complexity - is the degree to which an innovation is perceived as being difficult to understand and use. Effort required and perceived gains can considered together; innovations which require little effort from the receiver will adopted more rapidly than demanding new skills and understanding.
- trialability - is the degree to which an innovation can be
experimented with on a limited basis. New ideas which can be tried out temporarily or partly will generally be adopted more quickly than innovations which are not divisible.

- observability - is the degree to which the results of an innovation are visible to others. The easier it is for an individual to see the results of an innovation the more likely he is to adopt it.

Gillespie, however, cites Yarborough (1981) who suggests, based on adoption theory, that 'nutrition innovations rate rather poorly', for the following reasons;

- the benefits or relative advantages are not immediately obvious, the benefits of gratifying a sweet tooth may be more immediate than the prospect of increased weight or dental caries due to an over-consumption of sugar.

- compared with other innovations the effects of good nutrition are not usually very visible. Many 'desirable' health behaviours do not have observable effects because they are in essence preventative actions.

- recommended eating patterns may be incompatible with current practices and beliefs, for example the reduction of sugar intake is incompatible with the widespread belief that sugar is needed for energy.

- nutrition and food selection principles are too complex for easy understanding and use; the complexity of a holistic concept such as 'a balanced diet', rather than issue specific messages such as 'reduce sugar, reduce fat, etc. is discussed below.

However, a positive attribute in terms of adoption criteria is that desired changes usually can be divided into smaller units and adopted sequentially on a trial basis, for example the gradual replacement of white flour by wholemeal flour.

Other workers (Havelock, 1969, cited by Nicholls) identify slightly different characteristics of change.

Nicholls, however, points out that studies dealing with the attributes of change, particularly in relation to changing eating behaviour are limited and further research is needed.

Giffet et al (1972) suggest that it is important to consider the feasibility of the change, 'the first task of the educator is to judge what change is needed, and the feasibility of such change'. The authors point out that a change may appear feasible to the nutrition educator but not to the adopter, and that the nutrition educator should ascertain first
of all whether the adopter recognises the problem as important (cf. the 'health belief' model), whether it is overshadowed by more immediate concerns, whether there is money, time, energy, personnel, or other resources required.

These authors also stress the importance of presenting the potential benefits realistically. This is difficult when a concept as hard to define as 'better health' is involved. This is recognised by Giffit et al 'admittedly there are few clear cut answers in nutrition; promising too much accomplishes no useful purpose, and unfulfilled expectations are disappointing and can boomerang to reduce credibility for future educational efforts'.

This point is perhaps of particular relevance to the current debate on diet and health. While many current health problems are multifactorial in origin and links between diet and disease are based, as yet, mainly on epidemiological evidence, as Tones points out 'it would be a bold physician who promised freedom from heart attack to those who modified their diet'... 'successful persuasion depends on communicator credibility, and making empty promises destroys credibility'.

The nutrition educator, therefore, needs to consider not only the message, but also how it should be communicated in order to have meaning to his audience.

**Implementing dietary guidelines - the message**

It was suggested in Chapter Two that the quantified recommendations of the NACNE (1983) and COMA (1984) reports provided a set of dietary goals for nutritionists and dietitians to work towards.

The nutrition educator has the problem of translating these quantitative recommendations into advice, which has meaning to the consumer, usually in the form of suggestions such as 'reduce intake of fatty foods', 'reduce sugar intake' and 'increase dietary fibre'. As indicated above, this approach has lead to misconceptions and confusion for a number of reasons.

Firstly, such advice is often given generally, providing the individual with little idea of whether it should apply to him or not, and if so, by how much should he reduce or increase these components of his diet. The JACNE publication approached this problem by including a quiz to enable the consumer to estimate his fat intake. Bender (1985), however, indicates the difficulties of this approach. It is suggested that few
nutritionists, themselves, know the fat content of their diet, this requiring a detailed dietary survey.

Secondly, this issue-specific approach has led to too great an emphasis, by both the food industry and nutrition educators, on individual foods rather than on the diet as a whole, foods being seen as 'good' or 'bad', or 'healthy' or 'unhealthy'. Fallows (1986) found that recent group discussions and interviews revealed 'the extent to which nutrition is viewed in issue-specific slogans such as 'less fat', 'more fibre', 'less salt' and 'less sugar'. Fallows suggests that these slogans are 'overwhelmingly the result of food marketing programmes which emphasise particular nutritional attributes'.

It is suggested, however that nutrition educators must also take some responsibility for this. Fallows points out the need for 'a co-ordinated programme of food and nutrition education in Britain', lest 'such an approach leads to confusion amongst the general public'. This thesis also argues that a co-ordinated nutrition education programme is needed, but that nutritionists should first of all reach some conclusion about the nutritional message, and in collaboration with experts in communication, how it should be communicated.

The argument of this thesis is that the central message of the NACNE (1983) report needs to be seen as a re-adjustment of the balance of energy coming from fat and from complex carbohydrate. The proportion of energy coming from different dietary sources, when interim goals were achieved, were defined incidently in the NACNE Report, rather than as its central message. It is suggested that, in order to give this message meaning to the consumer, the concept of a 'balanced diet' is a useful one, but it first of all needs to be re-defined.

As was discussed in Chapter Two, the main feature of the diet which is epidemiologically related to incidence of the so-called 'diseases of affluence' is an imbalance between the energy contribution from fat and carbohydrate; this is illustrated by the graphs in Figures 2.9 and 2.10. The achievement of dietary goals would correct this imbalance. Therefore, the term 'balanced diet' would seem an appropriate one to use for a diet which will achieve these dietary goals.

The NACNE Report suggests that the term 'balanced diet' is best avoided 'the idea of a balanced diet as one providing enough of all the nutrients to prevent deficiency disease is no longer relevant in these conditions' ... 'it is suggested that a new approach that avoids the term 'balanced diet' in the traditional sense is appropriate'.The NACNE
Committee suggest alternative terms such as 'prudent diet', healthful diet', or 'healthy varied diet', but reach no conclusion on the most appropriate of these.

It was suggested in the ILEA Report (1984) that 'the idea of a balanced diet should be redefined as one which more closely defines the proportion of energy coming from different sources'. It was suggested that the recommendations of the NACNE and COMA Reports should provide the basis of this definition.

A 'balanced diet' could, therefore, be defined in quantitative terms as one in which the percentage of total energy from different sources was as below:

- From fat: 30 - 35% (not more than 35%)
- Of which SFA: 10 - 15% (not more than 15%)
- From carbohydrate: 50 - 55%
- Of which sugar: 10 - 14% (not more than 14%)
- From protein: 10 - 12% (not less than 10%)

It is emphasized that this quantified definition of a 'balanced diet' can only be provisional, pending further research involving dietary studies to assess the feasibility, also the nutritional adequacy of such a diet for different groups of the population, particularly children.

There is little agreement amongst nutritionists on this idea, many feeling that the term 'balanced diet' should be abandoned rather than redefined. However, it is suggested that the concept of a 'balanced diet' redefined in these terms will help to shift the emphasis away from 'good' and 'bad', 'healthy' and 'unhealthy' foods towards a consideration of the diet as a whole - 'there are no bad foods, only bad diets' - thus reducing the element of 'self denial' about healthy eating.

The idea of a 'balanced diet' is supported, after much deliberation, by the authors of the ILEA Nutrition Guidelines (1985) 'NACNE does not go along with the concept of a balanced diet and recently there have been others who have not approved of the phrase. We found no better description of what we wanted to achieve, other terms like 'healthy diet' being equally open to misinterpretation' (Watson 1985). The definition of a balanced diet is defined and explained in the publication, and will be discussed in section 6.5.

The concept of a 'balanced diet' rather than emphasis on individual foods is supported by a number of recent surveys.

The Consumers Association (1986) carried out a survey to find out whether consumers are 'being given the right sort of information they need.
in order to change to more healthy eating, and if goals are achieved, does the new diet still provide all the required dietary components'. It was concluded that 'advice about changing diet must include information about what to eat more of, as much as information about what to eat less of'.

An MLC 'opinion leaders' survey (1984) found the view among doctors, that 'it was more important to promote a balanced diet than to focus publicity on individual foods'.

A recent survey carried out by Presto (1985) supermarkets found that consumers did not want 'lists of 'good foods' and 'bad foods', but suggestions for meals'.

Thus the concept of a 'balanced diet' can be defined in quantitative terms understood by nutritionists, and can be of practical value in the planning and assessing of diets, but it is one of the more difficult concepts to communicate. The JACNE (1985) publication attempted to do this - 'it is important to get the balance between fat and starchy carbohydrate right', although this message is not communicated very strongly.

The area, therefore, that needs careful consideration is how the concept of a 'balanced diet' as defined above in quantitative terms can be encoded so that its meaning is conveyed to the consumer.

While the concept of 'balance' is meant to apply to the whole diet, the question can be asked - over what period of time should energy from different sources be balanced?, should it be on a weekly, daily, or meal by meal basis? This is clearly an area where the further dietary studies suggested by the Consumers Association (1986) would be helpful.

While obviously balance will not always be achieved in an individual meal - a meal in which energy sources are unbalanced can be corrected or compensated by other meals during the day - the idea of balancing energy from different sources in each meal is quite a good starting point. The sort of changes which would re-adjust the balance of energy in the right direction were shown by examples of breakfast, lunch and main meals in the JACNE publication.

What needs also to be considered by nutritionists is whether the message can be translated into 'simple rules to aid meal planning' or whether the best way is to give large numbers of examples of balanced meals and/or daily or weekly menus, or a combination of both.

The use of a carefully devised 'food choice' scheme, based on food groups, to help guide people towards the choice of such a balanced diet is discussed in section 6.5. It is suggested that such a food choice scheme
might provide 'point of choice' information to enable the consumer to choose a balanced diet. This will be discussed in relation to the choice of food at cash cafeterias in school meals.

6.4.7 The role of health professionals in nutrition education

A number of authors (Robert-Sargeant, 1981; Lennon and Fieldhouse, 1982; Smail, 1983) discuss the role in nutrition education of health professionals such as doctors, pharmacists, nurses, midwives, health visitors, community nurses, social workers and dietitians. This section will consider their role in relation to the variables in the process of communication (discussed in section 6.4.3.), that is, as senders of the nutritional message to specific audiences using appropriate channels of communication. The credibility of these senders must be considered in terms of their sources of nutritional information or their nutritional knowledge.

Robert-Sargeant (1981) identifies health care professionals working in hospitals or in the community. Figure 6.5 shows their interrelationship with the patient.

Most of the health professionals identified in this figure are working as health educators within the health service where the aim is prevention. It was suggested in section 6.4.3 that, in this situation, methods aimed at a change in behaviour may be appropriate.

All these health professionals have the opportunity to use interpersonal channels of communication, often on a one-to-one basis, and often over a period of time. It was suggested in section 6.4.6. that interpersonal channels are more effective at changing attitudes or persuading as they allow a two way exchange of ideas, and the receiver is able to obtain clarification or additional information about the change from the source.

In addition consultations with the above professionals, or home visits in some cases, allow the sender to ascertain the needs, interests, attitudes and beliefs of the receiver, the more effectively to communicate the message. Smail (1983) suggests that doctors could use the opportunity afforded by home visits to build up a picture including dietary habits. They should attempt to ascertain patient's dietary habits by asking about dietary intake in the previous 24 hours, or by asking patients to keep a dietary diary.
A number of authors point out the opportunities for nutrition education afforded the above health professionals.

Robert-Sargeant (1981) describes general practitioners as 'the most available and the first point of access to the health care system'. Smail (1983) suggests that 'people do see their doctor as being an important and reliable source of general advice', and that as about 75 per cent of people see their doctor at least once a year and 95 per cent at least once every five years, 'there is scope for doctors to become more active in giving preventative advice within the ordinary consultation'.

Robert-Sargeant also discusses the opportunities afforded health visitors and midwives, 'the major role of health visitors is preventative health care; historically, they have been involved with mothers and babies but their role has been expanded to include the health education of the population as a whole, the health visitor is thus the person best placed in the community to provide nutritional guidance'. This author also points out that midwives and health visitors are involved at a time when motivation can be at its greatest, 'thus giving them an opportunity to advise which is much envied by other educators'. The influence of the primary socialisation process in the formation of food habits emphasizes the important role of these particular health professionals.

Robert-Sargeant also suggests that pharmacists have an opportunity for nutrition education, 'health education and health maintenance are part of the traditional role of the pharmacist'... 'on the retail side pharmacists are constantly being asked to advise the general public on food - from baby foods to vitamin supplements and so called 'slimming
foods - pharmacists frequently comment on their need for more comprehensive nutritional information to help them deal with this aspect of their work'.

This author also points out that social workers and community nurses also have opportunities to provide nutritional guidance particularly on home visits.

There is little evidence available concerning the use of these opportunities by health professionals. Smail (1983) cites the preliminary results of a survey carried out in Wales indicating that doctors do talk to their patients from time to time about diet, although the emphasis appears to be on dietary modification suggested by specific diseases or by obesity, rather than on general promotion of good dietary habits. Some doctors, however, seem to leave such matters to others - the media, or perhaps to nurses or health visitors. This author suggests that doctors should see the consultation as providing an opportunity to give general health advice, noting however, the tendency 'for doctors to see dietary modification as a form of treatment for a disease' and thus to prescribe a high fibre 'medicine'. Smail concludes that 'doctors are not yet very good at including much preventative health advice or indeed checking whether or not patients have understood what has been said'.

In order to ascertain the reasons for the above conclusion, it is necessary to discuss the extent of the nutritional knowledge of the health professionals. A number of authors have commented on this. Smail cites Morse (1976) who suggests that 'most doctors and nurses do not know any more about nutrition than their patients. The great majority of correspondence to women's magazines and many food firms is concerned with explaining dietetic advice given by doctors'.

Sources of nutritional knowledge and information available to health professionals also need to be discussed. Two aspects need to be examined, firstly the nutrition content of the initial training, and secondly the provision for health professionals to keep up to date with developing nutritional knowledge.

Concerning the first aspect, Smail (1983) cites a BNF survey (Gray 1983) which found that 'nutrition is generally neglected in medical education at present in the UK'. Lennon and Fieldhouse (1982) suggest that 'nutrition as part of the curricula of medical schools is generally not well developed ... what little is included usually appears in biochemistry and physiology courses and concerns nutritional theory rather than
application'. These authors suggest that nutrition in medical schools should be taught by a dietitian or nutritionist. Robert-Sargeant suggests that 'we must see that nutrition and dietetics are an integral component of the medical curriculum, and ensure that it is presented to the medical student in such a manner that he or she can make use of that knowledge in medical practice'. This author also suggests that concern has been expressed about the small amount of nutrition included in training courses for health visitors.

The second aspect is of particular relevance to the implementation of dietary guidelines; as Robert-Sargeant points out 'many health care professionals will have trained several years ago and as with other scientific subjects, new information about nutrition is constantly becoming available. Lack of time for reading or attending study courses may mean that out of date information is communicated'. This author also points out that 'professional staff, like many other members of the general public consider themselves experts in nutrition, merely because they eat three meals a day, they may be tempted to give their personal opinion as a consensus view'.

It is suggested that the nutritionist or dietitian has an important source role in this area, and that the above health professionals can be seen as 'senders' or nutrition educators. Roberts-Sargeant points out the key role of the dietitian, 'advice on nutrition can come from many professional sources; it is essential that the advice is co-ordinated, consistent and authoritative ... one of the most valuable ways in which dietitians can use their expertise is in advising fellow professionals ... it is vital that the community as a whole has access to professional nutritional advice. It is essential that the public are equipped with sufficient information to enable them to judge the value of the various messages that confront them from the media and elsewhere. We must ensure that the health care professional is qualified to respond to the ever changing needs of society'. Smail (1983) also recognises the role of the dietitian in this area, he questions whether doctors have the necessary dietary expertise to interpret dietary recommendations for individuals.

Another aspect of the role of health professionals as nutrition educators, is their expertise as communicators. Of the above authors, only Smail discusses this area, 'it is important to consider whether doctors' advice can actually influence peoples' food habits'. This author cites Tones' health action model (Figure 6.4) as 'a theoretical basis which suggests that doctors can modify health action by providing appropriate
cues'. Smail recognises the importance of the doctor relating 'if possible, such cues to the person's individual perceptions and beliefs about health, and specifically to beliefs about the links between food and health'.

The opportunities for health professionals to find out about their patients' dietary habits and attitudes, and to use this information as the basis of their communication was pointed out above. There is little evidence relating to the extent to which this occurs, or to the training or expertise of these health professionals as communicators.

Smail suggests, therefore, that doctors, particularly general practitioners, have a key role in the implementation of dietary guidelines, 'doctors should clearly be concerned not just with modifying the diet of those in 'high risk' categories .... but with reminding everyone of the importance of an appropriate diet'.

Smail notes the opportunities that doctors have in this field (this applies to other health professionals also) but also points out that doctors 'can only be a small cogs in the wheel of change' suggesting that the government, food and farm industries should 'take a hard look at long term planning ... only if we can develop a clear national strategy on food policy will doctors' individual advice to patients and community groups have a greater chance of producing some real change in individual choice'.

Turner (1979, 1984,) also stresses the importance of 'educating the educators - medical professions, education and catering professions, also the food industry, government and mass media personnel', and points out the need for a national nutritional policy to co-ordinate the nutrition education of these educators. Turner (1979) suggests that 'a deplorable state of lack of communication exists. To open up the channels of communication there is a need for major changes in the attitude and behaviour of those responsible for courses to train the educators. Nutritionists must pay more attention to the method of communicating their knowledge in a meaningful way'. Turner emphasizes the need for research in this area.

Many Area Health Authorities are now attempting to formulate nutrition and health policies, not only to co-ordinate the nutrition education activities of these health professionals, but also to ensure that the provision of food in hospitals and institutions in their area is consistent with dietary guidelines. It is also important that the
activities of those working in schools and in school meals should also be seen as part of such an overall policy; the degree of co-operation of education authorities and the school meals service with these Area Health Authority policies has varied from area to area; only some areas building on the experience gained in the FEAST project (Burman, 1985).

The role of a government body in the co-ordination of such a nutrition and health policy, preferably on a national scale and involving also the food industry and the mass media, is discussed in section 6.7. It is becoming clear that there needs to be more discussion and research, particularly in relation to the communication of the nutritional message, before a nutrition and health policy on such a scale can be formulated. The suggestion by the British Dietetic Association (1980) that those involved in both nutrition education in schools and in school meals should work with those involved in nutrition education in the community was discussed in Chapter Four.

6.4.8 The role of the mass media in nutrition education

Since the publication of the NACNE Report (1983) and the subsequent discussion, the subject of food and health has received considerable media attention, possibly due to the element of controversy. While there is thus considerable material available to illustrate an examination of the role of the mass media in nutrition education, and while there may be circumstantial evidence, there has been little, if any, systematic research to assess the effect on attitudes to food and health and eating behaviour of this media attention. Thus, while the influence of the mass media is undoubtedly very powerful, and an important aspect of communication, a detailed discussion of this influence is a specialist area outside the scope of this thesis.

In the context of the implementation of dietary recommendations both the potential and the actual role must be considered.

The potential role of the mass media is enormous. Turner (1984) identifies a number of mass media channels - television, radio, press, such as newspapers and magazines, including special-interest magazines dealing for example, with women's affairs, health, food, cookery and science. Virtually any programme, article, or item dealing with food or health could be a vehicle for nutrition education. Posters and leaflets produced for example by the food industry and professional health education organisations such as the Health Education Council or Area Health Authorities could also be considered as mass media,
though their influence is much less far reaching. However, mainly because it is almost certainly the most powerful and frequently used mass media channel, most of the following discussion will refer to television.

While all the above mass media channels will have their own characteristics and symbols, and each will have its own target audience, this section will focus on the common characteristics and functions of mass media channels as opposed to interpersonal channels of communication. It was suggested above that to have the most effect, the nutrition educator might use an appropriate combination of mass media and interpersonal channels of communication.

This section will consider the mass media channels in relation to the whole process of communication - that is providing a link whereby the message can be transmitted from source and sender to audience or recipient. Sources of nutritional information must also be discussed.

In considering the role, potential and actual, of the mass media in nutrition education, the characteristics and functions of a mass media channel as opposed to an inter-personal channel must be considered.

As discussed in section 6.4.6, mass media channels may successfully impart information, but they are unlikely to have any persuasive effect. Lennon and Fieldhouse (1982) suggest that the use of mass media may involve problems of selective exposure and that it is likely that messages will be ineffective for audiences who are not previously motivated.

Mass media however, can affect or stimulate awareness, create interest, and provide knowledge. As discussed previously, provision of information is often an essential precursor to attitude or behaviour change; thus the potential role of the mass media in nutrition education is important.

To some extent also, the mass media can also influence norms, for example the current 'healthy lifestyle' norm has been partly the result of media influence. Lennon and Fieldhouse (1982) suggest that social norms can be communicated, certain types of foods may be promoted, by being associated with desirable lifestyles.

The potential of television and radio as a nutrition education medium was recognised in 1972 by Manoff (cited by Earl, 1986) 'television and radio were untapped resources which could reach target populations en masse in the shortest possible time'. Earl (1986) cites data which indicate that 98 per cent of British households have television sets, and
that the average viewer in the UK watches television for 2 hours 57 minutes per day. Lennon and Fieldhouse (1982) suggests that 'television is a pervasive medium, and audiences will be large'.

Lennon and Fieldhouse discuss the ways in which the mass media may be used in nutrition education; they suggest that television, and radio, including local radio could be used in the following ways;
- contributions to features or documentary programmes on both television and radio,
- short interviews on magazine programmes when basic advice can be given and contemporary issues discussed, again on both television and radio
- radio phone-in programmes,
- programmes for schools on radio and television.

Lennon and Fieldhouse suggest that newspapers are widely read, there are many different styles to suit audience needs, and that local newspapers are acceptable and credible; also that information presented in magazines is probably more acceptable than if presented in the form of leaflets emanating from a professional source. These authors suggest that the press, magazines, including women's interest magazines, and newspapers, including local newspapers, could be used in a number of ways; regular features, question and answer columns, comments on topical issues, and recipe pages all offer possibilities for providing sound nutritional information.

The first question to consider is the extent to which this potential is used.

Earl (1986) conducted a survey between March 1984 and March 1985, to determine how much nutritional information was disseminated on television other than in minority educational series. Advertisements were also excluded because 'they would form a study in themselves'. Not all food items were included, cooking technique, recipe and restaurant items were classed as relevant only if nutritional benefits were implied or the behavioural pattern was presented as one which viewers should emulate. The survey findings are shown in Table 6.5. The survey found that each week British television devoted between 30 minutes and one hour of transmission time to nutrition; also that Independent Television gave more time than BBC, Channel Four being most likely to grant coverage.
Table 6.5 TV coverage of nutrition
(from Earl, 1986)

<table>
<thead>
<tr>
<th>Time</th>
<th>Channel</th>
<th>Programme</th>
<th>Duration (mins./secs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>31.3.84 - 6.4.84 inclusive</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0900</td>
<td>BBC1</td>
<td>Food &amp; drink</td>
<td>12.83</td>
</tr>
<tr>
<td>1230</td>
<td>ITV</td>
<td>On the Market</td>
<td>5.13</td>
</tr>
<tr>
<td>1900</td>
<td>BBC1</td>
<td>Medical Express</td>
<td>8.75</td>
</tr>
<tr>
<td>2025</td>
<td>BBC2</td>
<td>Food &amp; Drink</td>
<td>12.83</td>
</tr>
<tr>
<td>2235</td>
<td>Channel 4</td>
<td>Well-being</td>
<td>20.19</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total 61.33</td>
</tr>
<tr>
<td>18.8.84 - 24.8.84 inclusive</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0900</td>
<td>ITV</td>
<td>Good Morning Britain</td>
<td>4.56</td>
</tr>
<tr>
<td>1100</td>
<td>BBC2</td>
<td>Open University</td>
<td>24.13</td>
</tr>
<tr>
<td>1830</td>
<td>Channel 4</td>
<td>The Good Food Show</td>
<td>11.45</td>
</tr>
<tr>
<td>2000</td>
<td>Channel 4</td>
<td>Earth Year 2050</td>
<td>6.19</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total 47.13</td>
</tr>
<tr>
<td>23.3.85 - 29.3.85 inclusive</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0910</td>
<td>ITV</td>
<td>Good Morning Britain</td>
<td>2.50</td>
</tr>
<tr>
<td>0915</td>
<td>BBC1</td>
<td>Breakfast Time</td>
<td>3.57</td>
</tr>
<tr>
<td>1330</td>
<td>ITV</td>
<td>Nothing but the Best</td>
<td>7.00</td>
</tr>
<tr>
<td>1430</td>
<td>ITV</td>
<td>On the Market</td>
<td>16.22</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total 29.29</td>
</tr>
</tbody>
</table>

A number of authors, however, (Turner, 1984; Lennon and Fieldhouse, 1982; Smith, 1981) suggest that the mass media potential is not appropriately or effectively used.

It is probably true to say that much of the current awareness and interest in food and health, revealed by recent surveys, is due to recent media exposure; it is probably also true to say that much (but by no means all) of the current confusion and disaffection with sources of nutritional information is due to the mass media taking on the role of nutrition educators, or senders of nutritional information, and communicating conflicting messages.
Turner (1984) supports this view, 'it is certainly true to say that the mass media have contributed not only to the considerably increased awareness of the relationship between food and health, but also to the misconceptions, erroneous beliefs and confusion in this area and thus to the consequent lack of change in eating behaviour'.

A number of authors point out that opportunities to impart nutritional information are often missed by the mass media. Lennon and Fieldhouse suggest that many magazines, particularly those aimed at women, carry features on nutrition, and very rarely are these written by a qualified nutritionist, food presentation 'seems to be the main concern rather than nutritional value'.

Smith (1981) suggests that most cookery journalism makes no reference to nutrition, 'what seems to be lacking in most cookery journalism is any recognition by the authors that there is in fact a reasonable consensus on what constitutes a medically prudent diet'. This author also suggests that much 'food and health' journalism 'trades on peoples' vague suspicions that modern food is not as wholesome as old fashioned 'natural' food.

Therefore, the next issues to consider in this discussion are, firstly, why the mass media have not been effectively used in nutrition education, and, secondly, how this type of communication channel could be used to greater effect by nutrition educators. In discussing these issues, the aims of the mass media and the nutrition educator need to be considered. Communication theory can provide useful guidance, it is perhaps particularly important to distinguish between the source and the sender of nutritional information. The concept of the 'gatekeeper' (Robinson, 1980) who controls the flow of information was discussed in Section 6.4.6. and is also useful in this context. Tones' 'health action' model can provide a useful framework for the discussion of both these issues.

It is possible that the one of the main reasons for the inappropriate and ineffective use of the mass media in nutrition education lies in the differing aims of the media and those involved in nutrition education. While at the present time, the main aim of the mass media is entertainment, that of the nutrition educator is to change attitudes and/or behaviour, or to enable people to make informed food choices. While these two aims should not, and need not be incompatible, at present they seem to be. Turner (1984) suggests that 'the mass media are commercial
organisations whose primary aim is to make money' and thus are 'in the entertainment business' rather 'an extension of the educational system'.

This was recognised by Manoff in 1972 (cited by Earl, 1986). This author pointed out that television was essentially an entertainment medium, and observed that educational programmes were rarely popular, suggesting that 'they have neither the budget nor the talent to infuse elements of audience appeal ... they tend to appeal to motivated audiences, who need the instruction least'.

Where programmes perhaps do set out to educate as well as entertain, they often are not well received, perhaps due to an insufficient consideration of the principle, important in communication theory, of relating the message to the needs and interests, beliefs and attitudes of the target audience. Earl cites Ackroyd (1984) who suggests in the Times, in response to the Channel 4 / HEC 'Food for Thought' programmes, that 'nutrition programmes are guaranteed to dull the palate'. These programmes were 'classed as paternalistic rather than wise and the claim was made that the public was growing tired of nutritionists anxieties and investigations'. The warnings of dietitians and others concerning over-exposure and lack of effect of nutritional messages were mentioned in Chapter Two. Ackroyd suggests that 'the gap between the nutrition educator and the consumer is not bridged'.

It has been suggested that these programmes in particular, and also much media nutrition material, are aimed at an inappropriate target audience. Earl pointed out that the 'Food for Thought' programmes were 'transmitted in minority time slots; thus appealing only to the already motivated', 'nutritionists need peak time'.

Smith (1981), discussing his review of media communication of nutrition, expresses anxiety that 'the target of these publications still seems to be the middle-class, middle brow or intellectual, who reads quality newspapers and listens to BBC Radio 4 and so has heard and absorbed the message already'.

The spread of innovation through through the social system was discussed in section 6.4.5. and the comments of Robinson (1980) and Salmon (1984) were noted above. In view of this perhaps, these programmes and publications were aimed at the right target audiences - the innovators and the early majority.

Earl's survey did show a trend towards involving other audiences - within ITN there has been a 'shift from featuring nutrition in serious minority, late evening programmes, to presenting nutrition snippets in
magazine-format breakfast and afternoon shows'; however only BBC 1 or Channel 4 will provide 'prime evening viewing time, as part of what they classify as television journalism series, where the central theme will be gourmet food or family care'.

Turner (1984) was very critical of the way in which the mass media handle nutrition and health information, 'the general public is bombarded with a mass of misleading information about food, nutrition and health .... nutrition information is generally distorted, out of perspective, frequently incorrect in factual content and certainly incorrect in the impression created by skilful omissions and juxtaposition of information'. He suggests that in this way the mass media reinforces the many misconceptions already held by the general public.

It is in the case of the mass media where the distinction between the source and sender of nutritional information - nutritionist and communicator, is probably most apparent.

Whereas nutritionists, doctors, scientists and 'food experts' have knowledge of nutrition and are therefore regarded as sources of nutritional information, they are rarely experts in communication strategies.

On the other hand producers, directors, journalists and presenters, with notable exceptions, rarely have detailed and up to date knowledge of nutrition, but do have the expertise in communication, and act as senders of nutritional information. This, often multi-stage process, inevitably results in 'noise' or loss and distortion of the nutritional message.

In addition these professional communicators are also in the position of being able to act in the capacity of 'gatekeepers' (discussed in section 6.4.6) and thus select the information and the messages they wish to communicate. Nutritionists, and others are sometimes used by the media to reinforce the credibility of the message that the gatekeeper wishes to communicate, but rarely as communicators in their own right.

Lennon and Fieldhouse (1982) suggest that much media material is conceived by professional communicators rather than professional nutritionists, and Earl (1986) suggests that while health educators, nutritionists dietitians may be interviewed in the longer informative series, TV reporters relay most of the information in the more popular journalist magazine presentations.

As suggested it is rarely difficult for a gatekeeper to find an expert who will provide research findings to give credibility to his
message, 'for every Ph.D there is an equal and opposite Ph.D. (Richardson 1985). Turner, discussing the use of health professions by the mass media, suggests that due to current editorial policies it is the 'tub-thumping' extremists of science and medicine, willing to put a personal controversial view' who are generally used by the media.

Both Turner (1984) and Smith (1981) are very critical of journalists as senders of nutritional information. Turner suggests that 'in media reporting there is a lack of objectivity. Information is often selected to support preconceived ideas that reflect the prejudices of the journalist or producer'. Turner supports this contention by quoting several editors and journalists, 'all stories are written backwards - they are supposed to begin with the facts and develop from there, but in reality they begin with the journalist's point of view ... from which the facts are subsequently organised' (Cockburn, 1983). Turner also quotes Maynard Smith (1983) 'journalists are apparently taking over completely the presentation of science to the public with loss of identity of the scientists themselves' and concludes that 'this tends to create controversy where none exists.

Smith suggests that 'publicity is given to faddist, fashionable theories linking diet and disease with little apparent concern for the quantity or quality of the evidence behind them ... journalists are too ready to give publicity to cranky unorthodox ideas, or to concepts that conform to their own prejudices'. Smith suggests that the root cause of this is the attitude of society towards what is news and what is not news, 'television and radio producers like nothing better than to find two spokespersons, expert or not, who can be persuaded to battle out their differences in public. So when a potential news item is offered to an editor or producer his first reaction is generally 'is it controversial?' Then he may ask 'is it new?' Only thirdly, and not necessarily at all, will he ask 'is it true?'' The effect of this attitude is that science journalists soon find that their balanced accounts of current concerns have less success than their reporting of extremist views.

Smith suggests that the answer lies in more effective nutrition education, 'In my view the long term solution lies in a better education for the whole population in scientific methods, so that a healthy scepticism will become more common'.

White (1976) points out the importance of nutrition education in helping people to 'evaluate nutritional information received'. This is discussed in more detail in section 6.5. in relation to nutrition education in schools.
The other side of the story is put by Forsyth (1986), the producer of the BBC Radio Food Programme from the Consumer Affairs Unit, whose remit is 'to discover and defend the interest of the consumer'. Forsyth, as the sender of nutritional information, points out his dependence on the source of such information, suggesting that his programme aims to supply the consumer with information that is 'intelligible, usable and useful'. In order to perform this task the information must be available to the producer; it must also be 'impartial, complete and significant'. Forsyth points out the difficulties involved in obtaining such information.

This author suggests that much MAFF data, such as that from the Food Advisory Committee, is subject to the Official Secrets Act, 'how can you have a democratic debate on such matters of public interest when only a handful of people have seen all the data and they are not allowed to tell?'

Forsyth underlines the need for co-operation between nutritionists and communicators, 'although some data may not be published, there are mountains that is. We don't have the time, even if we had the knowledge to read and evaluate it all. We need guidance'. He also points out the lack of impartial sources of nutritional information, 'we need independent experts. These are few on the ground'.

This author questions the validity of research findings which are funded by those with commercial interests in particular products, but also points out that these may not be the only sources of nutritional information that is not completely impartial, 'while it is common to suspect people who have a vested commercial interest, how do we deal with those who are voluntarily 'selling' a philosophy, way of life or obsession'.

Forsyth also criticises both the food industry for providing incomplete information, for example emphasizing the nutritionally positive aspects of their products and ignoring any negative aspects; and also nutritionists for the 'information overload' 'that drives journalists to the 'experts' who translate for us and direct us in particular ways that suits them'.

Forsyth sums up the relationship between source and sender, 'I'm only the piano player! It's the doctors and nutritionists who play the tunes'.

The above discussion of the relationship between nutritionists and doctors as sources of nutritional information and professional communicators as senders using the mass media, emphasizes the importance
of co-operation between the two.

The next issue to consider, therefore is how communication theory can be used to provide guidance for more effective use of the mass media in nutrition education.

Firstly, the source-sender conflict discussed above needs to be resolved. As was suggested by Gillespie (1982) and discussed earlier, this involves either nutritionists working closely with professional communicators, or preferably nutritionists acquiring expertise in this area, and realising the importance of communicating their message in relation to the beliefs, attitudes, needs and interests of their target audience, and in such a way that the message can be understood and applied.

Turner (1984) suggests not only that 'what we need is a better dialogue and understanding between professional communicators and the custodians of true nutritional knowledge' .... 'it would be helpful if more scientists would learn to express their ideas in clear, straightforward language and be more open to approaches from the media'; but also that there needs to be a change of editorial policy, 'editorial policies are based substantially on the concepts of newsworthiness, controversy, and sensation .... there needs to be an end to subjective, selective reporting'.

This author suggests that the answer lies not so much in nutritionists acquiring communication expertise, but in nutrition education for the communicators, 'I am sure that nutrition education for (the professions, industry, government) and the mass media personnel is a good idea'.

Turner also suggests that as part of an overall government policy, co-ordinating initiatives on the implementation of dietary guidelines, possibly via an 'executive arm' of COMA, 'mass media editorial policies could be influenced'.

Other authors have suggested that nutritionists should acquire expertise in communication techniques.

Earl (1986) cites Lambert-Lagace (1982) who points out that 'if nutrition educators do not consider the type of media which consumers use, they will fail to communicate their messages effectively'.

Salmon (1984) suggests that 'nutritionists have much to learn from the approach and techniques of the media which have become the norm and what people have come to expect'.
Secondly, there must be some consensus on the nutritional 'message'; the idea that the main message should be the redefined concept of a balanced diet, was discussed in section 6.4.6. It was suggested that there was a need for government policy to co-ordinate the formulation of this message, and its transmission by all those involved in nutrition education, including the food industry and the mass media.

Thirdly, there must be systematic application of communication theory to the transmission of the nutritional message; Tones' 'health action' model (Figure 6.2) may provide useful guidance towards communication for change of attitudes and behaviour, or for informed choice. The potential of mass media channels needs to be recognised and appropriately used. These channels can ideally be used for creating awareness, and providing knowledge.

Knowledge needs to be provided to create beliefs - in the context of the current discussion - concerning the relationship between food and health. Despite controversy, the consensus of evidence supports this relationship.

Knowledge also needs to be provided to enable behavioural intention to be translated into actual behaviour; people need to know which foods are high in fat, sugar, salt and fibre. They also need to know how the concept of a balanced diet can be translated foods, meals and diets on day to day basis. This latter area is the considerably more difficult task, but one to which nutrition educators must address their attention. This information needs to be presented in the context of 'situational' factors influencing eating behaviour, such as personal and family taste preferences, time, convenience and price factors. Again there has been some media activity in this area; the recent BBC television series 'Taste of Health' clearly had this aim. It is suggested, however, that the lifestyle depicted in many of these programmes was likely to apply only to a small minority of the population.

This knowledge must be presented in the context of the motivational (affective or attitudinal) forces influencing eating behaviour. Turner (1984) suggests that if nutrition educators are to influence behaviour, information reaching people from all sources must be 'clear, consistent, relevant to people's everyday lives and accurate'. The nutritional message must be presented in terms of the needs, interests, nutritional knowledge, beliefs and attitudes of the target audience. It was suggested above that this will involve consumer research and that there is a need for this type of research. Turner (1984) also points out the need for research in this
area, 'the starting point in guiding peoples attitudes and behaviour is their present beliefs and practices, our knowledge of such matters is severely limited' ....'I maintain that we need a strong bias towards sociological aspects of nutrition in deciding research priorities'.

Nutritionists using mass media channels also need to be aware of the characteristics and potential of these channels. Radio and television rely on the spoken word; television has the great advantage of visual impact.

As was discussed above, television is primarily regarded as an entertainment medium, it could nevertheless also be used to transmit nutritional messages. Turner suggests that at present, the emphasis is in the wrong place, 'let us not use nutrition and health as vehicles for entertainment, but entertainment as a vehicle for nutrition and health education'. 'Health messages discreetly introduced into popular radio and television programmes can have immense impact'. Turner describes this as incidental learning.

This was also recognised by Manoff in 1972 (cited by Earl, 1986) who argued that 'nutrition educators should use the reach and frequency techniques of advertisers, devise short messages and design pieces to insert into popular programmes thus exploiting for nutrition education the established following of popular programmes'. Lennon and Fieldhouse (1982) also suggest that 'the opportunities for giving simple messages should be exploited'.

The findings of the survey by Earl (1986) indicate that there has been a shift towards providing nutritional information in magazine programmes, suggesting that 'the demands of the popular programme producer can be met, and pictures and consumer orientated information can be made available'. 'What British television seems to be asking nutrition educators to do is to recognise the mass reach but ephemeral nature of the medium and therefore to provide information and ideas that are not highbrow but which can be grasped quickly'.

6.4.9 The role of the food industry in nutrition education.

It is argued in Section 6.2 that the main role of the food industry in the implementation of dietary guidelines lies in the provision of food from which a balanced diet can be chosen. It is however suggested that the agencies involved in the food supply chain, from the primary producer to the retailer and caterer should also play a part in nutrition education. Many companies and organisations in the food industry already provide
nutritional information or nutrition education material as part of their marketing strategies. The task of this section is to examine the current activity, and potential role of the food industry in nutrition education.

Several issues need to be discussed. Firstly, whether or not the food industry can, or should be obliged to contribute to the process of nutrition education. Secondly, to examine the effectiveness of the current activity of the food industry in nutrition education, and finally to discuss ways in which this activity may be made more effective. These issues are discussed, from the point of view of the food manufacturer, by Fortescue (1981).

Once again, the discussion of these issues enters areas where there are considerable differences in view, accounted for by differences in political and philosophical outlook; there is also an economic dimension to the discussion. A detailed examination of these issues, therefore, is beyond the scope of this thesis. They are nevertheless issues which need to be discussed more generally and more openly by all those involved in the implementation of dietary guidelines. Once again, as will be discussed in this section, this supports the case for a government policy to co-ordinate the interests of the food industry and the consumer and to ensure effective communication of a consistent nutrition education message.

When discussing the issue of the food industry's obligation to contribute to nutrition education, it is necessary to distinguish between the provision of information and the process of education. This distinction has already been discussed, the process of education involving either attempts to change attitudes and behaviour, or to provide guidance in the process of decision making. It was suggested that it was likely that, in both cases, an important aspect of this process, but by no means the whole, is the provision of knowledge or information. Fortescue puts forward a rather different view of the distinction between these two processes, 'let us agree on the difference between information and education, to inform is to bring facts to someone's attention, to educate is to give systematic instruction. The giving of information is clearly an important facet of education, but education has many other components, one of the essentials being a programme or plan over a period of time'.

Superficially there can be little argument over whether or not the food industry has an obligation to provide information. However, in order to examine this issue more fully it is important to discuss the type of information that the consumer requires to enable him either to change his
behaviour in the direction of healthier eating, or to make an informed food choice.

Tones' 'health action' model can again provide guidance. To enable the consumer to translate behavioural intention into actual behaviour, information on the nutrient content of foods must be available. The provision of 'point of choice' information on food labels is discussed in section 6.4.10. Despite some of the issues involved, the provision of this information is relatively easy and straightforward in that it is clearly based on fact.

Similarly information on the nutritional value of their food products or commodities is the basis of much of the marketing material produced by the food industry. Fortescue points out that the food industry is bound by the Code of Conduct of the Advertising Standards Authority, 'advertising, labelling and information of any sort about a product must be legal truthful honest and decent'. As is pointed out, however, until there is legislation standardising nutritional labelling there is nothing to stop manufacturers from promoting positive nutritional attributes on their labels or in their marketing material, and ignoring the rest. A notable example, among many, of this practice is the leaflet giving nutritional information about McDonalds products, which emphasizes the calcium content of milk shakes but fails to point out the high sugar content.

Thus there can be little doubt that the food industry can, and should be obliged to, provide information about the nutritional value of their products on food labels and also possibly as part of their marketing material. However, it is also important that if such information is given, some way needs to be found to ensure that the consumer is not misled by omission of information.

Tones' 'health action' model also suggests that in order to create the beliefs which will influence behavioural intention, knowledge concerning the relationship between food and health is needed. The provision of this sort of information is much less straightforward, based as it is on a consensus interpretation of evidence.

As was pointed out above, the health claims that can be made by the food industry are carefully controlled; Fortescue points out the anomalous position of the food industry, 'the food manufacturer may not make any nutritional claims which are not substantiated by nutritional information. Thus alone among those who might wish to give nutritional advice to the public, the food manufacturer is debarred from doing so without publishing the precise facts on which the advice is based. Any member of the public
on the other hand, however ill-informed can perfectly legally advise the world in general not to eat the same product for any reason they like to invent and the manufacturer has no redress'.

In practice, however the consumer is not as well protected as this may suggest; as has been discussed previously it is always possible for anyone involved in the communication of nutritional messages - not just the food industry - to find someone to provide evidence to lend credibility to the particular message they wish to transmit.

In addition, as Robinson (1980) points out 'what is usually allowed is vague wording which may imply more than it says, eg. the use of words like 'natural' and 'goodness', etc.' Also that 'it is possible for advertisements to choose to attack other products indirectly rather than directly, which may be all the more effective in influencing a consumer through avoidance of his normal defence mechanism to a clearly stated claim'.

Thus, it is likely that it is from the provision of information concerning the relationship between food and health, that much of the current controversy, confusion and misconceptions have arisen. It has been stressed before, though, that by no means all the responsibility for this should be laid at the door of the food industry.

Perhaps, it is at this point that the issue becomes not one of whether or not the food manufacturer should be obliged to provide information, but the less straightforward one of whether some way should not be found of ensuring that the information provided is complete and impartial, and therefore does not mislead the consumer.

This is clearly the main area, as suggested before, where there is a need for a government policy to ensure that a consistent nutritional message is effectively communicated by all those involved in nutrition education.

Fortescue, having established the manufacturer's obligation to provide information, then questions whether 'the food industry's obligation to inform can be extended into an obligation to educate? The instinctive answer is that it should not'...'it is not generally speaking the role of manufacturing industry to seek to improve the health of the general public, or to shoulder the responsibility of ensuring that people live better or live longer or lead healthier lives'.

This author also suggests that the food industry is not in a position to be able to educate, 'industrialists are not educators and are not
objective about their own products', questioning whether 'it can be said to be ethical to combine apparently objective nutritional advice, with efforts to persuade the reader to eat an individual food'.

The food industry, however, does provide 'nutrition education material'. There can be no doubt about the motive for this; it was suggested in section 6.4.6. that one of the factors determining whether communication is successful or not is the credibility of the message, which in turn depends on establishing the trustworthiness of the communicator. In the current climate of interest in food and health, an important way of doing this is for the food industry to provide nutritional information or educational material. It, therefore, becomes necessary to distinguish between marketing communication and educational communication, and to discuss the extent of their compatibility.

Fortescue discusses some of the ways in which the food industry provides nutritional material as part of their marketing communication. He suggests that, of the firms who produce booklets for teachers and students, some make general statements of good nutritional practice in the first half of their booklet and devote the second half to recipes with their own product figuring prominently, others confine themselves to objective statements, but print the company name prominently on the cover in order to make the association in the student's mind between that company and good nutritional practice. Some firms associate themselves with nutrition education by giving their names to seminars by leading nutritionists thus establishing trustworthiness by associating their name with highly reputable advice.

Fortescue also notes, however, the recent trend by organisations to defend their commodity from attack on nutritional grounds, by counter attack, also on nutritional grounds, 'the virtues and benefits of ones own commodity are emphasized, sometimes perhaps disproportionately in literature intended to educate, and any opinion or statement critical of that commodity by no matter how distinguished a nutritionist, doctor other scientist or researcher is countered by quoting the view of a second expert who has reached precisely the opposite conclusion'. Fortescue suggests that 'the net result is to confuse the student and not to advance the cause of nutrition education'.

This author also suggests that theories should always be identified as not proven'. It is suggested that all those involved in nutrition education, not just the food industry, are at some time guilty of not doing this.
Fortescue therefore concludes that 'the responsibility of the food manufacturer is to process safely, to label accurately, and to inform fully'. 'The manufacturers then have, and can have, no responsibility for nutrition education; they can, if they wish have a role, and ought to play it well'. He points out the difficulties, 'in defence of their own product they are tempted to become unobjective and and to resort to propaganda rather than education'.

In order to discuss this issue of whether or not the food industry should have an obligation to educate as well as to inform, and to examine both the current activity, and potential contribution of the food industry to nutrition education, it is necessary firstly, to distinguish between marketing communication and educational communication, and secondly to discuss their compatibility.

It has been argued in this chapter that those involved in nutrition education should consider more carefully the application of communication theory to the problem of implementing dietary guidelines, in much the same way as the food industry uses this theory to market their products. The views of Robinson (1980), Salmon (1979) and McKenzie (1979) in this area were discussed in section 6.4.6. The views of Gillespie (1981) on the distinction between marketing communication and communicating the nutrition education message were also discussed, the main difference being in the complexity of the message. It has also been argued above that the aims of marketing communication and educational communication may also be very similar, to attempt to change attitudes and behaviour. Thus it is suggested that the main distinction must lie in the motives or purposes of the communication rather than in the methods, aims or message.

The purpose of marketing communication is, in all cases, to change attitudes and behaviour in the direction of increasing or promoting sales of the food products or commodities, produced, processed, manufactured, or sold by those involved at the different stages of the food supply chain.

The purpose of educational communication is the prevention of disease or the promotion of health, involving either an attempt to change attitudes and behaviour, or the provision of information in an understandable and usable form in order to help the process of decision making.

A discussion of the relative worth or value of these two motives or purposes is beyond the scope of this thesis; it is suggested, however, that, as Fortescue points out, much of the criticism of the food industry 'seems to stem from an innate almost atavistic conviction that it is
morally and socially wrong to make a profit from food'.

The question of compatibility of these two activities - marketing communication, promoting the sales of food products or commodities, and educational communication, promoting health - is, however relevant to whether or not the food industry is in the position of being able to, and should be obliged to educate as well as inform.

Clearly marketing communication promoting the sales of products or commodities in line with dietary guidelines is likely to be compatible with nutrition education communication.

On the other hand, while the argument that the main nutrition education message should be the concept of a balanced diet tends towards the 'there are no bad foods, only bad diets' line, it is important to emphasize that this must be communicated as a quantitative concept, which involves providing guidance on the quantities of fat and sugar, in terms of foods, meals, snacks and diets on a day to day basis, that are likely to be compatible with both taste preferences, and good health. Thus equally clearly, marketing communication aimed at increasing sales and consumption of foods containing fat and sugar is unlikely to be compatible with this nutritional message.

Thus, while in the case of some food products or commodities, marketing communication and educational communication may be compatible, their motives or purposes differ. On these grounds therefore, it must be argued, that the food industry as a whole is not in a position to educate other than by providing information on the nutritional value of their products or commodities, and thus cannot be under any obligation to do so. However, it must also be argued that, as Fortescue suggests, 'if they choose to (educate), they should do it well'. The position of the large retailer such as Tesco, selling a wide range of products, is discussed in section 6.4.6, in connection with nutritional labelling and the provision of accompanying nutrition educational material.

It is suggested that in order to also fulfill an educational purpose, marketing communication should conform to certain criteria.

That the consumer should be in possession of all the relevant information is a necessary prerequisite for informed choice. Any information provided, whether relating to the nutritional value of the food product or commodity, or to the relationship between food and health, should therefore, be impartial, complete and not mislead the consumer.

It has already been suggested that the concept of a balanced diet, defined in quantitative terms, should be the main nutrition education
message. While, as discussed previously, there are nutritional grounds for this, it is also the only message that is likely to appeal universally to the food industry.

Fortescue suggests that 'the greatest contribution that the manufacturer could make to nutrition education could be an agreement that there should be incorporated into advertisements a phrase to the effect that all food should be eaten within the framework of a balanced diet and that prospective customers for the product advertised should take this into account. The necessity for a balanced diet for ordinary healthy people would seem to be a nutritional imperative with which nobody disagrees. Let the food industry therefore play its part in burning the phrase 'balanced diet' into the minds of people and thus make a more important contribution to nutrition education than it could by any other means'.

This still depends on all involved reaching agreement on the use and definition of the concept of a balanced diet. It is also a quantitative concept, thus marketing communication aimed at changing attitudes and behaviour, which also aims to fulfill an educational purpose should only be promoting the increased sales of commodities or products likely to be consistent with health, even within the context of a balanced diet.

6.4.10 Nutritional labelling

Another area where there is a need for the expertise of the communicator working in conjunction with the nutritionist is in the provision of 'point of choice' nutritional information on food labels. In this section some of the views and issues in the current debate on nutritional labelling will be discussed as a particular communication problem. The task of the sender is to encode the information about the nutritional value of the food so that it has meaning for the audience, that is, so that the consumer can understand and use it.

The debate on nutritional labelling is by no means new, however, the pace of this debate has increased considerably since the publication of the NACNE (1983) and COMA (1984) Reports. Many different interested and involved parties, the food industry, the government, nutritionists and nutrition educators, and the consumer, have all contributed their views, adding to the complexity of the debate.
The rationale for nutritional labelling

The NACNE (1983) report suggested that 'fuller labelling of foods is long overdue and its health educational as well as regulatory functions have to be recognised'.

It was suggested in section 6.4.6 that while recent surveys indicate an increased interest in and awareness of the importance of healthy eating, there was at the same time a lack of consistency between behavioural intention and actual behaviour. It was suggested that one of the factors contributing to this may be the lack of knowledge of the sources of nutrients or the nutrient content of foods available, revealed by recent surveys.

Section 6.4.4 examined Tones' 'health action' model (Figure 6.4) which indicated that knowledge of the nutritional values of foods was needed if behavioural intention was to be translated into actual behaviour. Nutritional labelling would provide such information at 'point of choice'.

A number of authors suggest that nutritional labelling is an important aspect of an 'informed choice' approach to nutrition education. 'If diet is to be decided by individuals then it is necessary that some foods and drinks should carry sufficient information about their composition to enable members of the public who wish to adjust their intake of particular dietary components to do so' (COMA, 1984).

Jupe (1985) puts forward the government view, 'I wish to make it clear however that generally British Ministers are not in favour of anything more than the absolute minimum of controls on the composition of food. Their general policy is that people should be left free to produce or to buy whatever they want, provided that everybody knows what it is. That brings me to food labelling'.

Richardson (1985), speaking as a food manufacturer, suggests that 'consumers whose interest in nutrition has been awakened will want to be able to assess the nutritional value of the foods they consume, and they will look increasingly to the food label as a means to supply this information'.

The food retailers view is put by Mason (1985), talking of the Tesco programme, 'we would avoid making judgements. Our objective would be to inform people so that they could make their own. We wanted people to be able to choose'.

The view of the consumer is put by Yeomans (1985) 'manufacturers
should not be required to reformulate products however, since there is no such thing as a bad food, only bad diets. The principle of our society is to make an informed choice. So information is the key. Nutrition labelling would seem to be the answer'.

It must be emphasised, however, as indicated by Tones' model, that nutrition education for informed choice involves considerably more than nutritional labelling. While most parties agree that any system of nutritional labelling must be supported by a programme of nutrition education to help consumers to understand and use the information on labels, this thesis argues that nutrition labelling should be seen as only one aspect of an overall nutrition education programme.

Both Richardson (1985) and Wheelock (1985) view nutritional labelling from a different perspective, seeing this as a stimulus to nutrition education.

Wheelock (1985) suggests that 'not only would it help people to compare different products, but supported with educational material it could also improve peoples' level of nutritional knowledge, and awareness of what they are eating'.

While communication theory suggests that the starting point for nutritional labelling should be the consumers' nutritional knowledge and understanding of nutritional terms and concepts, Richardson (1985) questions this principle, and suggests that effective nutritional labelling should 'stimulate nutrition education' ... 'it seems absurd that a system of nutritional labelling should be designed to fit existing consumer knowledge of nutrition, when one of the major objectives should be to use nutritional labelling as an educational tool!

Rather like the chicken and the egg, this clearly needs careful consideration. It is suggested that these views emphasise the importance of running a nutrition education programme not just at the same time as, but in close conjunction with the introduction of fuller nutritional labelling; it is perhaps in this respect that the Tesco programme (discussed below) is most important.

It is therefore suggested that any proposals for nutritional labelling are seen as inseparable from a carefully co-ordinated nutrition education programme. This, it would seem, is an area where there is general agreement, but as yet little official action. Perhaps this is because this aspect is considerably less straightforward than merely requiring that nutritional information is provided on food labels.
Richardson (1985) also points out the potential effect of nutritional labelling on the food industry, it should 'encourage the production of nutritious foods' and 'promote confidence in the food industry'.

Wheelock (1985) makes a similar point, 'it is likely that nutritional labelling would act as a 'hidden persuader' and encourage food manufacturers to take account of nutritional principles in the formulation of their products'.

Some food manufacturers and retailers already provide nutritional labelling on some or all of their products, they see this as an important marketing strategy. It was suggested in section 6.4.6 that for the food industry to provide information on the nutritional value of their products was one way of establishing their 'trustworthiness' and thus reinforcing the credibility of their message.

Jupe (1985) suggests that 'the sellers, in particular the big multiples, have sensed that food labelling can be good business because it is a customer demand that they can respond to in a highly competitive business and it is a means of adding to the interest of what they have to sell'.

Mason (1985), discussing the Tesco labelling and nutrition education programme, describes the marketing benefits of providing nutritional information, 'we recognised two types of opportunity, firstly, to provide our customers with a service they wanted, and secondly, to benefit from significant amounts of potentially favourable publicity'...'any business that underestimates the benefits of meeting consumer demand is short sighted. We saw an opportunity to lead the retail industry in this respect and it seemed commercially sensible despite the potentially vulnerable product groups that might experience a downturn in sales'. It was also seen as an opportunity 'to respond to an enormous groundswell whipped by the media' and 'to respond to a government backed report'.

While obviously a marketing ploy, the Tesco programme is a significant initiative in nutrition education, providing 'point of choice' information, for the consumer, supported by educational material. Most interested parties agree on the need for consistency of format in nutritional labelling, and on the need for a nutrition education programme in conjunction with such labelling. It is suggested that this project could be seen as a pilot project, which, with necessary adaptation could be adopted more widely. The need for the nutrition educator to recognise the expertise in communication possessed by many in the food industry has been mentioned before.
Aims and objectives of nutritional labelling - criteria for effective labelling

It is suggested, therefore, that the aim of nutritional labelling is to provide the information that the consumer needs to enable him to choose a balanced diet if he so wishes. To achieve this, the information will need to be in a form that he can understand and use.

Stocker suggests that the function of nutritional labelling is to 'inform the consumer about the energy and nutrient composition of foodstuffs' and to 'facilitate the comparison of different products at point of sale'. The issue of whether nutritional labelling should enable the consumer to compare the nutritional value of foods with dietary requirements and recommendations, or only to compare different products at point of purchase has implications for the way in which the nutrition information is presented, and is discussed below. Stocker points out that nutritional labelling 'is not in itself a device which will enable the consumer to compose for himself a nutritionally balanced diet', thus emphasising the importance of seeing nutritional labelling as an aspect of an overall nutrition education programme.

Yeomans (1986) suggests that nutritional information on food labels should enable people to
- determine the amount of a stated nutrient in an identifiable amount of food
- determine the relative amounts of stated nutrients in a food
- compare apparently similar foods and different foods on the basis of nutrient content within the context of their total diet.

A number of authors suggest criteria for effective nutritional labelling in order to help the consumer to choose a balanced diet.

Mason (1985) suggests that the information on food labels should be factual, unbiased, be able to be understood, meaningful, useful, and 'actionable'.

Jupe (1985) puts forward the government view that it should 'prevent the consumer from being misled'.

Stocker (1985) also suggests that 'it should not mislead or confuse the consumer'.

Richardson (1985) and Yeomans (1985) suggest that, to this end, information should be presented in a standard form.
This last aspect is one on which there is general agreement, but as yet little action. A standardised format involves discussion not only on which nutrients should be listed on the label and how they should be quantified, but also on the way in which the information should be presented. These are the main issues to be discussed in this section.

Yeomans (1986) pointed out the dilemma for the nutritionist and communicator 'people want more detailed information - but at the same time want a simple label which is clear to understand'.

There are a number of issues which need to be considered before this dilemma can be resolved, a detailed discussion of the views of all interested parties on all of these issues is beyond this scope of this section of this thesis.

These issues will be discussed in the light of proposed government initiatives in this area, and steps already taken by the food industry and also in the light of any evidence relating to consumers' views on the information that they need, their knowledge and understanding of nutritional terms and concepts.

**Government initiatives on nutritional labelling.**

In the COMA Report (1984), it was recommended that foods which 'are major contributors to fat intake' be labelled with 'the percentage by weight of fat and saturated, polyunsaturated and trans fatty acids'.

Following this, in March 1985, the government announced its intention to introduce statutory requirements whereby foods 'which make a significant contribution to the fat content of the diet will have to be labelled with their total fat content, and their saturated fatty acid content'. In addition the government prepared draft guidelines for full nutritional labelling, to cover energy, protein, carbohydrate and fat; but this is likely to be voluntary.

The draft guidelines, to form the basis of a code of practice for nutritional labelling, were circulated, for comment, to a large number of interested people in the fields of nutrition, home economics, dietetics, medicine and health education, also to food industry associations, consumer groups, government agencies, and professional organisations concerned with health and nutritional status.

In addition, research was commissioned and funded jointly by MAFF, the Consumers Association, and the National Consumer Council, to examine a number of labelling procedures to determine the most appropriate way of
presenting information on food labels so that they could be easily understood and useful to the consumer.

A MAFF Press release (1986) (cited in Nutrition and Food Science 1986) stated that 'MAFF is at present considering comments from the food industry, consumer groups and other interested parties on their draft regulations on fat content labelling of foods'. 'It is hoped that the regulations, which will require the total fat and saturated fat contents of foods to be clearly indicated to the consumer, may be put to the House before the summer recess. The regulations may then be introduced at the beginning of 1987 and become mandatory one year later'.

Among the proposals put forward in the draft regulations is one that 'the information provided for the consumer must be easy to understand, clearly legible and indelible'.

A number of groups have expressed concern that the proposals for mandatory labelling only apply to fat.

Richardson (1985) suggests that 'it is unscientific to focus attention entirely on mandatory fat and fat-type labelling without any reference to total energy or to energy derived from other macronutrients' ... 'the singling out of fat reinforces the erroneous idea of 'good' and 'bad' foods'... 'it is far more sensible to declare total fat content along with energy, carbohydrate and protein'. This author points out that 'this view is shared by CODEX and other EEC countries'.

The Consumers' Association is unhappy that fat will appear on the label unaccompanied by other nutritional information, 'it will help people who wish to reduce their intake of fats, but will do nothing to help them compensate for lost calories by increasing their intake of other suitable foods' (Nutrition and Food Science, 1986).

The London Food Commission (1985) is also critical of the governments proposals to focus only on mandatory fat and fat-type labelling of certain foods, and for full nutritional labelling to remain voluntary.

Wheelock (1985) suggests that 'there is a real danger that hasty and ill-considered action by the government could result in an ineffective and/or inappropriate system of nutritional labelling'.

What information does the consumer need?

This can be considered as two related questions, firstly, how much information does the consumer want or need and how much will they be able to understand or use? Secondly, which nutrients should appear on food
labels and how should the information be expressed quantitatively? The answers to these questions will depend to a certain extent on the way in which, and how clearly the information is presented, a further question which is discussed below.

Salmon (1985) describes a survey carried out by Bird's Eye, in 1978, in which three different label types were tested. People found the American type of label, with a large amount of information, too complex and overpowering, and no-one understood it; whereas, if the label only provided a small amount of information — protein, fat, carbohydrate and calorie contents, it was better received, people could easily find the information they wanted, which was the calorie content.

Yeomans (1985) also discusses this issue, 'how much information can people take in and understand at one go?' 'If they were given details of six or more nutrients, for example, would they switch off altogether?' The CA/MAFF (1985) survey found that detailed labelling which included energy, macronutrients, fatty acids, dietary fibre and salt, as well as major vitamins and minerals, was not well received, although consumers said they were interested in a broader range of information than fat alone.

Jupe (1985) also discusses this from the point of view of government regulation, 'the most effective labelling will need to be fairly short and simple, which runs against the natural tendency of government regulation'.

Both the Consumers' Association (Yeomans, 1985) and Tesco (Mason, 1985) carried out a survey to ascertain what nutrient information consumers wanted on food labels (Table 6.5)

To enable the consumer to choose a balanced diet, it is important that he has information not just about the fat content, but also about the content of carbohydrate, including sugar, and protein in individual foods.

The National Consumer Council (1985) made available their comments on the government's proposals for nutritional labelling. This organisation suggested that to enable the consumer to follow the advice of the COMA (1984) Report, they would need information on the following:

- fats, including saturated fats,
- salt,
- fibre,
- carbohydrates, including sugars.

They therefore recommend that 'this information, together with protein and
calorie content, should be given on the labels of all foods which are significant nutritionally'. This then would provide information on five nutrients and energy, a possible sensible maximum. It is also suggested that few nutritionists would disagree with this.

The London Food Commission (1985) suggests that information on calories, total fat, broken down into saturated and polyunsaturated fatty acids, added sugar, salt and fibre, should be provided.

| Table 6.5 Consumers' views on nutrient labelling |
| CA / MAFF | Tesco |
| Number of respondents thinking that it was very important the food labels should show: | Major things people were concerned about, mentioned most often, in descending order: |
| Protein | 71% | Additives |
| Vitamins | 68% | Calories |
| Fat | 56% | Fat |
| Sugar(s) | 54% | Salt |
| Calories | 54% | Vitamins |
| Salt | 52% | Sugar |
| Iron | 50% | Protein |
|  |  | Fibre |
|  |  | Carbohydrate |
|  |  | Minerals |

However, in the Tesco survey when the respondents were asked the single most important element, the order changed, vitamins moved to the top of the list, followed by calories, protein, then additives, and then a long way behind, fat, fibre, salt and sugar. Despite the current increased interest in healthy eating, these views largely reflect past priorities in nutrition education.

An issue on which there are different views is that of whether, within the figure given for total sugar, 'added sugar' should be distinguished from sugar already present in foods. While there is little evidence to justify this on physiological grounds, a number of nutritionists feel that it is justified on nutritional grounds.

Recent surveys reveal that this is an area where there is emotion,
confusion and a number of misconceptions - products such as muesli bars and fruit yogourts are seen as 'healthy' foods despite a high sugar content.

Having to declare 'added sugar' may persuade food manufacturers to consider reformulation of their products to reduce sugar content; if it was made clear also that 'added sugar' included not only sucrose but other sugars also, it might dissuade food manufacturers from implying that products sweetened with honey, apple juice or other 'natural' sweeteners were in any way nutritionally beneficial.

Mason (1985) points out that Tesco made the decision to provide the figure for 'added sugar' and to declare whether this sugar was sucrose or any other sugar 'clearly in many ways it would have been easier not to do this, for instance if one takes a product like yogourt, standard fruit yogourt which is genuinely perceived to be a healthy product has more added sugar than most people expect'.

The amount of information concerning vitamins and minerals that the consumer would want, need or would find useful in the context of the current nutritional concern, is debatable, and will certainly be considered by most nutritionists as a lower priority than information on the nutrients discussed by the NACNE (1983) and COMA (1984) reports.

As, however, there is an interest in and a desire for information on the vitamin and mineral contents of foods, even though this does reflect past rather than current priorities in nutrition education. A possible compromise would be only to give vitamin content where the food provided a significant proportion, by clearly defined criteria, of the RDA. This is the basis of vitamin declarations in the Tesco scheme. The criteria for providing information on some minerals, such as iron would be difficult to define, given the variability in absorption of these nutrients.

Richardson (1985), also supports this idea, suggesting that 'it may be more appropriate to allow a much greater flexibility to declare only those nutrients of interest, so long as the information is presented in a uniform manner'.

The National Consumer Council (1985) also commented on the terminology to be used on food labels; 'we recommend that types of fat should be expressed simply as 'saturates' and 'polyunsaturates', omitting the words 'fatty acids', which give rise to confusion'. 'we also believe that the terms 'energy', 'kilocalories' and 'kilojoules' should not be used'. 'The simple word 'calories' is one of the few nutrition terms that nearly everybody (98%) recognises'.

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The way in which the nutrient content is quantified has also been debated. This depends on whether the purpose of nutritional labelling is seen as providing information to enable the consumer to compare similar or different products at point of purchase or to enable the consumer to relate the nutrient content of foods consumed to dietary recommendations.

If nutritional information is to be related to dietary recommendations, it follows that there should be a consensus of views on the quantification of the recommendations. At present the extent of agreement is greater for some nutrients than others. Since the COMA (1984) Report only quantified the recommendation for fat and saturated fatty acids, it is perhaps logical that the government, taking advice from this committee, should choose only to make labelling with fat content mandatory.

There is less agreement on the dietary goals for fibre, sugar and salt. Although the figure of 25 - 30 grams, based on long and short term NACNE recommendations, is often used as a goal for dietary fibre, Leeds (1986) suggests that there is, as yet, insufficient evidence to quantify recommendations for this dietary component.

This is not, however, to suggest that information on fibre, sugar, and salt contents of foods could not be given to enable the consumer to compare fibre contents of different foods.

While many may have reservations concerning the RDA figures, these are generally accepted quantified dietary goals, and as such are useful for comparison.

In order to interpret nutritional information on food labels in relation to dietary recommendations, an understanding of certain concepts is required. Richardson (1985) suggests that an understanding of the concept of nutrient requirement is needed. In order to relate nutrient content of foods to recommendations an understanding of the concept percentage is also required. Recent surveys indicate that understanding of these concepts is limited, thus emphasizing the need for nutritional labelling to be seen in the context of a nutrition education programme. The National Consumer Council (1985) suggest, on the basis of their research that 'percentage declarations should not be used'. The use of graphical devices such as pie diagrams or bar charts to convey the idea of percentages (discussed below) perhaps should be explored.

Since the NACNE and COMA reports express fat recommendations in terms
of percentage of total energy, it would help the consumer to relate the food to its place in the diet if the fat, carbohydrate and protein content of foods were expressed in similar terms.

There is, however, considerable resistance to this idea from nutritionists largely on the grounds that this is an entirely new concept and one which is difficult to understand. Both Bender (1985) and the National Consumer Council suggest that 'percentage of energy' declarations should not be used, 'this concept appears to be beyond the grasp of most people'. This may also be better expressed graphically or using symbols and does further emphasize the need for nutritional labelling to be seen in the context of an overall nutrition education programme.

Another aspect of quantification is the unit amount of food to which the nutrient content should relate, whether this should be expressed per 100 grams or per portion.

The 1984 Food Labelling Regulations suggest that;
- the amount of fat, carbohydrate and protein should be given in terms of grams per 100 grams,
- where certain claims are made, listed vitamins and minerals should be given in terms of percentage of recommended daily amount,
- where appropriate, the information should be given in terms of the amount of nutrients in a specified serving.

All this adds to the complexity of the label, the CA/MAFF research found that 'the use of 'per serving' and 'per 100g.' both caused confusion'.

It is obviously very important that attention is given to the way that this information is displayed on the label to ensure that it is understood and used. The CA/MAFF research found that while percentages were disliked, the use of metrical weights is, however, becoming more acceptable, 'there was some objection in the research to using metric weights as a base, but we cannot see any practical alternative. With pre-packed food, most of which shows the metric weight '100g.' should in time become an easier base to use than an imperial base'(National Consumer Council, 1986).

Richardson (1985) also suggests that information given per serving is more useful, 'declaration of nutrients expressed as % RDA on a per 100g. basis would not provide either the dietitian or the consumer with particularly useful information'. Richardson compares this with the USA
system where the nutrition label refers to the % RDA in a quantified serving, 'so that a consumer could, if he wished add up the proportion of nutrients from different foods to ensure that the diet as a whole is providing the RDA'.

How should the information be presented?

The above issues are those in which the expertise of nutritionists are required. The communication of this information to convey meaning to the consumer is an area where the expertise of the communicator is also required.

The importance of this was emphasized by Mason (1985). After examining the wide variety of ways of presenting information currently used in the UK, also in the USA and Canada, the Tesco team concluded that 'the vast majority of ways of presenting information served more to confuse than to bring clarification'. Mason cites the example of a large American retailer carrying out a similar project, 'they felt that if they had been allowed to take the technical expertise and then market the nutrition information as they would any other product, the consumer would have more clearly understood what the issues were and would have been able to act more in line with what it was that everyone was hoping that they would achieve'.

Tesco concluded that 'if we were going to provide our customers with a genuine service we were going to have to provide more than bald numbers on a pack which had no meaning'... 'we had to address the issues of food and health and present them in as interesting and as lively a way as possible so that the consumer could understand them and react to them'.

The COMA (1984) Report suggests that 'consideration should be given to providing in addition (ie. not in place of) uniform and more simple labelling codes to enable the general public to distinguish more easily between fats and oils with high or low contents of fatty acids'.

The use of simple labelling codes has been an area of much debate, largely because the main one considered was the use of a traffic light code to classify fat content of foods. This scheme has been rejected by nutritionists and consumers alike; nutritionists on the grounds that it perpetuates the idea of 'good foods' and 'bad foods', and consumers on the grounds that 'they detest being preached at - traffic lights warning of high fat content are out' (Jupe 1985).
The CA/MAFF research found that 'this kind of approach was unpopular with the public, eliciting emotional and sometimes hostile responses'.

However, as with food groups, one bad example should not invalidate the idea of finding some way of making nutritional labelling more understandable and usable for the consumer. There are a number of ways of doing this.

Numerical data may either be clearly tabulated, according to a standard format, to enable easy comparison between products, or they may be expressed graphically for example in the form of bar charts or pie diagrams, by which means the data can also be related to recommendations.

Yeomans (1985) puts the view of the consumer, based on the results of the CA/MAFF survey,

- visual formats (bar charts and pie charts) were initially liked.
- pie charts gave the impression of completeness of information, but they proved difficult to use, particularly when there were several segments.
- when using bar charts for comparison between products, consumers had a tendency to compare lengths of bars irrespective of scale
- the initial reaction to columns of figures was slightly negative, particularly with the more detailed formats.

However numerical formats proved the most easy to use.

The different labelling formats used in the research are shown in Figure 6.6. It is suggested that these by no means exhaust the ways of expressing this information in a graphical form, and that more research and the expertise of a communicator are required.

Alternatively, the relationship between the amount of a nutrient in a food and the recommendation can be expressed either descriptively in terms of 'high', 'medium', or 'low' (rather than in terms of 'good', 'very good', 'excellent' suggested by Richardson 1985), or represented by a symbol or a code.

The use of descriptive terms is only possible if there are carefully laid down criteria to define these terms; their value to the consumer depends on the consumer's understanding of 'high' and 'low' in relation to recommendations. The system also is open to abuse, no manufacturer is going to label products as 'low in fibre'. This emphasises the need for mandatory labelling using a standard format and criteria.

Both Yeomans (1985) and Mason (1985) stress the importance of both a
standard format and standard criteria for this form of labelling, 'as well as having an agreed standard format for presenting nutrition information, we also need clear guidelines and definitions related to claims for nutritional benefits' (Yeomans 1985). Mason stresses the need for a policy on this issue 'the reason a policy would help is so that consumers would come to understand what high, medium and low meant, and that it would be the same for all products from whatever source'.

Mason describes the fairly rigorous criteria used in the Tesco programme, 'we have a set of guidelines based on the NACNE and COMA reports which define whether a product can or cannot carry one of these symbols'. 'If a product is, say, high in fibre but also high in salt and sugar .... that product will not get the high fibre symbol'. These criteria are shown in Table 6.6.

The use of codes or symbols to assist in the interpretation of nutritional information is also a matter of debate, interested parties have expressed differing views in this area.

Richardson (1985) suggests that 'although a major criticism of nutritional labelling, both at home and abroad, is its complexity, there is no way that a subject as complex as human nutrition can be expressed so simply that each food can be assigned a nutritional quality number or colour code'... 'In any search for simplicity, against which no one can argue, oversimplification and distortion of the nutritional character of food products can only reduce the system to point of futility and produce a labelling programme with no credibility at all'.

On the other hand, Mason defends the use of symbols in the Tesco programme, 'whilst we all want people to read the labels and understand that 1 gram of fibre is not very much, and 8 grams is a lot, if we are honest it is clear that this will not happen overnight. Our view was that if you wanted to promote understanding and to give people readily accessible information on which to make a choice, then this sort of move (the use of symbols) was justifiable'.

It is suggested that this illustrates the difference between the theoretical approach of the nutritionist and the pragmatic approach of the marketing man with expertise in communication. Mason suggests that 'we do envisage the day eventually when the nutrition information panel will have become such a part of peoples' buying habit and such a significant element in the way that they choose their foods that the symbol will become irrelevant. But realistically that day is quite some years away yet'.

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Figure 6.6 Labelling formats used in the MAFF/CA survey

(from Yeomans, 1986)

A. Nutrition Information
100 grams of this product contain:
1579 kilojoules/375 kilocalories
27.0g fat (of which: 10.0g are saturates)
3.1g are polyunsaturates
24.9g carbohydrate
9.8g protein

B. Nutrition Information
100 grams of this product contain:

<table>
<thead>
<tr>
<th>Number of grams</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
</tr>
<tr>
<td>Fat</td>
</tr>
<tr>
<td>Carbohydrates</td>
</tr>
<tr>
<td>Protein</td>
</tr>
</tbody>
</table>
1579 kilojoules/375 kilocalories

C. Nutrition Information
100 grams of this product contain:
1579 kilojoules/375 kilocalories
Fat: 27.0g (of which polyunsaturates 3.1g and saturates 10.0g)
Carbohydrates: 24.9g (of which sugars 0.0g)
Protein: 9.8g
Dietary fibre: 0.0g
Salt: 1.9g
65% of calories from fat

D. Nutrition Information
100 grams of this product contain:

Energy: 1579 kj/375 kcal
Protein: 9.8g
Carbohydrate: 24.9g
Fat: 27.0g
(of which saturated fatty acids 10.0g)

E. Nutrition Information
100 grams of this product contain:
27.0g of fat
3.1g of which 10.0g are saturates
24.9g of carbohydrate
9.8g of protein
1579 kilojoules/375 kilocalories

F. Nutrition Information
100 grams of this product contain:
1579 kilojoules/375 kilocalories; 27.0g of fat; 24.9g of carbohydrate; 9.8g of protein

% of calories provided by:
Fat
Carbohydrate
Protein
The use of symbols is an area where there is a particular need for the expertise of the communicator; the meaning of symbols can only be related to the recipient's experience and the potential for distortion of meaning between source and recipient is great. This area is one in which there is a great need for research. Symbols can be used either as a single symbol to indicate a particular nutritional feature as in the Tesco programme, or as a way of representing nutrient quantity pictorially as is used in the Shredded Wheat nutritional material.

Table 6.6 The Tesco labelling criteria  
(adapted from Mason 1985)

<table>
<thead>
<tr>
<th>In order to qualify for the logo stating</th>
<th>The food product</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Low fat</strong></td>
<td>must contain not more than 50% of the quantity in the product as normally available, or not more than 35% of total energy must be provided by fat</td>
</tr>
<tr>
<td><strong>Low salt</strong></td>
<td>must contain not more than 50% of the quantity in the product as normally available, or must contain not more than 400mg of salt per 100kcal of food.</td>
</tr>
<tr>
<td><strong>Low sugar</strong></td>
<td>must contain not more than 50% of the quantity in the product as normally available, or not more than 10% of total energy must be provided by total sugar content. (Calculation to include all sugars, sucrose, glucose, dextrose, and so on)</td>
</tr>
<tr>
<td><strong>No added salt</strong></td>
<td>no salt (NaCl) has been added during manufacture</td>
</tr>
<tr>
<td><strong>No added sugar</strong></td>
<td>no sugar has been added during manufacture</td>
</tr>
<tr>
<td><strong>High fibre</strong></td>
<td>one serving must contain at least 4.2g. dietary fibre</td>
</tr>
<tr>
<td><strong>High in vitamin A</strong></td>
<td>one serving must contain at least one sixth of the RDA of vitamin A, or 125ug.</td>
</tr>
<tr>
<td><strong>High in vitamin C</strong></td>
<td>one serving must contain at least one sixth of the RDA of vitamin C, or 5mg.</td>
</tr>
<tr>
<td><strong>Rich in vitamin C</strong></td>
<td>one serving must contain at least one half of the RDA of vitamin C, or 15mg.</td>
</tr>
</tbody>
</table>
Nutritional labelling and nutrition education

The importance of seeing the provision of nutritional information on food labels as part of an overall nutrition education programme has been stressed, and lack of official action in this area noted.

This is another important aspect of the Tesco initiative. Mason (1985) describes this part of the programme, 'we determined that the only way that the programme was going to be worthwhile was if the issues were understood; we felt that the only way that this could happen was through attractive, colourful leaflets which brought the somewhat remote issues to our shoppers'.

The main accompanying leaflet covered the following areas;
- dietary guidelines, based on the NACNE and COMA Reports,
- an explanation of the symbols and how they worked,
- 'visual demonstrations of the sorts of moves that one ought to be making in order to have a healthier diet'.

Further leaflets on individual topics, such as fibre, are aimed at helping the consumer to relate the nutritional information on food labels to quantified recommendations, for example, 'currently we consume about 15 to 20 grams of fibre in the food we eat each day. We should be aiming at 25 to 30 grams a day at least. The easiest ways to measure how much you are eating is to look for the nutrition information panel on Tesco label foods and simply add up the number of grams per serving'. The leaflet suggests that the consumer looks for the high fibre sign to indicate the foods that contain the most fibre.

While, as suggested above, this initiative was seen as an important marketing opportunity, it does provide a good example not only of the co-ordination of a nutrition education programme with the provision of 'point of choice' information, but also of co-operation between nutritionists and those with the marketing expertise working on the problem of communicating a nutritional message. While not suggesting that this programme cannot be improved, it could provide a useful pilot project, which, after adaptation, could be more widely adopted.

Yeomans (1985) on behalf of the consumer stresses the importance of finding a standard format for presenting nutritional information, 'clearly it is vitally important to have an agreed, standardised format for presenting nutrition information. There are many ways in which such information could be presented and without some controls consumers could be faced with a plethora of different methods and could be confused and
misled'.

It is, however, strongly suggested that before any standard format becomes mandatory (if ever) there needs to be considerable research, involving nutritionists and those with expertise in communication, in order to find ways of presenting nutritional information in such a way that it conveys meaning to the consumer, that is, it is both understandable and usable, and will assist the consumer to choose a balanced diet if he so wishes.

Richardson concludes that 'clearly, the format for the successful declaration of nutrition information remains experimental and controversial. The government appears to be moving to a decision on nutritional labelling very rapidly, whilst little progress is being made on nutrition education. There is a real need to carry out a systematic programme of research to identify the most effective methods of communicating nutrition to the public. Different methods need to be tested across the country and results should be evaluated critically after extensive consultation with interested parties. The theory that labels are the best way of giving information should be considered in detail'. Wheelock (1985) also argues that insufficient consideration is being given to the problem of communicating nutritional information, 'too little consideration is being given to the best ways of providing consumers not only with the nutritional information they need but also with expertise to make effective use of it'. Wheelock also suggests that government action on nutritional labelling is 'hasty and ill-considered', and that 'once locked into legislation, this would set back progress for years'.

The important role of nutrition education in schools in helping pupils, and therefore future consumers, to understand quantified nutritional information and apply this understanding to their choice of food is discussed in section 6.5. The problem of providing 'point of choice' guidance for schoolchildren in the cash cafeteria is discussed in section 6.7.

6.4.11 The role of nutrition education in the implementation of dietary guidelines - conclusions

These last four sections (6.4.7; 6.4.8; 6.4.9; and 6.4.10) have discussed, in relation to the overall process of communication, the current activities and potential contribution to nutrition education of
various senders of nutritional messages - health professionals, mass media journalists and producers, and the food industry. These senders have been discussed in relation to the nutritional message, and the channels of communication available to them; the focus and the starting point for the process of communication is the audience or consumer.

Neuberger (1984) discusses the problem of the differing interests of the senders in the current nutritional debate, and the dilemma in which scientists as sources of nutritional information find themselves. Referring to the mass media, he suggests that 'a balanced, dispassionate statement, which emphasizes the difficulties encountered and the large area of ignorance which still exists, will make less of an appeal or be considered less newsworthy than a more extreme expression of opinion which simplifies the problem in a manner, which to a scientist may seem somewhat intellectually dishonest'.

Referring to the food industry, Neuberger suggests that 'large financial interests may be involved in nutrition .... it is in these circumstances easy to accuse scientists of having their judgement affected by financial considerations'.

Most of important of all however, is the consumer, who can only emerge from the current debate confused and even more likely to ignore all advice provided by 'experts'. Neuberger suggests that 'the public will expect definite guidance from us, and such guidance will be ineffective if it is given with too many reservations'. 'I feel we should stop accusing each other of this lack of scientific integrity and discuss the problems on their merits .... and to respect the honesty of those with whom they disagree'.

In order that the consumer receives the nutritional message in an understandable and usable form, these different interests have got to be resolved; this is likely to require several stages.

Firstly, there is need for consensus by all those involved in nutrition education on the interpretation of the evidence relating to the role of diet in the aetiology of disease. The NACNE report in 1983 set out to establish this necessary consensus in order to provide the basis for nutrition education. Since then, there has been considerable debate, not always constructive, and often in the opposite direction from a consensus.

Secondly there needs to be agreement on the nutritional message arising from this. While it has already been argued by a number of those involved in nutrition education that the central nutritional message could
be the redefined concept of a balanced diet, there has as yet been little
discussion on this, or on the way in which this may be translated into
guidance for consumers. Thus the formulation of the message depends on
nutritionists coming to an agreement on the definition of a balanced diet
in quantitative terms and then translating this into foods meals and diets
in terms of all the factors influencing consumers' food choice.

Finally, bringing in those with some expertise in communication,
there needs to be empirical research to validate aspects of communication
theory in relation eating behaviour, followed by the application of the
findings of this research to the problem of effectively communicating the
nutritional message. Research to ascertain the most effective way of
communicating the nutritional message involves not only the expertise of
nutritionists but also communication techniques such as those possessed by
the food industry, and those in the mass media. It also involves free
discussion without prejudice between them.

It is likely that all this will only be achieved by a planned and co­
ordinated programme, such as is discussed by Tones (1979) and Gifft et al
(1972). Also it is likely that such a programme will only be initiated
through positive intervention by means of a government policy on food and
health.

While, as discussed in section 6.4.2, there is circumstantial
evidence to suggest that there have been changes in eating behaviour,
there have been few studies to ascertain the extent to which the reported
increased interest in 'healthy eating' is resulting in changed eating
behaviour. There is a need for more dietary studies in this area.

There seems to have been little attempt to mount a programme to co­
ordinate the activities and interests of all those involved at arriving at
and communicating a consistent nutritional message implementing the
recommendations. Such a programme should include a clear statement of
aims, and should also plan for the evaluation of the programme.

This absence of a planned programme must be largely attributable to a
lack of government initiative in setting up an independent body which
represents the interests of all involved in the process of nutrition
education. This body would need to arrive at a consensus interpretation of
the evidence, to formulate a consistent nutritional message to be
communicated by all those involved in nutrition education, and co-ordinate
the large amount of research needed to provide the basis of the effective
communication of this message.

A number of authors (Sanderson and Winkler, 1983; Fallows, 1985) have
compared the advertising budget of the food industry with that available
to, for example, the Health Education Council for nutrition education.
Fallows (1985) suggested that such an independent body could perhaps be
funded by a levy from the advertising budget of the food industry. The
role of the government in implementing dietary guidelines is discussed in
section 6.7.

6.5 NUTRITION EDUCATION IN SCHOOLS

The argument central to this thesis is that where there is a school
meals system, such as a cash cafeteria, which allows considerable freedom
of choice, nutrition education in school has an important part to play in
helping children to choose from the food items available. It was
suggested in Chapter Four that the proposed guidelines for the nutritional
aspects of school meals should include emphasis on the importance of
nutrition education to help children in their choice. The need for this is
clearly shown by the study described in Chapter Five. It was recognised
that liaison between school caterers and those involved in nutrition
education would also be necessary. This is discussed in section 6.6.

This section also emphasises that the school meal should be seen as
an important nutrition education resource, from the point of view firstly,
of reinforcing the nutritional message through the provision of foods from
which a balanced diet can be chosen. Secondly the school meal provides an
opportunity to apply decision making skills in a practical everyday
situation. Additionally, collection of data on food choice provides a
means for both pupils and teachers to evaluate the nutrition education
programme, the importance of which is discussed below. Thus the potential
of the school meal as a nutrition education resource and an integral part
of the nutrition education programme will be emphasised throughout this
section.

It was suggested in section 6.1 that the implementation of guidelines
on the nutritional aspects of school meals should be seen in the context
of the implementation of dietary guidelines in the community as a whole.
An additional argument put forward in this section is that nutrition
education in schools should play a key role in this process. The need for
a government policy for nutrition education is discussed in section 6.7.
It is suggested that nutrition education in schools is seen as an
important aspect of an overall nutrition education programme.
This section will consider the need for nutrition education in schools, the aims and objectives, also the content and methodology with particular reference to implementation of dietary guidelines. The context of nutrition education, or where in the curriculum it should appear and evaluation of nutrition education in schools will also be discussed. The final section will examine the feasibility of using a food group scheme to provide 'point of choice' in the school cash cafeteria.

6.5.1 The need for nutrition education in schools

The task of this section is to establish the need for, and the importance of nutrition education in schools with particular reference both to the implementation of dietary guidelines and to food choice in school meals. This need can be established on three main grounds.

Firstly, on nutritional grounds; the role of nutrition in the health and growth of school children was discussed in detail in Chapter Three. A number of surveys of the diets of schoolchildren indicated that in some cases and in some ways, diets were not meeting children's needs. In addition, the relevance of, and need for nutrition education is shown by the findings of a recent survey on the diets of schoolchildren (DHSS 1986).

Secondly, there are educational grounds; the current emphasis in education is on 'preparation for life' or 'life skills'. An important aspect of this is teaching decision making, or problem solving skills - education for 'informed choice'. Schoolchildren, particularly older ones, are increasingly in the position of being able to make their own choice over food, both at home and at school, therefore this approach is particularly relevant and necessary. Additionally, because of its relevance to almost all children, food choice is a particularly good application of this approach to education. The justification for an 'informed choice' approach to nutrition education in schools was discussed in Section 6.4.3.

Robert-Sargeant (1984) also points out that current socio-economic changes, and trends in eating habits (discussed in Section 6.4.2) underline the need for such an approach to nutrition education in schools. This author suggests that these trends 'present the young consumer with decision making processes' and, therefore, that 'an individual's responsibility for his own health needs must begin as early as possible'... 'nutrition education in schools should be regarded as a high
Thirdly, further justification is provided by the view that schools are the main agency for the process of secondary socialisation. Lennon and Fieldhouse (1982) suggest that this is a period when knowledge is acquired which is necessary for a rational explanation of behaviour which serves as a reinforcement for the maintenance of behaviour. Thus nutrition education in schools potentially plays an important part in the formation of good food habits. In this context, a number of authors (Lennon and Fieldhouse, 1982; and Newsome, 1986; Schools Council, 1971) mention the importance of ensuring that environmental experiences, such as tuck shops and school meals, do reinforce, rather than conflict with, the educational message.

Lennon and Fieldhouse also discuss the process of 'anticipating socialisation' whereby individuals frequently adopt the values, attitudes, and behaviours of social groups to which they would like to belong. Ritchie (1967), cited by Lennon and Fieldhouse, discusses the importance, in nutrition education, of recognising the part played by peer group pressure in the formation of food habits of schoolchildren, particularly adolescents. Ritchie suggests that the wish to conform may have desirable or undesirable effects in a nutrition education programme.

The influence of food and health norms and of significant others is recognised in Tones' 'health action' model. This is discussed below in relation to the content and methodology of nutrition education in schools.

It is argued in this section that nutrition education in schools should play a key role in the implementation of dietary guidelines. This also can be justified on a number of grounds.

Firstly, as was discussed in section 6.4.5, change occurs over a period of time, and a number of stages can be identified. The interpersonal relationship between teacher and learner can be developed over a period of time, with appropriate activities to help the transmission of knowledge and the exploration and clarification of values. Ritchie (1967) suggests that 'children are a captive audience'.

Secondly, early influences are important in the formation of food habits, these come from the family, particularly the mother. Nutrition educators are aware of the 'nutrition education vicious circle' whereby food habits not conducive to good health are perpetuated.

This circle must be broken into somewhere. Ritchie suggested that children of the present will be the parents of the future and will hand on
to their children their own dietary norms; thus the school would seem to be the appropriate place to break into this circle. Ritchie also suggests that 'a further advantage in this country is that the vast majority of children do pass through the educational system, thus the problem of accessibility is solved'.

Thirdly, the school cannot be considered in isolation. School-community interaction, as well as having important implications for content and methodology, (discussed below) provides important justification for the key role of nutrition education in schools in the implementation of dietary guidelines.

Many of the misconceptions and confusions relating to food and health, revealed by recent surveys, can almost certainly attributed to the conflicting messages being received by the consumer. Children are also receiving nutritional messages from sources outside school, and an important aspect of nutrition education should be the provision of knowledge to ensure that correct beliefs about food and health are held by the next generation.

Similarly an important aspect of teaching the decision making process is helping the pupil to evaluate the nutritional messages from a number of different sources, and to relate school sources of information to outside sources.

A number of authors discuss the importance and effects of the interaction between school and home.

Thomas (1979) stresses the importance of nutrition education in schools being seen in the context of nutritional practices in the community, 'the interaction is clearly extensive'. This author cites Bayley (1964) who found, in a study of changing food habits in Israel, that one of the major factors effecting changes in adult eating behaviour was the influence of children returning home from school having learnt about nutrition and eaten the foods served there for lunch. This underlines the importance of school meals as an educational resource. Thomas comments that 'a mutuality of influence occurs which cannot be ignored. Unless gains won in the classroom are mirrored and supported in the community at large, there is a danger that behaviour potentiality will give way to habitual practices'.

On the one hand it is possible that the child may transmit information to the home and parents. Ritchie suggests that 'children form a useful bridge in approaching families'. Lennon and Fieldhouse (1982) suggest that 'the establishment of a formal home-school link might allow
the child to become the agent of change, correcting erroneous beliefs and transmitting reliable information. The likelihood of this happening depends on the comparative credibility of the school and other sources of nutritional information, such as the mass media particularly television. A number of school nutrition education projects, such as the FEAST project in Ashley Down (Burman, 1985) have involved parents and the community.

On the other hand, there is the danger of 'culture clash' between home and school if teachers attempt to change values (discussed in section 6.4.3). Lennon and Fieldhouse discuss the possible effects of a 'culture clash' in nutrition education, 'teaching nutrition in schools may not only be unsuccessful in changing food habits established during primary socialisation, but may also create emotional and psychological conflicts in the child who finds a disparity between what his teachers and what his parents say, or what actually happens in the home environment'. The authors suggest that this culture clash is particularly apparent with immigrant children and to a lesser extent with children from lower socio-economic classes and the child may reject what he is taught at school, or may comply while he is at school but re-adopt family values at home.

This emphasises the importance of the teacher being aware of and taking into account the influence of the home on children's beliefs and attitudes to food and health.

Lack of skills and knowledge to convert behavioural intention into actual behaviour have been identified as barriers to change, and thus to the implementation of dietary guidelines. An important aspect of the problem solving or decision making approach to education is the analysis and interpretation of data, and the application of this information to the problem. The increased availability of nutritional information at 'point of purchase or choice' requires the ability to interpret and apply the information to food choice. Equipping the next generation with this ability, which may also diffuse into the home, is also an important aspect of nutrition education.

Therefore the need for and the importance of nutrition education in schools can be established. A planned programme with clearly stated aims and objectives, and carefully thought out methods both for achieving these objectives and for evaluation of the programme is needed. Roberts-Sargeant (1984) suggests that there is a need to develop a co-ordinated programme on nutrition that is in keeping with the life-style of the child, and stresses 'the need to emphasize a practical approach that has immediate
impact'. This author suggests that the school catering service provides an opportunity to relate theory to practice.

6.5.2 Aims and objectives of nutrition education in schools

It was argued in section 6.4.3 that the aim of nutrition education in schools should be to enable pupils to make responsible or informed food choices. It was suggested that the achievement of this aim would involve not only the provision of knowledge but 'approaches designed to explore and clarify attitudes and values' (Newsome, 1986).

It was suggested in this section that almost all teachers are aware of the danger of the 'middle class educator imposing their values' (Lennon and Fieldhouse 1982) and may in consequence avoid the issue.

In practice, however, the dividing line between the teacher 'imposing their values', and 'helping the pupil to explore and clarify their own values', is a very fine one, and one which few teachers never cross. This applies also to areas of the curriculum other than nutrition education.

Similarly there is also, in practice, a very fine dividing line between, on the one hand, 'putting the pupil through a positive process of decision making', (Schools Council 1977) and 'equipping the individual with the ability to make judicious food choices and evaluate the nutrition information he receives', (White 1976), and on the other hand, attempting to change eating behaviour. It is often difficult to decide exactly where the former process becomes the latter.

This point is discussed by Williams (1981), who suggests that 'teachers must be clear in their aims because although they may think that pupils are being given the opportunity to form their own decisions, subtle pressures may be unconsciously placed'.

6.5.3. The Context of nutrition education in schools.

The above discussion underlines the need to ensure that nutrition education starts as early in the school career as possible.

This is justified on educational grounds. An important educational principle, supported by theories on cognitive development, is to proceed from the known to the unknown. Since food is part of a child's life from birth onwards and the experience of eating is one shared by all children, work with food is an ideal vehicle for learning in many fields. The potential is shown by Squire (1981) in Figure 6.7. This approach is the
Figure 6.7 The integrated curriculum: planned and structured learning which could develop from the starting point *
(from Squire, 1981)

**Nutrition and health**
- Ears, eyes and nostrils, and their functions
- Three regular meals a day, as much variety as possible—no eating between meals, good eating habits, the importance of breakfast
- Use of eggs in cake-making
- Chocolate eggs, energy, moderation, dental care
- Safety, hygiene, exercise
- To make: Scrambled eggs (wholemeal bread)

**Language development**
- Nursery rhymes: Humpty Dumpty, Mother Goose
- Poems
- Stories: Chicken Licken, The Giant
- Jam Sandwich
- Vocabulary: spiral, whirl, curved, twisted, fine brittle, edible, eggshell, scrambled, poached, fried, boiled
- Oral work and discussion
- Recording, creative writing—magic egg
- Reading recipes
- Using reference books

**Mathematics**
- Sorting and classifying: shells, eggs—sets, graphs
- Selecting, weighing, counting, comparing, ordering, estimating, one to one correspondence
- Addition, subtraction by comparison, conservation of number, shape, size, timing, multiplication, division

**Science**
- Breaking shells, experiments, flint and oyster shell—hen's gizzard
- Testing for freshness (eggs), displacement of water
- Yolk, white and air—meringue
- Sounds from eggs, shells
- Tasting, camouflage, timing

**Manipulative skills**
- Holding eggs carefully, rolling
- Drawing, crayoning, painting, writing, sewing, modelling, decorating
- Food activities
- Mixing, stirring, whisking, folding, slicing (older children), washing up

**Other areas of the curriculum**
- Music: Sounds—from shells, coconuts—horses galloping
- Own tunes and rhythms
- Movement: Awareness of shape, rolling
- Humanities: Egg rolling at Easter
- Medieval times—eggs to the Lord of the Manor at Easter, and other customs
- Other creatures from eggs
- Conservation and environment
- Play: Home-corner café

**Other**
- Nutrition and health
- Ears, eyes and nostrils, and their functions
- Three regular meals a day, as much variety as possible—no eating between meals, good eating habits, the importance of breakfast
- Use of eggs in cake-making
- Chocolate eggs, energy, moderation, dental care
- Safety, hygiene, exercise
- To make: Scrambled eggs (wholemeal bread)

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basis of much of the food work that is carried out in the early school years and there is clearly considerable potential for development in this area. The Ashley Down Community project - FEAST arose out of such work at Ashley Down Infants' School.

Ritchie (1967) stresses the importance of nutrition education from the beginning of the child's school career, 'children are not set in their ways; during the early days at school the child's ideas, including those concerning food and dietary habits, are still in the formative stage, and are more readily influenced than those of an adult'. This author also suggests that 'children aged 5 - 14 years are more open minded and used to accepting new ideas as part of growing up and are therefore more likely to be receptive to changes in ideas and agreeable to modification in eating habits; new ideas fit in with the concept of the school being a place of change' also 'they have great curiosity, have wide interests and are eager to learn'.

The interaction between home and school in relation to nutrition education was discussed above, the influence of home is likely to be greater in the case of younger children, but it is also likely that links between home and school are more easily forged at this stage.

The early introduction of nutrition education into the school curriculum is also supported by Thomas (1979), 'there is every reason to suggest that this general approach to the development of nutritional concepts (discussed by Thomas in the context of nutrition education in the secondary school) should be emphasized from the first day at play-group or primary school. In fact the day to day interaction with food on the school premises is sometimes used as an opportunity to do this'. Thomas does however, suggest that 'it seems likely that more work is required to see how these early stages can best be used as part of a rational sequence'.

There is limited information available, giving any indication of the extent, content or methodology of nutrition education in the early school years. A number of reports (Schools Council, 1977; DES, 1985) have considered this area, and some material has been developed for use with children of primary school age (Squires, 1981).

Howie (1983) describes a survey carried out in North Staffordshire to ascertain what is taught to children under 12 years, how often and with which subjects, and also the role of the dietitian in nutrition education. This survey found that 'nutrition' is taught to all ages from 3 - 12 years, but most popularly between 8 - 12 years, that is in middle schools. It was also found that in 30 per cent of schools nutrition education
programmes are devised and taught by the class teacher, and in 20 per cent of schools by specialised teachers, for example of home economics or science; about 40 per cent of schools use health professionals either to advise teachers or to teach themselves.

In the case of many teachers acting as nutrition educators, particularly those in primary and middle schools, problems arise due to the limited amount of nutritional knowledge provided in initial training courses, and the difficulties of keeping up to date with developments in nutritional knowledge. These problems are similar to those described in section 6.4.7, in relation to health professionals acting as nutrition educators. Howie (1983) found that 'many schools expressed a desire for more information to keep them up to date', and suggested that 'this is of particular value in primary and middle schools where teachers are not trained to give nutrition education unless they choose biology, or a food related option in health education in their training'.

Here the expertise of the community nutritionist or dietitian is important. There is a need, however, to relate the nutritional message to the stage of cognitive development of the child (discussed below). It is suggested that the teacher with the educational expertise has an important role as sender or communicator working in conjunction with the nutritionist or dietitian as the source of nutritional knowledge and information. Both Howie (1983) and Evans and Spalding (1984) stress the value of this use of the dietitian's expertise, 'we would prefer to advise the teachers on what to teach their pupils as we believe that this is a much better use of expertise - the teacher knows her class and sees them regularly for follow up and further instruction'. Evans and Spalding (1984) describe a nutrition course for primary school teachers run by dietitians in Leicestershire.

Later in the school career, the question arises of whether nutrition education should be either 'taught as a formal school subject, with an allocated number of hours in the curriculum' or 'integrated into existing curriculum subject areas', (Lennon and Fieldhouse, 1982).

These authors quote, on the one hand Holmes (1970) who favours the first option, 'it has been claimed that granting separate status to nutrition increases its importance in the eyes of the pupil', and on the other hand FAO (1971) who suggest that 'nutrition teaching should be a permanent and continual process with a specific well-planned methodology; it cannot be relegated to one or two hours per week'.
The authors themselves favour the second option 'integration of food and nutrition education with all school subjects, whether obviously related or not, is the best way of converting the educative act into a permanent action which favours achievement of the final objective - change of attitudes and habits. Continuous reinforcement is harmonious with the fact that nutrition education is a continuous process'. The authors cite Morant (1971) in support of this view 'the topics that need to be covered for children to have an all-round knowledge of nutrition are too diverse to be taught as one subject. It would be easier for the teachers involved, and would also give the children new angles on the subject, to teach nutrition through various timetabled subjects'. It is suggested that the danger in this approach unless very well co-ordinated, lies in the possibility of loss of impact through dispersion.

Thomas (1979) also discusses this issue, 'its presence somewhere is vital to reinforce its place as a valued subject. However there is likely to be strong resistance to its appearance as a separate discipline, for timetable reasons if nothing else. One possible approach would be to develop this as a key strand in health education. But this approach suffers from limitations, one of these being the lack of prestige attached to non-examinable subjects'. Thomas suggests also, that health education itself is still at the developmental stage 'with the degree of activity varying greatly from one school to another'. This author suggests the approach in which 'appropriately designed nutrition education' is incorporated into existing examinable subjects, 'would seem to offer one solution'.

Traditionally nutrition education is included in one or more of the curriculum areas such as home economics, health education, science or biology, social studies or general studies. In these areas, usually, different aspects are considered. As with medical education, a physiological or biological approach tends to be taken in biology or science; social studies tends to focus on the food choice aspect or on issues involved in food provision; health education, where this appears on the school curriculum, may examine the relationship between food and health, but often with little reference to the implications for food choice. The following discussion will mainly apply to nutrition education in the context of home economics, as Robert-Sargeant (1984) points out 'home economics seems to provide an ideal vehicle for teaching nutrition at secondary level'.
The lack of relationship between the traditional focus of home economics courses - the acquisition of skills dictated by examination syllabii - and the learning of nutritional principles as a separate and often unrelated exercise, has been the subject of much discussion. There is, however, considerable evidence that home economics courses are changing, probably stimulated by new examinations and other educational initiatives, which have created the need to reconsider both content and methodology of these courses. This area will be discussed below.

Ideally nutrition education should be seen as an integrated whole, and all aspects considered and developed to form a rational sequence, preferably following on from and building on, work done in the primary or middle schools. There is some evidence of a more integrated approach.

Rowe (1986) sees the development of a new GCSE examination as an opportunity to take a completely new look at home economics, including its place and that of nutrition education in the curriculum. This author describes how Suffolk teachers are responding to the challenges, 'all curriculum initiatives are under close scrutiny in terms of the potential cross-curriculum links, improved inter-school and community liaison, .... and more appropriate course content'. As is discussed below the problem of implementing dietary guidelines provides ideal material for the development of such an approach to home economics teaching. Rowe reports that 'we have reached a stage where the subject is fulfilling its true potential and forming constructive links with other specialisms, with industry and the local community. There is an accompanying change in teaching method'.

There is evidence to suggest that similar reconsiderations of home economics are occurring in other areas of the country also. The potential cross-curricular links envisaged by the authors of the ILEA Guidelines are shown in Figure 6.8. Watson (1985) suggests that 'many schools are attempting to establish a nutrition policy where all teachers and others within the school who have a stake in food and nutrition co-operate'. This author also points out the importance of involving teachers in local authority food policies, 'it is clearly beneficial for both sides if teachers are involved at the planning stage with dietitians and others invited into schools to share expertise'; the author adds that this is happening within ILEA.

A number of nutrition projects involving cross-curriculum links, and links with school meals and with the community are discussed below.
Figure 6.8 Food and Nutrition across the curriculum
(from ILEA Nutrition Guidelines, 1985)
The question arises of what happens in schools in which there is no home economics teaching? New educational initiatives are occurring across the whole school curriculum and there is evidence that social aspects and implications are more frequently considered in subject areas such as science and biology, which is again encouraging for a more integrated approach to nutrition education. However, while nutrition has at least always been traditionally included in some form in home economics syllabii, there is no certainty that nutrition education will be seen as a priority in other areas of the curriculum. It is important that the opportunity for nutrition education, provided by the current wave of educational initiatives is used. It is, therefore, suggested that some government policy on nutrition education in schools would help to ensure this.

6.5.4. Content and methodology of nutrition education in schools

The important principle in communication theory (discussed in section 6.4.6) of relating the message to beliefs, attitudes, values, needs and interests of the audience, will determine both content and methodology of nutrition education. Tones' health action model can be used to provide guidance.

It was suggested in section 6.4.4, on the basis of Tones' model, that health or nutrition education may,
- modify or create beliefs by providing knowledge,
- provide skills and knowledge necessary to translate behavioural intention into action,
- help in the process of exploring or clarifying values,
- attempt to create decision making skills to facilitate action after clarifying beliefs and values.

It is suggested that nutrition education in schools should concern itself with all these activities and processes.

Figure 6.9. shows how this model can be used as a framework for planning both the content and methodology of nutrition education in schools. It also gives an indication of the necessary prior information about the audience, which is the starting point of the communication process.

This model will be discussed in relation to some of the available nutrition education material, in particular the 'Nutrition Guidelines' (ILEA, 1985). The ILEA Nutrition Working Party set out to produce teaching
Application of Tones "Health Action" model to food choice
material designed to enable children to make an informed choice about the food they eat. The material produced so far is in the form of a source book for teachers, including information on dietary goals and dietary guidelines ('nutritional messages'). Suggestions for applying these guidelines to practical teaching (teaching strategies) are given in the accompanying 'teaching matrices'. These give teaching points, in tabulated form, based on the nutritional messages, with suggestions for practical applications and ways of putting them into a social and economic context. They also provide examples of how the information presented in the guidelines could be interpreted.

Moody (1984) and Turner (1980) also list their suggestions for the content of a nutrition teaching scheme. While neither author places their suggestions for content in the context of an 'informed choice' or 'decision making' model, both recognise the importance of the 'socio-economic context of nutrition'. Moody suggests 'the teacher responsible should be able to base guidance in food choice on existing patterns and habits and aim to encourage modification and moderation through an awareness of requirements for good health in all population groups', and Turner suggests that 'nutrition is not only about food, but also about the people who eat it, so teaching might aim to develop a fuller understanding of people, their social and cultural differences, and the variation in need between individuals and throughout life'.

As was discussed in section 6.4.4, Tones' model does not take into account the effect of feedback, which is a feature of most decision making models. Hence the need for empirical research to develop and validate a true 'decision making' model for nutrition education in schools. The ILEA material, while not actually based on this model, does however, recognise the importance of the interaction of the belief system and the motivational system, also the operation of situational factors in food choice. This material will be used in this section to illustrate how the Tones' model can be translated into strategies for teaching nutrition in schools.

School nutrition education programmes, as any others, should consider the important interaction of the three sets of variables in the communication process; those associated with source and sender, those with the message and those with the audience. The appropriate use of different channels of communication - media and resources, should be considered, noting both the potential use and limitations of each. Appropriate use of
media and resources will be discussed in this section, as an aspect of methodology. These three sets of variables can be discussed in relation to nutrition education education in schools.

**Source and sender variables:** The distinction between nutritionists and nutrition educators as sources and senders, and the problem of ensuring that nutritional information relayed by nutrition educators is accurate and up to date was discussed in relation to health professionals in section 6.4.7. This was also discussed above in relation particularly to primary and middle school teachers. The out of date nutritional knowledge of home economics teachers has frequently been discussed; there is, however, considerable evidence that this is changing. The ILEA 'Nutrition Guidelines' provides a useful source book for nutrition teaching.

**Message variables:** The nutritional message in the context of the current discussion on the implementation of dietary guidelines is the concept of a 'balanced diet'.

The definition of 'a balanced diet' given by the ILEA material incorporates, in a non-quantitative form, the one discussed in section 6.4.6, and is based on the consumption of a variety of foods:

'A balanced diet is one which provides:

- an adequate amount of food energy,
- optimum proportions of protein, starch and fat,
- sufficient dietary fibre,
- an adequate amount of minerals, trace metals, vitamins and essential fatty acids.

If a diet meets an individual's energy needs and comprises a mixture of cereal foods, vegetables and fruits with some milk, milk products, meat, fish, eggs or pulses, and small quantities of fats and oils, then adequate amounts of nutrients should be present' (ILEA, 1985).

The ILEA material uses a system of food groups (as discussed below) to provide general guidelines for choosing a balanced diet.

The theory that the characteristics or attributes of the message will influence its adoption was discussed in section 6.4.6. This section will discuss the implications of adoption theory for both the content and methodology of nutrition education in schools, also for the provision of food in school meals. As discussed previously, the concept of a balanced diet rates poorly in terms of complexity, hence the use of food groups to communicate this message.

**The audience/recipient variables:** The need to relate the nutritional message to the beliefs, attitudes, needs and interests of pupils, implicit
in adoption theory, was established in section 6.4.6. The model shown in Figure 6.9 gives an indication of prior knowledge needed by teachers about their pupils;
- of existing food consumption patterns.
- of existing beliefs, attitudes and values relating to food and health
- of the situational factors influencing food choice,
- of the source and effect of outside influences on beliefs and attitudes to food and health.

Some of the data on food habits and nutrient intake of schoolchildren was discussed in Chapter Three. Some of the surveys providing information on schoolchildren's nutritional knowledge, beliefs, attitudes, and values concerning food and health were also discussed in this chapter. It was pointed out that the findings of these surveys had important implications for nutrition education. This section will examine, in addition, the findings of a survey by Newsome (1986) which provides useful information in this area. The author discusses the implications of her findings for both the content and methodology of a decision making model for nutrition education in schools.

As discussed previously, the food industry spends large amounts of money on market research to ascertain potential consumer characteristics before marketing their products. It is suggested that nutrition education needs to be based much more firmly on this sort of information, of which there is very little available in a co-ordinated or usable form.

An 'informed choice' or 'decision making' model for nutrition education, as shown in Figure 6.9, thus recognises the complex inter-relationship of the factors influencing food choice. While it is important when planning nutrition education to distinguish between content and methodology, this model illustrates the importance of discussing them together, 'subject content, however important cannot be divorced from strategies for teaching this content' (DES 1985).

The different elements of this model will be discussed separately in this section, however their inter-relationship is best indicated by reference to Figure 6.9. Designing methodology to take account of this inter-relationship is perhaps the most difficult aspect of nutrition education.

Two questions need to be considered by the nutrition educator when choosing objectives;
- what cognitive concepts need to be understood, or nutritional
knowledge provided in order that correct beliefs should be formed concerning the relationship between food and health, (ILEA 'nutritional messages')?

- what knowledge or information needs to be provided, skills taught, or concepts understood in order for the pupil to be able to translate behavioural intention into action (ILEA 'food groups')?

The right-hand side of this model indicates certain areas of content (concepts, knowledge and skills) which are necessary pre-requisites for informed choice.

The means of achieving these objectives, or communicating this content also need to be considered;

- how can this content be presented in such a way that it is understandable and applicable to food choice. This involves taking into account the pupils' stage of cognitive development, the attitudes and values of the pupil, and the influence of situational factors on food choice, also outside influences on beliefs and attitudes.

The above areas of content will be discussed, together with suggested strategies for teaching them. These strategies must take into account the motivational or affective factors and the 'situational' factors influencing food choice, shown on the left-hand side of Figure 6.9, (ILEA 'socio-economic context of nutrition')

Other questions of methodology will also be discussed;

- how can the pupil be taught decision making skills,
- how can the appropriate environment and conditions be provided in school for the translation of behavioural intention into action.

**Source and effect of outside influences.**

This model (Figure 6.9) recognises the effect of outside influences on the beliefs and attitudes, and thus the behaviour of the individual. It was suggested above that the starting point for the communication process should be the pupils' existing beliefs, attitudes and values relating to food and health. It is, therefore, important to know the sources of these. The findings of the survey by Newsome (1986) indicate the importance of the family. This survey, enquiring where pupils learned the most about food, revealed important influences on food habits (Table 6.7) in 80 per cent of cases it was from the mother, and another 16 per cent ranked their mother among the first five sources of learning.
Table 6.7 Sources of learning ranked according to gender.
(From Newsome 1986)

<table>
<thead>
<tr>
<th>BOYS</th>
<th>GIRLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mother</td>
<td>Mother</td>
</tr>
<tr>
<td>School</td>
<td>School</td>
</tr>
<tr>
<td>Books</td>
<td>Relatives</td>
</tr>
<tr>
<td>Relatives</td>
<td>Books</td>
</tr>
<tr>
<td>Father</td>
<td>TV Programmes</td>
</tr>
<tr>
<td>TV Programmes</td>
<td>Father</td>
</tr>
<tr>
<td>TV Advertisements</td>
<td>Friends</td>
</tr>
<tr>
<td>Magazines</td>
<td>Magazines</td>
</tr>
<tr>
<td>Friends</td>
<td>TV Advertisements</td>
</tr>
</tbody>
</table>

Newsome suggests that this 'corroborates the proposition that learning about food begins at birth, that socialisation is of utmost importance and is a phase where the basis for a future lifestyle is laid down'.

A MAFF survey in 1983, produced similar findings, (Table 6.8)

Table 6.8 Claimed sources of information on food and nutrition (adolescents, 15-25 years)
(From MAFF 1983)

(percentage of total mentions)

<table>
<thead>
<tr>
<th>Source</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parents</td>
<td>38</td>
</tr>
<tr>
<td>Friends</td>
<td>33</td>
</tr>
<tr>
<td>Newspapers</td>
<td>22</td>
</tr>
<tr>
<td>Specialist Magazines</td>
<td>11</td>
</tr>
<tr>
<td>Other magazines</td>
<td>28</td>
</tr>
<tr>
<td>Television</td>
<td>39</td>
</tr>
<tr>
<td>Radio</td>
<td>7</td>
</tr>
<tr>
<td>School or college</td>
<td>20</td>
</tr>
</tbody>
</table>

This research also indicates the importance of peer-group, the mass media, advertising and marketing material produced by the food industry. These outside influences affect both the belief system and the motivational system.
Skills required to evaluate nutritional information.

The increasing amount of information available from the mass media, and the food industry was discussed in sections 6.4.8 and 9, and nutrition labelling in section 6.4.10. The problem of conflicting nutritional messages transmitted by different 'senders' was also discussed, as was the need for consistency of nutritional message. An informed choice model for nutrition education therefore implies the teaching of skills which will enable pupils to analyse, interpret, and evaluate nutritional information and data and apply it to food choice.

The information from these sources relates to both the nutritional value of foods, and also to the relationship between nutrition and health. Information in the former area is easier for pupils to handle. This was recognised in the curriculum document 'Home economics 5 to 16' (DES 1985), 'although not all pupils will be able to understand research findings on the relationship between foods and health, the majority should be able to read manufacturers instructions and food tables with understanding in order to make considered choices'.

It is argued below and can be seen from Figure 6.9, that skills in the buying, storage, and preparation of foods are pre-requisites for the translation of behavioural intention into actual behaviour. It is, however, important to accept that much food consumed is in a processed and/or pre-prepared form, and while the acquisition of food preparation skills may lessen dependence on such foods, it is unrealistic to suggest that their use will decline very much. Thus it is important to help pupils to select a balanced diet from the range of foods available, hence the importance of pupils being able to evaluate the nutritional information relating to these foods.

With more and more information available from the food industry and the mass media, there is no shortage of resources. In addition, as long as there is no consistency of nutritional message, this is an important aspect of an informed choice model for nutrition education. This seems likely to become even more important as the flood of messages from these senders show no signs of abating.

This view is put forward by Newsome (1986) who points out that the media attempt to inform, but often confuse the public with so-called facts about food and health, and suggests that 'the need for sound nutrition education to help individuals to sort fact from fiction becomes more and more apparent'. This author also suggests that 'an important task of the teacher must be to help pupils to decipher and evaluate the mounds of
information available in order to make well-informed responsible decisions regarding food choices which in turn are choices regarding health'.

The evaluation of nutritional information is an important aspect of the ILEA 'Nutrition Guidelines' material, Watson (1985) suggests a number of teaching strategies, involving looking at and questioning food advertisements and food labels, to achieve this.

Cognitive concepts influencing the belief system.

It is suggested that an understanding of the following cognitive concepts influencing the belief system are necessary pre-requisites for informed food choice;

- the importance of diet as a factor contributing to health and the prevention of disease,
- the relationship between specific nutrients and health, emphasizing not only the prevention of deficiency, but also, and of particular relevance to the current discussion, the prevention of diseases related to an overconsumption or an imbalance of nutrients,
- nutrient requirements and recommendations for a healthy diet, RDA's and dietary goals, variation in individual requirements, needs of special groups of the population, again in relation to the current dietary recommendations,
- the concept of a 'balanced diet' to meet the above requirement and recommendations.

The ILEA Nutrition Guidelines includes a discussion of these concepts in a section on 'Nutrition Messages', based on 'Eating for Health' (DHSS 1978) and the NACNE Report (1983). The quantified dietary goals from this section are shown in Figure 6.10. This section also discusses the following nutrients which may be deficient in UK diets - iron, folates, vitamin B12, vitamin C, vitamin D, magnesium, copper and zinc. It is suggested that calcium should also be added.

These concepts can be 'learned' at a number of different levels. A number of authors have pointed out the importance of ensuring that nutritional concepts are understood rather than 'rote learned'. Traditional methods of nutrition education have been much criticised as tending to teach pupils about nutrients in such a way that often resulted in 'rote learned' superficial knowledge, and an inability to apply this
### Figure 6.10 Nutritional messages

(from Watson, 1985)

<table>
<thead>
<tr>
<th>Dietary component</th>
<th>Present average intake in the UK</th>
<th>Suggested average national intake</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starch</td>
<td>25-27% of total energy</td>
<td>INCREASE to 40-50% of total energy intake, by increasing consumption of unrefined* cereal foods, starchy vegetables and pulses</td>
</tr>
<tr>
<td>Dietary fibre</td>
<td>20g (wide variation) per person per day</td>
<td>INCREASE to 30g per day, by increasing consumption of unrefined* cereal foods, fruits, vegetables and pulses</td>
</tr>
<tr>
<td>Protein</td>
<td>12-15% of total energy</td>
<td>RETAIN with a greater proportion from unrefined* cereal foods, fruits, vegetables and pulses</td>
</tr>
<tr>
<td>Sugar</td>
<td>18-20% of total energy</td>
<td>REDUCE to not more than 10% of total energy intake, by decreasing consumption of sugar, sugary foods and drinks</td>
</tr>
<tr>
<td>Fats and oils</td>
<td>38-42% of total energy (with saturated fatty acids supplying 20%)</td>
<td>REDUCE to not more than 30% of total energy intake, by decreasing consumption of saturated fatty acids so that they supply a maximum of only 10% of energy intake</td>
</tr>
<tr>
<td>Salt</td>
<td>Approximately 12g per person per day</td>
<td>REDUCE to approximately 8g per person per day</td>
</tr>
<tr>
<td>Alcohol</td>
<td>Wide variation</td>
<td>Should not exceed 4% of total energy intake</td>
</tr>
</tbody>
</table>

*Unrefined — cereal foods which have not had their fibre content removed or significantly reduced during processing

These dietary goals must be considered in terms of food preferences, availability and the social and economic factors which govern the food choices people make. For example, a dietary goal of 30% energy supplied by fat may be unrealistic given current expectations about food and meals. However, this could be achieved over a period of time during which tastes change and the food and agricultural industries supply and produce foods with a reduced fat content.
knowledge to food choice or practical cookery. Lennon and Fieldhouse suggest that 'the lack of success of much nutrition teaching may be because the children acquire 'empty facts' without understanding of fundamentals, teaching of nutritional facts should be seen as a necessary step influencing food habits not as an end in itself'.... 'it is the practice rather than the knowledge that is important'. Ritchie (1967) also stresses 'the importance of the application of these (nutritional principles) in everyday life'.

Newsome suggests that 'in supporting a decision making model I do not deny the importance of factual information in programmes, but stress that information is only useful if it can be applied purposefully. An individual is only in a position to make a decision utilizing knowledge if he or she genuinely understands the relevant information'.

Therefore, the way in which these concepts are communicated is important.

Firstly, it is important that they are communicated in relation to the pupils' stage of cognitive development. Moody suggests that 'the timing of the introduction of nutrients as abstract concepts is important' but suggests that this should be the basis of nutrition teaching, 'meal choosing systems incorporated into the later stages of such a scheme would now be fully supported by background information'.

There are many who would not agree with him. Hogarth and Hadley (1985) suggest that 'attempts have been made to overcome the problems of the abstract notion of nutrients by including experimental work where detection by analysis is included'. This is the basis of the Nuffield Home Economics material. These authors suggest however, that 'the interpretation of the data is difficult, since it is not usually quantitative'. The use of dietary analysis programmes such as are used by both the Nuffield scheme and the ILEA programme may help provide some understanding of these abstract concepts, particularly in relation to requirements and recommendations.

Secondly these concepts must be communicated in relation to pupils' preconceived ideas or existing beliefs. As can be seen from Figure 6.9, these existing beliefs arise from outside influences such as parents, peer-group, media, advertisements and marketing material produced by the food industry. A number of authors point out the effect on the belief system of these influences and the importance of using existing beliefs as a starting point in the educational process.
Crockett (1985) suggests that 'the teacher expects (the child's) mind to be empty before the content of the lesson'. This author cites Watts (1982) who suggests that 'greater attention needs to be given to the understanding and prior knowledge that children bring to the classroom'. Crockett suggests that 'many teachers feel that these misconceptions will disappear when the 'right' notions are taught', and puts forward the theory that 'it is now clear that pupils often stick with their intuitions even when they have the requisite thinking skills or processing strategies to overcome them. It is likely that teaching which ignores misconceptions, or alternative ways of viewing the world, may make them more elaborate and stable instead of extinguishing them' (the problem and effect of multiple and often conflicting messages was discussed in sections 6.4.6).

Therefore, the beliefs that the pupils bring with them affect their perception of the concepts communicated to them by teachers often resulting in conflicting and confused conceptual pathways or frameworks. It is therefore suggested that it is important to design the methodology of nutrition education to determine what these existing beliefs are, or to attempt to understand pupils already existing conceptual pathways or frameworks, and then try to modify them rather than create completely new ones.

Thirdly, as can be seen from Figure 6.9, these concepts must be communicated in relation to pupils' attitudes and values relating to food and health, and also in relation to 'situational' factors influencing food choice. The implications of this for both the content and methodology of nutrition education in schools will be discussed below. Pupils' attitudes and values, also are affected by outside influences.

**Knowledge and skills required for the translation of behavioural intention into actual behaviour.**

It is suggested that knowledge and skills in the following areas (with emphasis on those aspects of particular relevance to the implementation of dietary guidelines), are necessary pre-requisites for informed choice,

- knowledge of the nutritional values of foods, dishes and meals, particularly in relation to the content of fat and different types of fat, carbohydrates including starch, sugars and 'added sugars', dietary fibre, salt and 'at risk' nutrients such as iron, calcium, folate, vitamin C, and vitamin D,
knowledge of the effect of different cooking and processing methods on the nutritional value of foods, particularly the addition of fat, sugar, salt, and removal of dietary fibre; also vitamin and mineral loss,
- skills in the buying, storing and preparation of foods, particularly those low in fat, sugar and salt, and high in fibre,
- knowledge of how to select foods which will meet nutritional requirements and dietary recommendations, i.e. how to choose a 'balanced diet'.

There has been much criticism of the traditional methods of teaching knowledge and skills in these areas. In the past, much home economics and nutrition teaching has resulted in the learning of nutritional facts and acquisition of food preparation skills being seen as separate and unrelated areas, and as ends in themselves rather than as the means of achieving a balanced diet. This was often attributed to the fact that examination syllabuses prescribed the food preparation skills to be taught. Very often these skills were not consistent with current nutritional thinking, the emphasis being on dishes and recipes high in fat and sugar and low in fibre, resulting in pupils receiving contradictory messages from theory and practical classes.

Teaching of these aspects often resulted in superficial 'rote learned' nutritional facts and food preparation skills. In order for concepts and knowledge relating to the nutritional value of foods to be understood and applicable to the choice of a balanced diet they too need to be communicated in relation to existing food habits, existing knowledge, and in relation to pupils' attitudes and values concerning food and health, and to other factors influencing food choice.

Applying communication theory, the starting point for work on this aspect could be the evaluation of pupils' own diets.

The availability of computer programmes for use in schools makes this feasible. This exercise also provides a starting point for a discussion of ways in which the diet may be changed, thus involving an examination of the various factors influencing food choice.

Such programmes can also be used for a wide range of activities to help pupils understand concepts in this area, and to help pupils to interpret and evaluate nutritional information about foods, food products, dishes, meals and diets in relation to recommendations or given criteria, also to apply their conclusions to the choice of a balanced diet. The
value of micro-computers in nutrition education was recognised in the recent curriculum document 'Home economics from 5 - 16', (DES 1985), 'problem-solving exercises may be devised in such areas as .... manipulating nutritional information relating to individual needs'. School meals could also be a useful resource in this area.

**Food preparation skills.**

There has recently been a move towards considerably less emphasis on the teaching of practical skills in home economics and nutrition. It is argued, though, that this aspect of home economics teaching should not disappear.

Knowledge of the nutritional values of foods and food preparation skills, together, are essential aspects of the above decision making model. In support of this Lennon and Fieldhouse (1982) cite Ritchie (1967) who suggests that nutrition education in schools should help children 'acquire skills in the production, storage, selection and preservation of food which will assist them in obtaining a good diet'. Lennon and Fieldhouse also suggest that 'the learning of skills is essential if theory is to be translated into practice'.

It is suggested that in the context of the current discussion on the implementation of dietary guidelines, a particularly important aspect of the teaching of skills should be the selection and preparation of foods low in fat, added sugars and salt, and high in fibre, and the modification of recipes in line with dietary guidelines. There is evidence that this type of work is increasingly becoming part of home economics courses.

Dewhurst and Lockie (1984) describe a pilot study to illustrate how the recommendations of the NACNE Report can be implemented in home economics courses. This is an area where further work is needed ascertain how traditional recipes can be modified in line with dietary recommendations.

The ILEA 'Nutritional Guidelines' material uses a system of food groups (discussed below) not only as a guide to the choice of a balanced diet, but also to provide a framework for the provision of knowledge on the nutritional value of foods and for the teaching of skills involved in the handling of foods. This section is based on the dietary goals from the 'nutritional messages' section, and emphasizes throughout the importance of foods low in fat, sugar and salt, and high in fibre.

This information is presented in the context of the socio-economic and cultural factors influencing food choice. Watson (1985) suggests that
the ideas examined in the nutritional messages and socio-economic sections are intended to pervade the whole framework within which learning about food occurs; the assumption is that teachers will present all their work 'flavoured' by the nutritional messages, and social and economic factors, and the teaching points (in the 'Teaching Matrices') focus on specific detail within this plan'. Table 6.9. shows some examples taken from the Teaching Matrices (Watson, 1985).

Watson suggests a number of teaching strategies for implementing dietary goals which involve encouraging the use of wholemeal flour or wholegrain cereal foods such as pastas and rice, starchy vegetables, particularly, where possible, those eaten primarily by ethnic minority groups like yams, sweet potatoes and plantain, and as wide a variety of fruit and vegetables as is available and a variety of pulses.

Suggested teaching strategies also involve encouraging the reduction of sugar and salt used in cooking and at the table, adapting recipes, using dried or fresh fruit or carrots as a sweetening agent, also the use of low fat recipes and low fat alternatives for dairy foods and meat, and the reduction of 'visible' fats on meat, for spreading and for frying.

**Communication of content - (concepts, knowledge, and skills).**

It was suggested that the nutrition educator needed to consider how the content discussed above could be presented in such a way that it is understandable and applicable to food choice, which involves taking into account the attitudes and values of the pupil and the influence of situational factors on food choice. Also it is important, based on adoption theory, that the communication of the message should take account of the attributes of the message itself, such as compatibility and relative advantage, both of which relate to the beliefs, attitudes and values of the audience.

Once again, therefore, the starting point is a knowledge of pupils existing food habits, their beliefs, attitudes and values relating to food and health, and of factors influencing food choice.

Newsome (1986) discusses a study investigating the factors governing food choice in a group of schoolchildren, some of the findings are shown in Table 6.10.
| Table 6.9. Examples taken from Teaching Matrices which show how nutrition information can be extended and illustrated by practical work and further discussion in class, (from Watson, 1985) |
|---|---|---|
| Section | Teaching point from the Guidelines | Practical application | Socio-economic context |
| Balanced diet | In the UK, a wide variety of foods available for us to choose from. | Make an exhibition of as many foods as possible — samples or pictures. How much do students already know about them? | Discuss where these foods come from and how, eg country, climate, transport, shops. What kind of processing have they undergone? |
| Balanced diet | Careful storage, preparation and cooking are vital for fruit and vegetables | Examine the effects of preparing and cooking cabbages on vitamin C content. | Cabbage can be prepared to look attractive and to retain its vitamin content. This is often not the case in institutional cooking. Discuss the reasons for and the effects of this. |
| Balanced diet | Using pulses to replace some meat and meat products increases dietary fibre as well as decreasing the fat content of the diet. | Make a dish based on a pulse to replace all or some of the meat in a more traditional dish eg curry, shepherds pie, rice and peas. | Compare the cost of this with the cost of the traditional meat dish. How important is cost? |
| Balanced diet | It is important to achieve energy balance in the diet. | Examine energy intake versus expenditure (eg by using ‘Energy’ programme). Cook a low-energy dish, which is tasty and nutritious. | Discuss the risks of obesity and ‘dieting’. It is important not to encourage the idea of slimming unless it is medically approved. |
| Food Group 1 | All the foods in this group provide some dietary fibre | Look at the ingredients listed on packets of breakfast cereals and on bread. How much fibre is contained in them? Make a wholemeal flour pizza. | What are the relative amounts of brown and white breads eaten? Make a survey of bread consumption, compare with national patterns. Discuss your results. |
| Food Group 2 | Fruit and vegetables are seasonal | Make a table of fruit and vegetables which grow in the UK and the season in which they grow. Cook a meal using vegetables in season. | Fruit and vegetables may be cheaper when in season. Compare prices. Discuss why seasonality does not always affect price, eg subsidies and pricing policies. What proportion of the family budget is spent on fruit and vegetables? |
| Food Group 2 | Fruit and vegetables are the main source of vitamin C in the diet. | Make a fruit salad (using no sugar) and calculate the vitamin C content of canned fruit salad. (Use computer programme ‘Nutrient’ for the analysis.) | Discuss why people might eat canned or frozen fruit and vegetables. Compare prices with fresh. How many of the class eat fruit and vegetables grown at home? |
| Food Group 3 | Baked beans are one variety of pulse food — the most popular one in the UK. | Prepare and cook your own ‘baked beans’. Make a balanced snack meal with the beans. Compare them for cost and taste with canned beans. Examine the label on the can. What are the ingredients? | Make a survey of the price of a variety of baked beans. Discuss competition between brands and value for money. |
| Food Group 3 | Processed foods in this group often contain salt and preservatives. | Examine a variety of processed meat and fish products. Look at the label. Where is salt on the list of ingredients? Which preservatives are present? | Discuss the reasons for adding salt and other additives such as colour. Methods of preservation have changed considerably. Which are the ‘traditional’ and ‘modern’ methods? |
| Food Group 4 | Women are advised to breastfeed their babies. The alternative is infant formula made from cows’ milk. | If possible, the class should watch breastfeeding or a film on breastfeeding. Make up infant formula, and compare differences in convenience and time with using human milk. | Discuss the factors involved in deciding whether or not to breastfeed. This is an area of conflict for many women, although it is now recommended by paediatricians. |
| Food Group 4 | Both calcium and vitamin D are particularly important at certain times (eg times of rapid growth) to prevent rickets or osteomalacia. | Using food from this and other groups, prepare a meal rich in calcium and vitamin D. | Discuss the role of ultraviolet light (sunlight) in the formation of vitamin D in the skin. |
Table 6.10. Pupils preferences regarding food qualities.
(from Newsome 1986)

Tasty
Good value for money
Fresh
Filling
Attractive
Nutritious
Quick and easy to cook
Sweet
Fun to eat
Spicy
Cheap
Slimming

Newsome suggests that the findings of her study 'enhance the understanding of the relationship between food habits and lifestyle characteristics'. This author points out the distinction between factors associated with ethnic origin and social class, and factors associated with lifestyles, 'different lifestyles can exist among families of the same ethnic origin or social class'.

Newsome suggests that the findings of the survey indicate that, while the ethnicity of individuals appears more closely associated with eating patterns than social class, (therefore indicating the importance of taking ethnic food patterns into account), inter-cultural food change has also occurred and thus stereotyped food habits could not be assumed.

Newsome also identifies important situational factors influencing adolescents' food habits, such as greater freedom of choice, compared with their parents, to make their own decisions with regard to what, where and when they eat, and greater spending power, increasing the availability of foods to choose from.

Newsome concludes that 'food choices are governed by personal norms and preferences and by cultural factors. Health considerations are of secondary importance'.

The findings of this survey, also those of Bull and Buss (1983), discussed in Chapter Three, illustrate the point made by Yarbrough (1981) that nutritional messages rate poorly in terms of compatibility, observability and relative advantage.
Newsome suggests that 'whilst the realization of good health through the adoption of sound eating practices may be deemed a worthy goal by nutritionists, probably few other people see this achievement as a worthwhile goal in itself. Certainly anyone who has attempted to tell a class of teenagers that if they continue to eat as they are doing they run the risk of developing heart disease in twenty or thirty years time will know the statement has little or no effect'. This clearly has important implications for methodology in nutrition education, communication must take these factors into account or the change will not be adopted.

Giffit et al (1972) also discuss this area, and suggest that the extent to which people are motivated to eat for reasons of health will vary, 'this is only one of the determinants of food choice ... a person who has always enjoyed good health, as many young people have can accept the fact intellectually that good food promotes good health, but will not accept the act that this knowledge should be put into practice - at least not yet'.

Nutritional changes, however, rate well on trialability, they can be tried out first.

It is therefore is important to find ways of presenting the nutritional message in such a way that minimises the loss of advantage in terms of, for example, taste, cost, convenience, emphasising the point that changes can be introduced gradually. The importance of taste as a factor influencing food choice in adolescents is clearly shown by this survey.

Consideration of these message attributes provides further justification for the argument, put forward above, that the acquisition of skills in buying, and preparation of foods which pupils will enjoy, and at the same time will constitute a balanced diet is an important aspect of nutrition education.

The opportunity provided by practical classes in home economics for pupils to taste and use a wide range of foods, to try new foods and new ways of preparing foods which are more in line with dietary guidelines, should encourage both an interest in and an experimental attitude to food choice and thus increase the likelihood of pupils consuming a balanced diet. These practical classes can also provide a focus for the discussion of the socio-cultural aspects of food choice.

Dewhurst and Lockie (1984) describe the rationale behind the recipe modifications tried in their project, 'rather than introduce completely
new recipes, those already in use were amended; they had been tried and tested and were liked by pupils; and it was felt that if changes were to be successfully accepted, the recipes had to remain palatable and realistic'. Table 6.11, shows examples of recipe modifications used in this project.

Practical home economics classes also enable a link to be made with school meals by providing the opportunity to try new foods and dishes before they are introduced into the school cafeteria. This, requires cooperation between those involved in nutrition education and school caterers (discussed in section 6.6). In one Surrey school, home economics teachers, in collaboration with school caterers, evaluated the use of different proportions of wholemeal flour in bread and other products and tasted different salads before they were introduced into school meals.

It is emphasized, therefore, that the teaching of these food preparation skills will involve an evaluation of the products in terms not only of nutritional value, but also in relation to factors influencing food choice, for example, socio-cultural factors, psycho-sensory factors, cost, and convenience. The tasting and eating of foods prepared is therefore an important part of this evaluation process. Ritchie (1967) suggested that one of the aims of nutrition education in schools should be 'to develop healthy attitudes to food and enjoyment of well prepared and nutritious meals'. It is suggested that practical work with food is one of the best ways of achieving this.

It can be seen from Figure 6.9, that the cognitive/belief system and the motivational/affective system interact in the formation of behavioural intention; also that 'situational factors' such as appropriate environment and conditions influence the translation of behavioural intention into actual behaviour. Therefore the cognitive concepts, knowledge, and skills, discussed above, must be communicated in relation to the various factors influencing food choice.

It was suggested in section 6.4, that there were several ways of grouping the variety of different factors that influence food choice. Most of these distinguished between extrinsic factors such as price, availability of food, and intrinsic factors which arose from the attitudes and values of the individual and from the culture of the society to which he belongs; or factors influencing availability and factors influencing acceptability.
Table 6.11 Recipe modifications and nutritional improvements

(from Dewhurst and Lockie, 1984)

<table>
<thead>
<tr>
<th>Recipe</th>
<th>Modification</th>
<th>Nutritional Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scrambled egg on toast</td>
<td>Wholewheat toast no butter or margarine spread on the toast</td>
<td>Increases dietary fibre, lowers fat</td>
</tr>
<tr>
<td>Apple crumble</td>
<td>Wholewheat flour reduced sugar skins not removed from apples</td>
<td>Increases dietary fibre</td>
</tr>
<tr>
<td>Fruit salad</td>
<td>No syrup skins left on fruit where appropriate</td>
<td>Lowers sugar, increases dietary fibre</td>
</tr>
<tr>
<td>Spaghetti bolognaise</td>
<td>Wholewheat pasta</td>
<td>Increases dietary fibre</td>
</tr>
<tr>
<td>Queen cakes</td>
<td>½ wholewheat flour ½ white self-raising flour</td>
<td>Increases dietary fibre</td>
</tr>
<tr>
<td>Eve's pudding</td>
<td>½ wholewheat flour ½ white self-raising flour reduced sugar skins not removed from fruit</td>
<td>Increases dietary fibre, reduces sugar</td>
</tr>
<tr>
<td>Banana loaf</td>
<td>½ wholewheat flour ½ white self-raising flour reduced sugar no salt</td>
<td>Increases dietary fibre, reduces sugar, reduces salt</td>
</tr>
<tr>
<td>Savoury cobbler</td>
<td>½ wholewheat flour ½ white self-raising flour reduced sugar</td>
<td>Increases dietary fibre, reduces salt</td>
</tr>
</tbody>
</table>

Note: Additional raising agent was required in all of these recipes. One teaspoonful of baking powder for every 50g of wholewheat flour was found to be satisfactory.
The ILEA 'Nutrition Guidelines' material has a section on 'the socio-economic context of nutrition'. Watson (1985) suggests that 'the consideration of social and economic factors opens up the study of nutrition far beyond the narrow confines of the structure and function of food and nutrients. The ideas examined in the socio-economic section are intended to pervade the whole framework within which learning about food occurs'. The nutritional messages are considered within the 'socio-economic context' of nutrition on the grounds that informed choice requires an understanding of the criteria for choice and the restrictions within which choice is set.

The grouping of the factors influencing food choice used in this material is shown in Figure 6.11. The authors suggest that 'the most basic control over what we eat is what is available at a price we can afford to pay. This is not under the direct control of the individual but is 'decided' by government or EEC policy, the food industry and the retail trade. From what is available at a suitable price, we choose within constraints. Some of these are of our own making, others are from family or society'.

Teaching strategies designed to help students appreciate these concepts are suggested; these are based on raising awareness by questioning motives and preconceived ideas.

Watson (1985) gives some examples of ways in which this may be done
- Encourage students to make a critique of their reasons for choosing or avoiding foods.
- Examine food taboos - not only those of others but those in our own culture.
- How and why do religious beliefs effect food choice?
- Are additives necessary? What do the E numbers mean?
- How important is peer group pressure?
- Are food habits changing? Collect data to show trends.
- What are the social and emotional connotations of giving, receiving and sharing food?
- Global food distribution food distribution is wildly unequal - famine in Africa, over production in Europe. Is there anything we can do to redress the balance?

Newsome (1986) suggests that an important task of the teacher is to emphasize that some potential and real health problems are created by societal and industrial factors over which the individual has little or no control, for example, food additives are not amenable to individual
Figure 6.11 Influences on food choice

(from Watson, 1985)
decisions, 'these larger societal and political issues require decisions which nonetheless can be and are influenced by determined individuals taking joint action. Nutrition education needs to address these issues also'.

**Appropriate environment and conditions**

As can be seen from Figure 6.9, Tones' model recognises the importance of appropriate environment and conditions for the translation of behavioural intention into action, this stresses the importance of ensuring that the tuck shop and school meals service (discussed in section 6.3) do reinforce the nutritional message in their provision of food.

Lennon and Fieldhouse (1982), citing the Schools Council (1971) refer to the 'hidden curriculum' including school meals and tuck shops. 'Every effort should be made by teachers at all stages of education to develop the link with the school catering officer and to recognise fully the potential value of the school meals service as an educational resource'...

"if the meal provided is well cooked and consumed in a pleasant environment it could form a useful addition to classroom teaching'.

Tuck shops also should be used as a vehicle for promoting sound food selection, 'whereas they may provide a worthy profit margin to strengthen school funds, they generally fail to support the development of responsible attitudes towards sound health'...

"it would not be difficult to replace the typical cariogenic offerings with more nutritious alternatives" (Schools Council, 1971). Perhaps this suggestion does not fully take into account the beliefs, attitudes and values of schoolchildren as revealed by the surveys discussed above.

Watson (1985) also suggests that 'the tuck shop and school meals are also 'food experiences', and points out that 'in many schools there are differing 'messages' being put across in all these areas'.

Newsome suggests that 'there is need to co-ordinate efforts regarding nutrition education throughout the school to ensure consistency, this needs to include policy issues such as the provision of tuck shops and school meals. At the moment, many schools are giving ambiguous messages to pupils concerning nutrition and this is serious fault which needs rectifying'.

These views therefore underline the argument that is central to this thesis, that in there is a need for liaison between those involved in
nutrition education and school caterers to ensure that the informed choice model of nutrition education can be followed through; to ensure that the foods are available and conditions are appropriate for behavioural intention to be translated into actual behaviour. This will be discussed in section 6.6.

How can decision-making skills be taught?

Both Tones (1979) and Newsome (1986) are advocates of an 'informed choice' or 'decision making' approach to nutrition education in schools. Tones cites the Schools Council Health Education Project 5-13 (1975), which points out 'the need not only to provide children with the information that they will need to make health decisions but equally important to put them through a positive process of decision making in order to prepare them for later vital decisions'.

Williams (1984) also argues the case for this approach, 'the practical considerations underlying a decision making model are firmly based in our present day society where choices are offered, where people are pressurised - by advertising, politicians, 'experts' of all kinds - and sooner or later, make some 'decision' about what they are going to do'. "It follows that we ought to teach people how to weigh evidence (what to take into account or what to discard) in making decisions that are in their own best interests'.

Tones admits however, that 'it is by no means clear how we teach effective decision making. It is true that an individual is only in a position to make decisions if he genuinely understands the relevant information, but what else is needed - apart from intelligence - is a matter of some contention'. Newsome agrees that 'there is little hard evidence suggesting that we know how to produce good decision makers'.

As was suggested earlier, children at school are already having to make decisions about food, everyday, hence the urgent need for those involved in nutrition education to consider the question of teaching decision making skills.

It was suggested in section 6.4.2, that values acted as a ranking devise for beliefs and attitudes which sorted out priorities for action, thus a decision-making approach to nutrition education in schools will involve helping pupils to explore and clarify their values in the area of food choice. Decision making is also a questioning and criticising
process, not only in the cognitive area but also in the affective or motivational area; pupils have to criticise and evaluate knowledge and develop values of their own. It is therefore suggested that decision making involves weighing priorities and taking decisions about values.

A number of authors and curriculum documents recognise that a decision making model for nutrition education is concerned not only with knowledge and skills, but also with attitudes and values, 'an important part of the work at all stages has to do with the development of attitudes and values and of the capacity to make judgements based on a reasonable consideration of evidence .... weighing the comparative merits of different courses of action', (Home Economics from 5 to 16, DES 1985).

Newsome suggests, on the basis of the findings of her survey, that 'having established that decisions about nutrition and food behaviour are matters which are often affective and cultural rather than cognitive and factual, individuals need to explore the values underlying their choices and behaviour'... 'if nutrition education is about encouraging individuals to make informed choices it has to take into consideration the current reasons for particular aspects of behaviour'... 'it appears clear that teaching for decision making must take into account approaches designed to explore and clarify attitudes and values'.

Tones cites Rath et al (1965) who suggests that 'schools should be concerned to promote decision making in the 'affective domain' - in other words to help children to reach decisions about issues which are emotional and controversial rather than factual or intellectual. This requires that pupils explore the values underlying their choices and actions'.

Both Tones and Newsome recognise the importance of appropriate teaching strategies and techniques to achieve this end, 'by employing various appropriate teaching strategies teachers hope to equip children with the skills necessary for making sound decisions' (Tones 1979). Newsome identifies the question 'what techniques and strategies are appropriate?' as a crucial one, but does not satisfactorily answer this question.

Tones cites examples of materials used in other curriculum areas (Schools Council Humanities Curriculum Project, 1969), mainly consisting of packs of 'evidence' as a basis for discussion of controversial issues. Evaluation of this project demonstrated 'significant changes in several
characteristics ... including self-esteem'. Williams also cites the Schools Council/Health Education Council materials 'Health Education 13 - 18', based on a decision making model.

While there is material relating to decision making in health education and other curriculum areas, there is, so far, little specifically relating to decisions concerning food and health in the context of, for example, home economics. This thesis argues for early development of such material as part of a carefully planned and evaluated programme relating specifically to food choice.

Thus, acceptance of a decision making model for nutrition education implies also an acceptance of the need for methodology which will help pupils to explore and clarify values. The problem of conflicting values has already been discussed; the role of the teacher in this process, therefore, needs to be considered.

Tones suggests that 'since the object of the exercise is not to promote any particular values, the teachers role is neutral', and points out that an essential feature of the Humanities Curriculum Project was that the teacher 'was expected to act as a 'neutral chairman' facilitating interaction and safeguarding the quality of the discussion'. Tones also noted that the results of this project suggest that the neutral approach might well produce more effective health promotion than more specific conventional health education, also that significant increases in pupil capabilities were only observed in those schools where the materials were used by teachers properly trained in the technique.

The role of the teacher in this process is also discussed in the 'Home Economics 5 to 16' document, 'on all these and other matters pupils' own parents already have views, some of which may be conditioned by religious or cultural background. It is most necessary that teachers be alert to and knowledgeable about the conflict of principles or loyalties which may arise and exercise tact in building upon pupils' existing knowledge and experience'...'in particular the conduct of discussion groups, which may form a valuable teaching strategy, requires careful planning and skilful handling if the debate is to be a real learning experience and not simply the reinforcement of traditional prejudices, most especially where sensitive issues are being considered'.

There is however, evidence that, while not specifically facing the issue of helping pupils to explore and clarify values, the need to teach decision making skills, within home economics, is being recognised. The
document that sets out assessment criteria for the new GCSE examination lists the following skills involved in the process of decision making:
- to analyse situations - by identifying the various human needs and materials involved, and to recognise the inter-relationship of these needs and factors.
- to recall, seek out, select, record and apply knowledge relevant to the needs and factors identified.
- to use investigative procedures,
  - to test and compare methods, materials and equipment,
  - to observe, measure and record observations accurately and systematically,
  - to interpret evidence in its various forms as a basis for making judgements and choices,
  - to justify judgements and choices in the light of evidence.
- to decide upon and plan a course of action which takes into account the priorities identified,
- to carry out the planned course of action by applying the required skills,
- to assess and evaluate the effectiveness of the course of action.

Recent educational initiatives such as GCSE, curriculum documents such as 'Home Economics 5 to 16' (DES 1985), material such as the Nuffield Home Economics scheme, are all evidence of a change in approach to nutrition education within home economics. The change is from a largely 'content based' approach to one that is also 'process based', of which decision making is an important aspect.

The Nuffield Home Economics Teachers Guide (1982) identifies six processes or broad general abilities and a number of separate skills, several of which may be involved in carrying through any process;
- observing - measuring, estimating;
- analysing - classifying, deciding criteria, identifying causes, interpreting graphs, using statistics;
- planning - suggesting and designing tests, suggesting hypotheses, selecting equipment, practical skills (dexterity and manipulation), reasoning logically;
- assessing - validity, relevant factors, accuracy, references;
- communicating - graphs, writing, speech, diagrams, maths.;
- applying knowledge - assessing ideas, evaluating results.

The National Criteria for GCSE emphasizes the importance of pupils
acquiring decision making and problem solving skills, and the importance of synthesis of knowledge and skills. They list the following management skills necessary for active learning and the synthesis of knowledge and skills;

- Investigational - factual recall, comprehension, interpretation of knowledge and instructions, analysis, discrimination, user-testing on performance and comparative performance, observations, recording of observations, selection of relevant information from observations required by a given problem, decision making, evaluation.

- Measurement - accurate measurement and estimation of area, shape, size, capacity, quantity, amount, weight, time, distance, temperature.

- Communication - the ability to read, interpret information, follow and give instructions, to learn new words, to understand technical terms and to be able to appreciate the importance of accuracy.

- Management - the effective management and organisation of time, money, energy/effort, materials, equipment and tools, human aptitudes and interests according to stated criteria for a given situation.

- Psychomotor - manipulation of materials, shape and form and the effective use of tools and equipment in order to produce desired results.

- Technological - according to availability and development.

It is suggested that all the above processes and skills are necessary pre-requisites for informed food choice. The choice of food within school meals as well as in other everyday situations, provides an ideal area for the acquisition of these skills and the practice of the processes. The authors of the GCSE document suggest that 'home economics pupils use the familiar situations of the household and social group as the platform from which to study the best use of physical and material resources' through the above processes.

6.5.5 Application of communication theory to nutrition education in schools

The view that communication theory should be applied to nutrition education in schools is supported a number of authors on the basis of the findings of nutrition education research.
Lennon and Fieldhouse (1982) cite Benson, who, as long ago as 1944, found that, in rural schools in the United States, children improve their food practices when they discover for themselves what changes they have to make, they are strongly motivated to learn about foods and apply what they learn to their own diets, and they also have access to the right kinds and amounts of foods.

Gifft et al (1972) discuss the role of the teacher, suggesting that this needs to be considered when deciding on methodology for nutrition education. These authors suggest that 'the educator functions primarily as a catalyst', providing the stimuli and involving the individual 'so that the learner acquires viable concepts - not just compartmentalised information or skills'.

Gifft et al discuss 'three guiding principles' based on communication theory, to be taken into account when considering methodology, stressing the importance of the teacher adapting to the needs and interests of the learner, - the response to a message is governed by the ratio between the anticipated benefit and the energy required to respond (relative advantage) - adaptation to the learners needs may mean making the response as easy as possible and choosing a message that the learner will view as relevant to him. These authors also stress the importance of, and discuss ways in which the teacher can develop communication with the audience and involve the learner, stressing that 'the educator must guide the learner beyond the accumulation of facts. Application automatically brings attitudes and values into play'.

Gillespie (1985) emphasizes the importance of considering 'the social context and interpersonal interaction' when designing methodology for nutrition education in school suggesting that the achievement of both short and long term nutrition education goals depends on the use of 'instructional strategies' and curriculum materials that use 'the social context and interpersonal interaction factors that have been demonstrated to impact learning, attitude acquisition, and behaviour change'.

This author suggests that it is through interpersonal influences that attitudes are acquired and behavioural patterns are changed. Research shows that competitive and individualistic learning do not create the social context and interpersonal interactions necessary for deeper-level learning and the modification of relevant attitudes and behaviours.

Gillespie lists the following instructional strategies that implement the social context and interpersonal interaction factors,
co-operative learning situations are structured so that participants work together to achieve mutual learning goals, inquiry learning involves stating a problem, selecting data sources, gathering data, processing data and making inferences, hands-on nutrition experiments and activities involving participants in such activities as planning menus, and purchasing, preparing and tasting various foods, out-of-classroom experiences where participants must apply what they have learned to actual shopping and consumption situations, the use of structured academic controversies involving participants taking opposing sides on an issue, explore their differences in opinion and information, and come to a consensus that incorporates the best ideas on both sides.

The author suggests that this last strategy 'has dramatic effects on achievement, retention, higher-level reasoning, positive attitudes towards the subject area, and continuing motivation to learn about an issue'.

Gillespie suggests that 'considerably more attention needs to be focused on training nutrition educators to more frequent and effective use of these instructional strategies and on developing curriculum materials that promote these strategies'.

6.5.6 Evaluation of nutrition education in schools.

It is suggested by both Giff et al (1972) and Tones, (1979) that evaluation was an important process throughout a nutrition education programme as it allowed both pupils and teachers to assess progress and make necessary amendments, and should be considered when planning the programme. Both these authors suggest evaluation must be clearly related to the aims of the programme, and to the criteria for success.

This is supported by Lennon and Fieldhouse (1982) who suggest that evaluation is an important part of any programme to teach new material, and that the purpose of evaluation is to determine whether the programme is effective in improving the overall standard of nutrition in the target group.

Newsome (1985) discusses the evaluation of a nutrition education programme, suggesting that evaluation of classroom practice needs to consider curriculum content, strategies and methodologies of teaching, resources and teaching aids, and pupil-teacher interaction, also a clear statement of programme aims and objectives.
Implicit in the acceptance of a decision making model for nutrition education is the acceptance of the criteria for evaluation.

Newsome discusses this area, 'if the main aim of nutrition education is to promote decision making skills, then it is deemed successful when it leads individuals to make decisions and to take actions which for them are responsible, logical and sound and which result in greatest benefits with the least disadvantages, whether or not we happen to agree with their conclusions. The decisions and actions may or may not be exactly what we hope for because may draw different but equally justified conclusions from the same set of given factors. This is the chance we take when we trust - as we must do - peoples' ability to think and act intelligently on their own, once we have completed our task'.

Newsome recognises that the acceptance of such criteria may be difficult for many nutritionists, 'when using a decision making model for nutrition education achievement is determined more by the clarity of thinking behind a decision or choice than by the behaviour itself. I acknowledge that it is very difficult to assess the soundness of an individuals highly personal process of decision making, however this is not a reason for choosing alternative models of nutrition education'.

6.5.7 Nutrition education and food choice in school meals - the use of a 'food group' scheme

Schemes which group together the wide variety of foods from which a balanced diet (in the traditional sense) can be chosen, in order to provide some sort of guidance towards the choice of such a diet, have been the basis of nutrition education for a long time.

The use of such schemes have been much criticised recently (NACNE Report, 1983; Turner, 1979; Moody 1981; Hadley and Hogarth 1985), largely due to the fact that these schemes evolve more slowly than the nutritional ideas on which they are based, and thus always seem to be one step behind.

This section will examine some of the criticisms of traditional 'food group' schemes and explore the idea that, while acknowledging the difficulty of classifying items as various as the foods and dishes that make up the changing British diet, it should be possible to devise a scheme which will give guidance to the consumer in the choice of a balanced diet in the redefined sense.

It is suggested that if such a scheme could be developed, it could form the framework for the provision of nutritional knowledge, the first step in any nutrition education process. This is the basis of the ILEA
Nutrition Guidelines (1985), discussed above. Such a scheme could also provide easily applied 'point of choice' guidance for the consumer.

This section will also examine the feasibility of the development and use of a scheme to provide 'point of choice' guidance in cash cafeterias in schools meals.

It is first of all necessary to discuss whether the use of a food choice scheme based on food groups, is compatible with a decision making or informed choice model for nutrition education.

As has been discussed earlier, and can be seen from Figure 6.9, knowledge of the nutritional value of foods is a pre-requisite for the translation of behavioural intention into actual behaviour. If this information is provided at point of choice, for example, at the cash cafeteria, it will enable those pupils who wish to, to choose those food items which will enable them to achieve dietary goals. However, as also has been discussed and can be seen from Figure 6.9, this information on its own will not ensure that children will choose wisely; in this model the belief system and the motivational system interact in the formation of behavioural intention.

It is thus suggested that such a scheme is not only compatible with, but could also be a useful aspect of a decision making model; it, however, should not be the whole of nutrition education, and should not be seen as a substitute for teaching decision making skills.

On the other hand, it could be argued that if nutrition education is effective, the use of food groups is not necessary; the defence, put forward by Mason (1985), of the use of symbols on food labels in the Tesco scheme (discussed in section 6.4.10) refutes this argument.

Early food choice schemes were based on the classification of foods on a 'functions of nutrients' basis. This scheme is criticised by Turner (1979) and the NACNE report (1983), suggesting with good grounds, that 'there is a need to discard much of the current approach to nutrition education, based as it is on the classification of 'protein foods' as 'body building', 'energy giving foods' for 'work and warmth', and 'protective foods' 'to prevent vitamin and mineral deficiencies'...'these food groups are of little relevance to current nutritional thinking'. While undoubtedly one could find schools in which such terminology is still used, the use of a 'food group' approach to nutrition education should not be condemned on the basis of one outdated example.
A number of other schemes group foods according to type. One commonly in use in North America and Canada, and subsequently adopted and then adapted by some organisations in this country, had four food groups, meat, fish and eggs; dairy foods - milk, cheese and yogourt; bread and cereals; and fruit and vegetables. Variations on this scheme had five, six or seven groups.

This type of scheme was criticised on a number of grounds, and later versions incorporated adaptations to meet some of these. For example, since, as it was pointed out, vegetarians do not eat meat or fish, and vegans no dairy products either, the meat group was adapted to include pulses and nuts, and called 'meat and alternatives'. Also, confusion arose over whether foods were being grouped according to biological origin or nutrient content, hence the differing views on where to classify potatoes; the common consensus that makes meal planning sense, if not biological sense, is to adapt the 'bread and cereals' group to include 'starchy staples' such as potatoes.

This type of scheme, however, was devised when the emphasis in nutrition was on ensuring adequacy of intake and therefore it is thought not to be relevant now. Another criticism is that the original 'four group' scheme did not make any reference to the place in the diet of fats and oils or sugar and sugary foods.

There have been a number of adaptations which have attempted to incorporate more recent nutritional thinking, by giving, in some way, an indication of the proportions of foods from each group which will constitute a 'balanced diet'. A number of ways of communicating this have been devised, for example,

- the Flour Advisory Bureau display the food groups in blocks of different size,
- the Milk Marketing Board use different sized segments of a wheel,
- the ILEA Nutritional Guidelines divides a circle into four sections, of equal size, but with bread and cereals and fruit and vegetables at the top; two extra sections containing fats and oils and sugar and sugary foods are outside the circle, to imply perhaps that these are not a necessary part of the diet.
- a Dutch scheme uses the petals of a flower, again using different sizes to convey proportions.
- another system displays the food groups in the shape of a pyramid to convey different proportions (Open University, 1985).

Most of these ways of encoding the nutritional message using
pictorial or graphical symbols have been devised by nutritionists, based on nutritional criteria. It is suggested firstly, that the use of a number of different ways of communicating what is basically the same message is confusing and thus weakens its impact, and secondly, that the message could have more impact if nutritionists were to work in conjunction with an expert on the design aspects of communication, who could contribute knowledge of the use of colour, shape, size and even movement to the communication of a nutritional message.

Another criticism or disadvantage of such a scheme is that within the food groups there is often no differentiation between for example, high and low fat meats and meat products or dairy foods, or high and low fibre cereal products, or way of indicating high sugar foods within any group for example fruit yogourts. A possible adaptation would be the use of symbols to represent high fat, high sugar, and high fibre foods. The use of such symbols was discussed as an aspect of nutritional labelling.

A final criticism is that such food group systems do not find a place for many of the 'composite items' which contain foods from more than one group, such as pizza, shepherds pie, or Lancashire hot-pot, and therefore such schemes are not related to the way in which foods are combined as meals and snacks. A number of schemes have been developed therefore on the basis of a 'meal choosing' pattern.

The Aquarian scheme devised by Finch (1978) is based on this approach. The terminology ('Mains', 'Fillers' 'Fruit and vegetables' 'Watery drinks', 'doubles' and 'trebles') has been criticised as idiosyncratic, but as Turner (1978) suggests the principle is a good one.

Turner suggests another scheme using this principle, and based on anthropological studies by Nicod (1974), who showed a 'deep-rooted, culturally determined structure to our meals, that may persist through major and minor meals, even to snacks'; each meal, and each course at a meal can be analysed in terms of its components, which will include some or all of the following; 'a centre item' (meat etc.), 'a staple' (potato, cereal), 'a trimming' (vegetable, fruit, jam etc.), and a dressing (gravy, ketchup, custard). However, removing differences in terminology, this scheme appears little different from that suggested by Finch.

Moody (1982) strongly criticises the use of 'over-simplified' schemes for nutrition education on the grounds that 'foods are inherently and notoriously difficult to group' and 'schemes such as the Aquarian scheme
pay for over-simplification by producing many anomalies'...'pupils who rely on such over-simplified schemes for their nutrition education will be ill-equipped to understand diet-health correlations, especially in the context of modern eating patterns'. Moody also suggests that such pupils will be ill-equipped to interpret nutritional labelling.

This criticism can be refuted on the grounds that such schemes should be used as an aid to the provision of knowledge, and to provide 'point of choice' guidance, rather than as the only form of nutrition education. The poor use of inadequate schemes in nutrition education in the past should not be used as a reason for not using a carefully devised scheme in the proper way in the context of current nutritional thinking.

Newsome (1986) in a study 'to test whether pupils would spontaneously use the food grouping system where they were being taught one in school, or, if not, what principle they would use to classify foods', concluded that 'many children find little relevance in food-grouping systems in common use', and 'therefore it is very unlikely that pupils will apply the system in planning and choosing meals outside the school system'. Again this is a valid criticism of many of the meal-choosing systems, using food groups, in current use.

Newsome also found that 92 per cent of the pupils said that they ate between meal times, and suggests that 'programmes need to change their emphasis from 'meal planning' to 'food choosing', recognising that snacks and convenience foods are a large part of many peoples diets today. Schemes need to work within the boundaries of existing eating patterns otherwise they will be irrelevant'.

Hogarth and Hadley (1985) list among other disadvantages of a food group system that 'it has never been demonstrated that this method of teaching is successful, ie. leads to changes in attitudes and behaviour'. They do however point out that this may not be due to a weakness in the method, but due to a 'lack of suitable evaluative techniques' and/or 'a lack of courage on the part of researchers to tackle the difficult problem of evaluation'. This again does not invalidate the argument for the appropriate use of a carefully devised food group classification.

Food group systems for nutrition education are almost exclusively discussed in the context of nutrition education in schools. It is suggested that a carefully devised 'food group' system, used and recognised by all those involved in nutrition education both in schools
and in the community, should be the basis of a co-ordinated food, nutrition and health programme in the UK, the aims of which should be to facilitate the implementation of dietary recommendations. It is suggested in section 6.7 that the role of the government should be to co-ordinate such a nutrition education programme; one of the first tasks of the group or organisation set up to do this might be to devise such a scheme, perhaps incorporating the best from existing schemes.

Such a scheme would have to be very carefully devised in order to fulfill certain essential criteria;

- it should incorporate current nutritional thinking, i.e. the idea that it is as important to discourage over consumption of certain foods as to encourage consumption of others.

- it should relate to and therefore fit into current eating patterns, which are continually changing; this implies a knowledge of (and therefore research) current eating patterns, and how and why they are changing (discussed in section 6.4.2), and also that the scheme should be flexible enough to be applied to a changing situation.

- it should be easily understood and applied in a practical situation, this implies research to ascertain how the 'message' or concept of a 'balanced diet' may be encoded in a graphical and/or linguistic code which would convey the intended meaning to the majority of people. It should be recognised that this requires the expertise of those in the field of communication working in conjunction with nutritionists.

It should be possible to devise a scheme to meet these criteria. The food group scheme used in the ILEA Nutrition Guidelines (1985) is one which, at present, most closely meets these criteria; 'the food group system was chosen because

- it is simple,
- it required no 'new' words to describe it,
- it is applicable in a multi cultural society,
- it is firmly food based' (Watson 1985).

It is suggested, however, that the pictorial representation (Figure 6.12) does require explanation, to give some indication of low fat foods within the meat and alternatives, and milk and milk products groups, and high fibre foods in the bread and cereals and fruit and vegetables groups. This is, however, made clear in the teaching material in which this scheme appears.

It must be emphasised that the use of such a scheme should not be the sum total of nutrition education. Whether the aim of nutrition education
A balanced diet

(from Watson, 1985)

A daily diet which includes food from each of these groups is likely to be a healthy eating pattern. However, many animal foods are high in fat so it is important to choose those with a lower fat content more frequently, eg white fish, chicken, lean meat, skimmed milk, low fat cheese.

These foods add palatability, food energy and some polyunsaturated fatty acids to the diet. They should not, however, replace foods from the four main groups and their consumption should be limited.
is to promote informed choice or to change behaviour, the provision of
knowledge, either at the stage of attempting to influence the belief
system (see Tones' health action model), or at the point of influence of
'situational factors', providing 'point of choice' guidance, is only one
aspect of nutrition education. The influence of the motivational or
affective system must also be taken into account.

If such a scheme could be devised and used as the basis of nutrition
education not only in schools, but also in the community by those such as
the food industry, including caterers, local health authorities by health
visitors and other health educators, there might be some continuity and
uniformity in the nutritional message received by people at various stages
in their nutrition career (see Figure 6.13) thus helping to reduce the
some of the current confusion. This would require a government co-
ordinated nutrition and health education policy.

Another scheme which is used (Health Education Council; Surrey
Education Authority) is one that uses the colours of traffic lights as
codes to classify foods into 'Stop and think foods', 'Go carefully - eat
in moderation foods' and 'Go Go Go foods'. This scheme is used by both
Surrey school meals and as the basis of nutrition education in Surrey
schools and therefore provides an example of good liaison between school
caterers and nutrition educators, and as such will be discussed in section
6.6. This scheme will not be discussed in this section as it tends to
promote the idea of 'good foods' and 'bad foods' rather than the idea of a
balanced diet. In addition, as was discussed in section 6.4.10. on
nutritional labelling there is considerable resistance to such a scheme
from both consumers and nutritionists.

6.6 THE NEED FOR LIAISON BETWEEN SCHOOL CATERERS AND NUTRITION EDUCATORS

It was suggested in Chapter Four that the proposed guidelines for the
nutritional aspects of school meals should not only emphasise the
importance of nutrition education to help children in their choice of
foods from the cash cafeteria, but should also recognise the need for
liaison between school caterers and those involved in nutrition education
in schools.

In section 6.3 it was suggested that the school caterer not only had
an important part to play in the provision of foods from which children
could choose a balanced meal, but that they should also see it as an
Figure 6.13 A nutrition career

(from Lennon and Fieldhouse, 1982)

PRIMAR Y SO CIALISATION

The Family

Food Practices
eg teeth-cleaning

snacking

Values and
Attitudes
eg religious proscriptions

cultural preferences

tastes

School

Information and
Food Skills

eg tuck shop

school meals

SECONDARY

SOCIALISATION

INFANCY

CHILDHOOD

ADOLESCENCE

MIDSPAN

ELDERLY

Sex

eg beer and chips

(masculine foods)

salad and muesli

(feminine foods)

Regional tastes

LOCAL NORMS

Re-SOCIALISATION

eg Slimming clinics

Campaigns

Professional education

IN FANCY

CHILDHOOD

ADOLESCENCE

MIDSPAN

ELDERLY

Sex

eg beer and chips

(masculine foods)

salad and muesli

(feminine foods)

Regional tastes

LOCAL NORMS

Source: Tones, BK (unpublished)
important part of their role to co-operate with those involved in nutrition education to help ensure the choice of a balanced meal.

It was suggested that the school caterer should be seen as an important member of the nutrition education team.

The role, in nutrition education, of the school caterer has been recognised for some time (this was discussed in Chapter One). More recently, a number of authors, including both those involved in school catering and those involved in nutrition education, point out the need for liaison.

Newsome (1986) suggests that 'there is a need to co-ordinate efforts regarding nutrition education throughout the school to ensure consistency, this involves policy issues such as the provision of tuck shops and school meals'.

Ball, (1985) pointed out that there has been 'a coming together of home economics teachers and advisors, community dietitians and caterers', citing the University of Surrey report (1984), 'it is particularly important that the nutrition educator should recognise the expertise with food which is possessed by the caterer and co-operate fully to ensure that the aim of guiding children towards a wise choice of food from the cash cafeteria is realised'.

Lawson et al (1983) also point out the role of 'suitably educated and enterprising' school caterers in the process of nutrition education.

Harrison (1983) asks 'School meals and food education - are they on separate tables'?... 'is it not time that the school meal was integrated within the overall food education of the school?' This author discusses the some of the possible reasons why school caterers have not, in the past, become involved in food education in schools, and suggests that those involved in nutrition education should 'treat the (school meals) organiser as a professional and identify the opportunities on a collaborative basis'.

Robert-Sargeant and Gray (1983), suggest that 'there is also a role for the school catering service to play a part in nutritional education. It provides an opportunity to relate theory to practice and to consolidate the message that nutritional knowledge and practice are important'. Pointing out that the choice that children make in the cash cafeteria is not necessarily a wise one, these authors suggest that 'the advent of free choice systems does offer an ideal opportunity to give guidance and to develop nutrition teaching in a practical and interesting way'... 'the foods available could be grouped on a nutritional basis so that each child
is allowed to select no more than one item from each group'. They do suggest, however, that this, and other possibilities, such as differential pricing, 'need to be carefully explored and their usefulness in practice carefully monitored'.

Potential and actual liaison between the school caterer and the nutrition educator will be discussed in this section with particular reference to ILEA and Surrey County Council.

There are a number of reasons why, and areas where there is a need for co-operation between school caterers and nutrition educators.

Firstly, as was pointed out by the Schools Council (1971), Watson, (1985), and Newsome, (1986), and discussed in Section 6.5, it is important that the school meals service (and the school tuck shop), in their provision of food, should reinforce, rather than conflict with, the nutrition education message being communicated by the nutrition educators. As was mentioned in Section 6.3, the School Catering Service in ILEA, have advised their school caterers to gradually introduce menu and recipe modifications (see appendix 2).

The need for liaison was also recognised by ILEA, following the recommendations of the University of Surrey (1984) report, ILEA Education Catering advised school caterers that 'they should respond positively to any approach from the school' and Head Teachers were advised that 'if your school intends to take some educational initiative in healthy eating likely to require catering support, it would be helpful if you would contact the catering organiser...'

Similar recipe and menu modifications introduced by Surrey County Council school meals service, following the NACNE report are discussed below. The liaison between school caterers and nutrition educators in this authority is also described below.

Secondly, it is important, if menu and recipe modifications are to be successfully introduced, that they are liked by children. It was suggested in section 6.5 that an important aspect of nutrition education in schools was to encourage children to taste and like as wide a variety of foods as possible to increase the likelihood of a balanced diet being consumed. It was suggested that Home Economics classes could be used as an opportunity to introduce and evaluate possible recipe modifications and new dishes before they were introduced into the cash cafeteria. Such an exercise was carried out in one or two Surrey schools. In addition it was suggested in
section 6.3 that, as in America, school meals committees might involve school caterers, nutrition educators and schoolchildren.

Thirdly, the area where the most extensive co-operation is needed is in the provision of 'point of choice' guidance at the cash cafeteria. The need for such guidance was shown by the study described in Chapter Five.

The area of work of the caterer and nutrition educator come together at the cash cafeteria service point. While recognising the already heavy workload and responsibility of both caterer and nutrition educator, if children are to be helped in their choice of food from the cash cafeteria, the caterer and those involved in nutrition education will need to work together - the nutrition educator to impart the attitudes to food and health likely to lead to wise choice of foods, and the caterer to provide a range of items from which a balanced meal can be chosen. This is less likely to be achieved by the caterer and the nutrition educator working independently. Here is, perhaps, the place for a 'food choice' scheme which will provide 'point of choice' guidance.

Several such food choice schemes are in operation in other countries - in France (McTaggart, 1980) and in Canada (Hurley, 1977) both involving colour coding of foods. Several schemes are being tried in this country, but so far, there is little evidence relating to their effectiveness.

The idea that those involved in nutrition education should devise a 'food choice' scheme based on food groups was explored in section 6.5. It was suggested that such a scheme should incorporate current nutritional thinking, be based on knowledge of food consumption patterns and be easy to remember and apply. It was also suggested that if such a scheme could be devised, after testing and evaluation in suitable schools, it could be used to provide 'point of choice' guidance at the cash cafeteria and that the monitoring of foods chosen from the cash cafeteria would serve as a method of evaluating the scheme.

Clearly, the development, use and evaluation of such a scheme would involve considerable co-operation between caterers and nutrition educators.

Alternatively, bearing in mind that caterers have limited time, guidance could be given more simply in the form of posters showing various of foods which will make a balanced meal, in contrast to a badly balanced meal containing items providing too much fat or sugar or both. This also would involve caterers and nutrition educators working together.

The food choice scheme used by both caterers and those involved in nutrition education in Surrey, based on a 'traffic light' coding was
described in section 6.5. The criteria used for coding foods are discussed below.

The food group system used in the ILEA Nutrition Guidelines material was also described in section 6.5. The committee writing this material had in mind, when devising these food groups, that they could be used to provide 'point of choice' guidance at the cash cafeteria. Despite the moves described above, liaison between nutrition educators and caterers in ILEA has not yet reached the point where this can be put into practice. Figure 6.14 shows how this system could be applied to meals commonly eaten in this country, it can be seen that these food groups could easily be adapted to provide guidance at the cash cafeteria.

Liaison between school caterers and nutrition educators - Surrey County Council 'Choosing Food for Healthy Living' campaign.

This campaign will be described in this section to illustrate the way in which liaison between school caterers and those involved in nutrition education can be established.

The campaign, 'Choosing Food for Healthy Living' promotes a programme of nutrition education in schools and colleges, the main purpose of which 'is to encourage pupils and students to be aware of the importance of choosing a healthy, balanced diet and to encourage them to reflect their knowledge of nutrition through their choice of food at the dining counter and elsewhere'.

The project, initiated by the School Catering Officer and the Senior Inspector for Home Economics for Surrey County Council following the publication of the NACNE report, is being run by the School Catering Service, in conjunction with the Inspectorate and home economics teachers. It forms an integral part of Community Health Education and has the full support of the Surrey Health Education Service (a service which is funded by District Health Authorities in Surrey and encourages health education in the community). In addition, the School Catering Service had the expertise, as their Catering Advisors, of a dietitian and a home economics graduate.

The aim of the campaign is to 'create a learning environment which will enable school and community - pupils, staff and parents, to make wise food choices and to consider the implications of this choice'.
Figure 6.14. Examples of Meals frequently eaten in the UK. (from Watson, 1985).

<table>
<thead>
<tr>
<th>Food Group 1</th>
<th>Food Group 2</th>
<th>Food Group 3</th>
<th>Food Group 4</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>roast potato*</td>
<td>cauliflower</td>
<td>roast beef**</td>
<td></td>
<td>*Fat content could be reduced by boiling instead of roasting</td>
</tr>
<tr>
<td>yorkshire pudding</td>
<td>carrots</td>
<td></td>
<td></td>
<td>**Cut the fat off</td>
</tr>
<tr>
<td>spaghetti†</td>
<td>green salad</td>
<td>bolognase sauce**</td>
<td>parmesan cheese*</td>
<td>†Wholewheat spaghetti is higher in fibre</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>*High in fat</td>
</tr>
<tr>
<td>pitta bread†</td>
<td>salad vegetables</td>
<td>houmous (chick peas and sesame seeds), olive oil</td>
<td>feta cheese*</td>
<td>†Wholemeal pitta bread is higher in fibre</td>
</tr>
<tr>
<td>rice†</td>
<td>spinach</td>
<td>groundnut stew*</td>
<td></td>
<td>†Brown rice is higher in fibre</td>
</tr>
<tr>
<td>tortilla</td>
<td>salad vegetables</td>
<td>refried beans*</td>
<td></td>
<td>*Fat content could be reduced by using lentils to replace some nuts</td>
</tr>
<tr>
<td>rice†</td>
<td>stir-fried vegetables*</td>
<td>chicken chop suey</td>
<td>bean curd</td>
<td>†Brown rice is higher in fibre</td>
</tr>
<tr>
<td>chapati</td>
<td>salad</td>
<td>chicken madras*</td>
<td>raita (yoghourt)</td>
<td>†Brown rice is higher in fibre</td>
</tr>
<tr>
<td>mashed potato</td>
<td></td>
<td>sausage*, baked beans</td>
<td></td>
<td>*Grill well to lower fat content</td>
</tr>
<tr>
<td>rice†</td>
<td>salad</td>
<td>halal meat*</td>
<td>yoghourt</td>
<td>**Include some salad or vegetables to improve nutritional value of meal(e.g tomatoes)</td>
</tr>
<tr>
<td>chapati</td>
<td>vegetable curry*</td>
<td>dhai*</td>
<td>yoghourt</td>
<td>†Brown rice is higher in fibre</td>
</tr>
<tr>
<td>rice†</td>
<td></td>
<td>pigeon-peas, chicken</td>
<td></td>
<td>*Fat content depends on cooking method</td>
</tr>
<tr>
<td>matzo meal</td>
<td>vegetables</td>
<td>kosher meat*</td>
<td></td>
<td>**Include some salad or vegetables</td>
</tr>
<tr>
<td>potato salad**</td>
<td>salad vegetables</td>
<td>quiche*†</td>
<td></td>
<td>†Fibre content can be increased by using wholemeal flour</td>
</tr>
<tr>
<td>roast potato*</td>
<td>vegetables</td>
<td>nut roast**</td>
<td></td>
<td>*Boiled potatoes have lower fat content</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>**Relatively high in fat. Reduce fat content by replacing some nuts with lentils</td>
</tr>
</tbody>
</table>
The objectives are
- to inform school and community of the main NACNE dietary recommendations,
- to enable pupils and staff to select a balanced choice of food items from the school canteen
- to increase awareness of the link between wise food choice and healthy living
- to increase the use of recipes which conform to dietary recommendations

It is suggested that all staff, home economics, health education, science and physical education can be involved in the implementation of these objectives and that all these areas of the curriculum have a place in the syllabus for teaching about food. However, it was suggested that 'ideally 'Choosing Food for Healthy Living' should be a core unit in Form tutor time'.

The means of achieving these objectives involve three main aspects, discussed in this thesis,
- provision of food by the caterer
- a food choice scheme used both by those involved in nutrition education and to provide 'point of choice' guidance at the cash cafeteria,
- liaison between school caterers and those involved in nutrition education

**Provision of food by the caterer**

The school catering service altered recipes and introduced new dishes and menus. These modifications involved reducing salt and sugar and using the wholemeal flour and whole grain rice where possible. In addition, food manufacturers were approached with a view to reducing synthetic additives, in particular colourings, from products used by Surrey School Catering Service. As mentioned above, some of the recipes changes were tried out in home economics classes, in the trial schools before they were introduced into the cash cafeteria.

Publicity for this project was important - details of some of the items available on the cash cafeteria were given in the press release. Scaled down versions of some of the new recipes were included both in the publicity material and in the teachers pack, for use in home economics
classes.

The use of a food choice scheme

The same scheme, based on traffic light colours is used both by those involved in nutrition education and also to provide 'point of choice' guidance at the cash cafeteria.

As was discussed in section 6.5.7. and 6.4.10, there are a number of criticisms of a food choice scheme using traffic lights. Another problem with such a scheme (and with others also) is to establish the criteria on which the different foods are coded.

Material in the information pack for school caterers explains the basis of the traffic light coding system, 'the aim of the coding is to make pupils aware of the current dietary guidelines and to enable them to reflect this knowledge through their choice of foods'.

- Foods high in fat, sugar or salt are coded RED
- Foods high in fibre are coded GREEN
- All other foods are coded AMBER

A number of additional points are made to provide further guidance.

1. Foods are coded in the context of the pupils diet as a whole, taking into account
   - the overall value of the food in the diet
     eg. Cheese and egg flan is coded amber
     - high in fat but nutrient dense
   - the acceptability of the food to the pupils - the coding system is used to encourage pupils to make a healthier choice between comparable foods
     eg. Muesli bar - amber        Iced buns - amber
     Chocolate cracknell - red     Doughnuts - red

2. For composite foods eg pizza, macaroni cheese, the coding is based on the main component of the food item
   eg. Pizza - mainly wholemeal bread base, with only a small proportion of cheese - coded green

3. To encourage pupils to increase the amount of fibre in their diet
a distinction is made in the coding between bread and pastry made with wholemeal flour and that made with white flour.

eg. Wholemeal filled roll - green
    White filled roll - amber.

It is suggested that 'the 'traffic light' system of food coding is an aid to an educated food choice that encourages pupils to select foods that make up a healthy, balanced diet'.

While recognising the criticisms of such a food choice system, this does put into practice a scheme which provides 'point of choice' guidance for children at the cash cafeteria, and as such can be tested, evaluated, and adapted where necessary. It also clearly illustrates the need for liaison between caterers and nutrition educators to set up such a scheme.

An advantage of this scheme is that the symbols used to convey the meanings are familiar to everyone (it was decided, however, that a food choice scheme for use with younger children would use different symbols to avoid confusion with road safety campaigns). The traffic lights also provide the campaign with an easily recognised logo for use on publicity material.

Establishing liaison between school caterers and those involved in nutrition education

This is probably the most important aspect of this project. As was stressed in Chapter Four, school meals must now operate on a commercial basis. This campaign illustrates the use of marketing methods not only to sell school meals but also to 'sell' nutrition education, an area discussed in section 6.4. Co-operation between school caterers and those involved in nutrition education reinforces both aspects. Liaison between school caterers and staff involved with the teaching of health and nutrition education in schools and colleges was necessary in order to put forward a common nutrition message to pupils and students.

There were several stages involved in establishing liaison.

The campaign began in the autumn of 1984 with a series of meetings, organised jointly by the Surrey School Catering Service and the Home Economics Inspectorate, where home economics teachers, catering staff and dietitians met to discuss the aims and objectives of the project, and
methods of implementation. Members of commercial organisations such as the Flour Advisory Bureau and the Milk Marketing Board were also present and a parent representative. Items from the new menus were sampled at these meetings.

Letters were sent simultaneously to home economics teachers and to school caterers to invite them to these meetings, asking each to invite their catering/teaching counterpart.

Early in 1985, following these meetings, new recipes and the 'traffic light' food coding scheme were introduced into four trial schools.

In June 1985 the scheme was launched to caterers and to teachers, following the success of the trial scheme, and from September 1985 it was introduced into every secondary school in Surrey.

Promotional material, teaching packs, information packs for caterers, posters, and handouts for the pupils were produced to support the campaign.

The teachers pack was designed to be used by all teachers not just those involved in home economics, it was hoped that the material would be used by form tutors, with home economics classes used to support the project. The teaching material was based on encouraging a decision making process to help children to decide on the colour coding.

Material for pupils (including 'traffic light' stickers), and material for parents (it was estimated that this reached 6,000 homes), and posters for classroom or school dining-room use were also produced.

In September 1985 there was a press launch. A press release aimed at creating pupil, staff and parent awareness was produced, whereby it was hoped to create demand.

The project received good press coverage in national newspapers such as the Times and Daily Telegraph, in local press, catering, home economics and nutrition press, also in 'Here's Health'. It was also featured on local and commercial radio and on Television London Plus.

It was felt that in retrospect that if the press launch had been held earlier, and the demand created before the launch to caterers and teachers, what little resistance there was in those groups would have been diminished.
Seven months after the campaign started an investigation was carried out in one of the trial schools to assess the impact the campaign had had on pupils' food choice and the extent to which the sales of certain food items had been affected.

Sales records from the autumn 1984 and autumn 1985 were analysed to discover whether the sale of high fat, high sugar food items had fallen, and high fibre, low fat food sales had increased. These figures were adjusted to allow for differences in school rolls.

### Percentage decrease in the sale of high fat/ high sugar foods
(Figures are 1985 results expressed as a percentage increase/decrease of 1984 results)

<table>
<thead>
<tr>
<th>Item</th>
<th>Percentage Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chips</td>
<td>13.9%</td>
</tr>
<tr>
<td>Crisps</td>
<td>44.2%</td>
</tr>
<tr>
<td>Sausage rolls</td>
<td>8.5%</td>
</tr>
<tr>
<td>Cornish pasties</td>
<td></td>
</tr>
<tr>
<td>Spring rolls</td>
<td>25.9%</td>
</tr>
<tr>
<td>Bought-in pies</td>
<td></td>
</tr>
<tr>
<td>Fruit cookies</td>
<td>6.8%</td>
</tr>
<tr>
<td>Cream whirls</td>
<td></td>
</tr>
<tr>
<td>Doughnuts</td>
<td>17.6%</td>
</tr>
<tr>
<td>Fizzy drinks</td>
<td>20.0%</td>
</tr>
</tbody>
</table>

### Percentage increase in the sale of high fibre/low fat foods

<table>
<thead>
<tr>
<th>Item</th>
<th>Percentage Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ploughmans</td>
<td>1027.6%</td>
</tr>
<tr>
<td>Jacket potatoes</td>
<td>1111.7%</td>
</tr>
<tr>
<td>Salads</td>
<td>386.7%</td>
</tr>
<tr>
<td>Fresh fruit</td>
<td>84.0%</td>
</tr>
<tr>
<td>Fruit juice</td>
<td>15.7%</td>
</tr>
</tbody>
</table>

(from - personal communication - Surrey School Catering Service)

This project, therefore illustrates a number of aspects that are involved in implementing dietary guidelines for school meals. It is suggested that an aspect which will require careful consideration is establishing liaison between school caterers and those involved in nutrition education, vital for the implementation of such guidelines.
6.7 THE IMPLEMENTATION OF DIETARY GUIDELINES - CONCLUSIONS - A NATIONAL NUTRITION POLICY?

It was suggested in section 6.1 that strategies for the implementation of dietary guidelines depended on the inter-relationship and relative importance of the two sets of factors (exogenous and endogenous) which influence food habits (figure 6.1). This view is supported by Nelson (1985) who suggests that 'the NACNE or COMA goals will only be achieved through adequate provision of the necessary foodstuffs and informed individual choice'.

There is, however, a dichotomy of views on the relative importance of these two sets of factors, and therefore of suggested strategies, this was also discussed in section 6.1.

Educative strategies are based on the theory that consumer demand is an important influence on the supply of food by the food industry, and that consumer demand for foods from which a 'balanced' or 'healthier' diet can be chosen can be stimulated by nutrition education. Legislative or regulatory strategies are based on the theory that consumer demand alone is insufficient to ensure the provision of such food; government policy or legislation is necessary.

In this chapter it has been argued that both types of strategy may be required. It is also argued that that an important role of government, via a nutrition policy, involving legislation if necessary, is to co-ordinate the interests and activities of those involved in nutrition education, creating consumer demand for healthier food, with those involved with the provision of food to ensure its availability. This section will examine briefly some of the arguments which have been put forward in favour of a national nutrition policy (or food and health policy), and discuss some of the suggested strategies. It was also suggested in section 6.1 that the proposed guidelines for school meals and any strategies for implementing these should be seen as an aspect of such a government policy.

6.7.1 The need for a National Nutrition Policy

As long ago as 1979, a number of authors pointed out the need for a national nutrition policy (Darke, 1979; Hollingsworth, 1979). The authors of the CAS Report (1979) put forward the case for a national food policy, suggesting that such a policy 'should not dictate the diet of the individual, but in the interest of health and well-being would co-ordinate
the activities of both the farming and food industries with those concerned with public health policies so that an adequate range of wholesome foods is available to the public'. The authors suggest that such an approach would help to give some stability in the planning of food production and supplies.

Also in 1979, the Royal Society of Health held a symposium entitled 'A National Policy for Nutrition?' at which, both the need for, and various aspects of such a policy were discussed, (Whitehead, 1979; Thomas 1979; Payne and Thomson, 1979)

In 1983 the authors of the NACNE Report, while not actually suggesting a national nutrition policy recognised that implementation of their recommendations would involve much discussion and reconciling of different interests, 'much will depend on the joint efforts of a large number of bodies in addition to the nutrition educators .... public attitudes to alter, agricultural practices, food manufacturing techniques and government and EEC regulations to change'... 'detailed analyses of the implications of this document for Government, the Health Departments, the Ministry of Agriculture, Fisheries and Foods, the Health Education Council and Industry will be needed and should involve each of the concerned bodies so that the most appropriate, cost effective and socially acceptable adjustments can be made'.

Following the publication of the NACNE Report, at the end of 1983, a number of authors (Robbins, 1983; Sanderson and Winkler, 1983; Walker, 1983) discussed the need for a national nutrition policy.

Robbins suggests that the government, as a first step towards such a policy, should accept the NACNE recommendations as dietary goals, 'the DHSS could provide the appropriate authority to the NACNE goals and through their responsibility for public health help co-ordinate their national implementation'.

Sanderson and Winkler suggest that 'formulating an effective food health policy involves a complex balancing of many interests and several strategies' (discussed in section 6.1) ... 'a nutrition policy must move beyond educating individual consumer-patients toward a balanced strategy involving all interested parties' ... 'negotiating a national food health policy with all the affected groups will be a long process'.

Walker also points out that 'a change to a new British diet will not come about only because of a consumer demand'.

In 1984 the authors of the COMA Report, while again not actually suggesting a national nutrition policy, made the following recommendations
to the government concerning the implementation of their dietary recommendations for the prevention of cardiovascular disease,

- means should be found to educate the general population of the United Kingdom in habits of eating and physical activity that will minimize the risk of cardiovascular disease and of obesity. The process of education should be started in schools.

- consultations should take place between the relevant government departments and the producers, manufacturers, and distributors of food and drink and caterers, which will lead to legislation and to Codes of Practice to improve public knowledge of the composition of foods, improve public awareness of the alcohol content of alcoholic drinks and lead to the provision of alternative preparations of some foods with lower contents of saturated and of trans fatty acids and/or common salt.

- consideration should be given to ways and means of encouraging the production of leaner carcasses in sheep cattle and pigs (for example by adjustments to the operation of the carcass grading systems).

- consideration should be given to ways and means of removing from the CAP those elements of it which may discourage individuals and families from implementing the recommendations for dietary change.

In 1984, following a recognition of the need to examine and analyse the implications of the recommended dietary changes for agriculture and agricultural policy, the Nutrition Society held a symposium at which various issues arising from the conflict between health and economic pressures on agriculture were discussed.

At this symposium, Marsh (1985) defined a 'health policy' as 'government actions designed to influence what we eat and the effect of this on those who produce our food '. He discussed the economic implications of a health policy, the impact on agriculture of proposed changes in dietary habits, also policy options by which the government might influence diet in relation to the economic context within which the industry operates, and the necessary adjustments in the agricultural sector.

Jones (1985) discussed the agricultural approach to a health policy, and the likely impact on meat production and the dairy industry.

In 1985, a symposium was held at Reading University discussing, from different points of view, 'Food Policy Issues and the Food Industries'. Various authors (Jupe, 1985; Yeomans, 1985; Richardson, 1985; Mason, 1985; Garrow, 1985) put forward the government, the consumer, the food industry
Despite all this interest and discussion there is little evidence, so far, of any government moves towards a coherent nutrition policy.

As recently as August 1986, the Lancet published an editorial entitled 'Britain Needs a Food and Health Policy; the Government Must Face its Duty' It was suggested that 'never since the Dig for Victory campaign in the 1939-45 war has Britain experienced such public awareness as it now displays of the importance of food to health. Despite this attention among its citizens, its government has of late produced little in the form of a national policy for healthier eating. The Ministers responsible often seem reluctant to face their duty - which undoubtedly includes the promotion of wiser eating habits' .... 'despite the scientific uncertainties which abound the government could, on the evidence available, adopt a less ambiguous stance'.

This editorial, while recognising initial steps taken by MAFF 'towards providing the public with essential information by way of labels on certain foods', strongly criticised the lack of government action towards a national nutrition policy; it was critical of government reluctance to endorse the NACNE recommendations, and interference with the publication of the JACNE leaflet, lack of official recognition of the HEC 'Guide to Healthy Eating', also the inadequacy of government labelling proposals (discussed in section 6.4.10). It was suggested that 'the vested interests which gain from the Government's recent reticence are a shrinking section of the food industry, but they are still influential'.

6.7.2 Suggested strategies or policy options

As well as recognising the need for a national nutrition policy, a number of authors have suggested and discussed various strategies which might be involved in such a policy. The dichotomy of views and suggested strategies have already been discussed. Various authors have put forward arguments in favour of different strategies.

Sanderson and Winkler (1983) suggest that pricing and/or regulatory strategies may be required.

A pricing strategy would involve altering the relative prices of foods 'to induce switching from harmful to healthful commodities' ... 'consumer choice among foods is already highly structured by the many financial instruments governments and international agencies use to raise
and lower prices - taxes, subsidies, tariffs, commodity agreements and direct fixing'. The authors suggest that 'present policies artificially raise consumption of products for which the NACNE working party recommends reductions eg. sugar, white bread, whole-fat milk and butter. The dietary effects of financial interventions are not considered because they are conceived as economic policies not as part of health policy'.

The economic factors influencing eating behaviour were discussed briefly in section 6.4.2, where it was suggested that the relative importance of price as a factor determining eating behaviour has not yet been ascertained sufficiently clearly to provide the basis of such manipulation of food prices. Both Payne (1979) and Marsh (1985) discuss the use of measures such as selective subsidies and taxation. Payne suggests that altering the relative prices of food items 'is more likely to affect the poor than the affluent' also that it 'smacks of coercion' and 'will not necessarily create any greater awareness of the risks involved'. Marsh also argues that a tax on food is 'a relatively blunt instrument in seeking to influence diet, except where it is heavily discriminatory against certain types of product'.

A regulatory strategy would 'structure the availability of foods through legislative and administrative controls'. Sanderson and Winkler suggest that present compositional regulations are 'doing nothing to promote nutritional quality' and are 'often nutritionally regressive'. They suggest that 'the present pattern of disease suggests we should incorporate nutritional criteria into food regulations' and that 'the role of the Food Additives and Contaminants Committee, on which doctors sit, could be correspondingly expanded'.

Strategies regulating the composition of foods do not meet with favour from either consumers' organisations or the government. Yeomans (1985) suggests that 'consumer organisations are not among the band of new puritans who think that some foods are so bad that they should be banned or their composition changed by law ... manufacturers should not be required to reformulate products ... since there is no such thing as a bad food only bad diets'. Jupe (1985) puts forward the government point of view 'British Ministers are not in favour of anything more than the absolute minimum of controls on the composition of food'.

Marsh (1985) discusses two other policy options which have been suggested;
- rationing - 'an attempt by legislative action to limit the quantity
of some food or foods consumers may buy seems unthinkable. To impose rationing in peace time would involve many problems it would also be inefficient, there is immense difficulty in relating individual entitlement to personal need. Research and development - 'it would be perfectly feasible to stimulate research in directions which give greater priority to received wisdom about diet'. Marsh suggests that such research could be directed towards finding substitutes (eg. artificial sweeteners) which avoid some problems of traditional products, to producing improved traditional foods (eg. leaner meat) or to removing undesired characteristics of food whilst leaving the consumer with an attractive product. This research could be 'pursued by the agricultural sector or in the food manufacturing industry, it could be stimulated by matching adjustments in agricultural price policy to encourage the use of new products'. There have been a number of initiatives in these areas, discussed in section 6.2.

A number of authors favour educative strategies Darke (1979), Hollingsworth (1979) and Widdowson (1985) as discussed previously, all favour such strategies.

Some authors favour the principle of free informed choice others favour persuasion.

Marsh (1985) discusses persuasion as a policy option, suggesting that 'the publication of advice to consumers is feasible and not costly'. This author discusses possible strategies which may be used by the government; it may seek to influence all sectors of society through the media, to persuade press and television editors to spend more time on the dietary merits of 'approved foods', it could stimulate health education in schools, it can ensure that foods are labelled in ways which help the concerned consumer to discriminate. it can help create a climate of demand for 'low-fat', sugar-free, foods which will provide a market for the food firms which will encourage them to invest in the production of such products.

Marsh suggests that 'commercial marketing skills may well be harnessed to changing consumption towards a better diet', noting that such persuasive activities are already undertaken by several governments and more seem likely to follow this direction.

Marsh also discusses the likelihood of the government adopting such a policy and some of the possible objections and implications. This author
puts forward the view that 'if governments take seriously the advice they have received, they may attempt to influence eating habits in a 'healthy direction'. Indeed if public opinion is convinced by such guidance it may press governments to 'take action'........ 'no government wishes to be seen to be careless of the nation's health thus this sort of propaganda seems likely to form an important part of health policy in the next few years'.

Marsh suggests however, that 'the concern expressed in recent expert advice about diet could have very serious consequences for the agricultural and food industries' .... 'labelling rules may raise objections among food processors, reduced consumption of fats and sugar may cause problems for farmers'. This author concludes that 'the scope for introducing a 'health policy' is constrained by political and economic limits which suggest that governments will have to rely on persuasion to encourage people to eat a 'better' diet. Unfortunately, success in this direction will intensify the already serious adjustment problems facing agriculture. Farmers will need to respond in ways which lead to both higher quality and lower cost'.

Both Jupe (1985), and Yeomans (1985), putting forward the government and the consumer view respectively, favour the principle of free informed choice.

Yeomans suggests that 'the principle of our society is freedom to make an informed choice .... consumer organisations think that consumers must be free to make their own dietary decisions based on informed choice .... new policies are needed to ensure that consumers are provided with sufficient information to enable them to make an informed choice about the food they eat and to change to a healthier diet if they so wish'.

Jupe suggests that 'their (British Ministers') general policy is that people should be left free to produce or to buy whatever they want, provided that everybody knows what it is'; adding that 'one of the first duties of the government is to promote the good health of the public ... the government is most certainly anxious to ensure that people should eat prudently and that they should avoid possible, and in any case unnecessary risk'. This author expresses concern that 'exaggerated advice on diet will confuse and obscure other and perhaps more vital messages on health ... dietary advice should, therefore, never be exaggerated or it may rebound not only on itself but on the more certain advice as well.... in dietary policy, the Government's approach is to maintain a sense of proportion, and to act and advise only on firm scientific evidence or - at the least -
on the consensus of responsible scientific opinion'.

Payne and Thomson (1979) also favour this principle, 'the situation that should be aimed for is one of people making free informed choices' .... 'the only possible worrying aspect of this is that individual's choices may not be informed. The remedy for this is to put more resources into nutrition education programmes'.

Both Payne and Thomson (1979) and Sanderson and Winkler (1983), however, express doubts about educational strategies, mainly on the grounds that such strategies have not been effective in the past. Payne and Thomson suggest that 'these have not been notable in the past for changing individual behaviour' ....'one might be happy with a situation where people are undertaking considerable risks given that they are aware of them'. Sanderson and Winkler suggest that 'the NACNE report confirms what some nutritionists have long recognised, the ineffectiveness of the educational strategy'.

6.7.3 A national nutrition policy?

The argument of this thesis is that a government policy is needed to co-ordinate the activities and interests of all involved to ensure that supply and demand for foods from which a 'balanced diet' may be chosen coincide.

While it is recognised that, in order to ensure availability of such foods, it is likely that there will need to be changes in both government and EEC agricultural policy, and possibly government Codes of Practice or legislation regulating the composition of some processed and manufactured foods, this thesis argues in favour of an educational strategy as an important aspect of a government nutrition policy, seeing such a strategy as, in the words of Garrow (1985), 'an essential first step'. This author expresses the hope that the JACNE (1985) publication 'will demonstrate that education of the consumer is an effective strategy in bringing into effect a national food policy, but we will have to wait and see'. The view of this author that 'with luck it may be all that is necessary', is, perhaps, somewhat optimistic.

The argument in favour of an educational strategy is put forward on the grounds, firstly that previous ineffectiveness is no argument against attempting to formulate an effective educational strategy, secondly that it is, in the words of Marsh (1985), 'feasible and not costly' (though this also is a somewhat optimistic view) and thirdly that consumer
organisations, the government, and a number of nutritionists are in favour of such a policy.

It was suggested in section 6.4.11 that the formulation of an effective nutrition education strategy would require a planned, co-ordinated and properly evaluated nutrition education programme with clearly defined aims and objectives. Such a programme would need to co-ordinate the interests, activities and expertise of all those involved. It was suggested that the government should set up an independent body representing the interests of all these, to stimulate and co-ordinate the necessary research, and to formulate an effective strategy based on the results of this research. Nutrition education in schools should be seen as an important aspect of such a nutrition education policy.

This view of a government nutrition policy is supported by both Thomas (1979) and Turner (1984). Both argue in favour of an educational strategy as an important aspect of such a policy, and suggest ways in which such a strategy may be formulated and implemented.

A recent Lancet editorial (1986) making suggestions for the formulation of a food and health policy also included an educational strategy, suggesting that 'a national food and health policy should be developed identifying the governments co-ordinating responsibility between all areas of national policy which affect food consumption'. The stages in the formulation of such a policy were discussed:

- a first step would be to identify healthy eating as the responsibility of a single Minister, 'at present it is passed to and fro between MAFF and DHSS, neither admitting or seeking responsibility'... a 'Minister of Health seems appropriate',
- to establish an inter-departmental committee to promote liaison
- most urgently, the government should produce and promote national dietary guidelines, scientifically acceptable to the professions concerned and expressed in as precise terms as possible, which can then be interpreted for the benefit of the public, in official pronouncements in newspapers and magazines, on radio and television and in other ways.
- a regular review of such guidelines
- the responsible minister would prepare and publish an annual report on the state of the national and the operation of his food and health policy.
Turner (1984) suggests that 'initiatives in different sectors need to be co-ordinated if they are to be effective and if we are to avoid further confusion .... there is a need for an overall plan (a nutrition policy) and we could also identify a need for leadership in implementing and co-ordinating that policy'. Turner suggests that leadership could come from the government via an 'executive arm' of COMA and that a co-ordinated nutrition policy should provide for;

- management of the flow of nutritional information to the public through the mass media and through professional channels,
- planned evolution in the nature of the food supply.

Turner suggests that the formulation and co-ordination of such a policy requires a mechanism for the;

- initiation of relevant nutrition research,
- integration and evaluation of research information to identify consensus of nutritional knowledge,
- translation of nutritional knowledge into specific health messages,
- planned (as opposed to arbitrary) dissemination of the consensus of nutritional knowledge and specific health messages.

Thomas (1979) reviews 'The place of education in a national nutrition policy' and suggests that 'orchestration of a national nutrition policy would require a central co-ordinating body of some sort, which might incorporate within its framework a section with special responsibility for educational aspects'.

This author also identifies the important question that must be answered before formulating a nutritional policy, 'what relationship between education and other measures does our society deem acceptable?' Thomas suggests that 'this question is the crucial one in any attempt to implement effectively a national nutrition policy'.

Thomas suggests a framework for the section responsible for 'educational aspects' of a nutrition policy; such a section would consist of a core 'information unit' and several (possibly three) 'working groups' which would 'focus at different levels of intervention'. This author suggests that membership of the different groups could be drawn from members of different government departments, educational establishments, professional bodies, and the food industry, also full time staff involved in the implementation of the educational aspects of a nutritional policy. There would be links between the groups at top level to provide an overall picture, 'this would then be incorporated into an overall Nutrition Policy Strategy'.

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Thomas suggests that the 'core information unit could have responsibility for monitoring the following:
- consumption patterns and food habits
- public attitudes and knowledge
- the appearance of new scientific information

This unit would also be responsible for 'translating nutritional guidelines into suggested patterns of eating akin to the habits of major groups of the population'.

Thomas suggests three working groups;
- firstly a multi-disciplinary group with special emphasis on expertise in curriculum development to consider the development of formal education; this group would be able to initiate research and development where necessary, and make recommendations with regard to implementation, also to liaise with examination boards, and to consider appropriate training of those involved in teaching the programmes designed.
- a second group with different skills would work at a different level of intervention, and would stimulate links between the core information unit and different communicators eg. journalists; this group would also be in touch with the food industry to co-ordinate co-operation in terms of advertising especially of new products created in response to a national nutrition policy, this group would also be concerned with labelling.
- a third group would be concerned with education designed for groups with special nutritional needs, with relevant information supplied by the core unit; this group would also need to be multi-disciplinary to take into account the implications of decisions such as the training of health professionals.

In the current climate this may seem a rather ambitious plan; Thomas does point out, however, that 'there may well be existing arrangements and organisations already fitted for a particular place within such a strategy'. The Joint Advisory Committee on Nutrition Education (JACNE) was convened with a membership similar to that suggested by Thomas; however this group does not seem to be having the authority or impact envisaged by either Thomas or Turner; nor do they appear to be taking account of the need for the research base that such a nutrition education programme requires. This Committee has since been disbanded.

It was suggested in section 6.4.11 that an independent body representing the interests of all involved should be set up to formulate and co-ordinate the implementation of a nutrition education policy. Such a
body would need to consider several stages and tasks.

Firstly they would need to arrive at a consensus interpretation of the evidence relating diet and disease and co-ordinate any further research in this area. The NACNE report was supposed to represent the consensus interpretation of the available evidence, 'an authoritative statement of the present consensus over the field was needed ... this paper presents a consensus of views'. Yet this report has not been officially accepted as the basis for dietary goals. Robbins (1983) suggests that 'NACNE provides an opportunity for national dietary goals and the source of coherence and guidance in formulating dietary advice and activities ... for dietary goals to be applied effectively they must be endorsed at a national level. At present, lack of UK national goals both encourages the proliferation of confusing advice and discourages the more general adoption of scientifically sound advice'. This is only the first stage in the implementation of dietary guidelines.

Secondly such a body would need to formulate a consistent nutritional message, based on the above consensus view, to be communicated by all those involved in nutrition education. The misconceptions and confusions arising from the number of conflicting messages currently being communicated were discussed in section 6.4. The suggestion that the nutritional message should be a redefined idea of 'a balanced diet' was discussed in section 6.4.6.

Thirdly this body would need to stimulate and co-ordinate the research needed to provide the basis for effective communication of this message. The suggestion that there was a need to apply the findings and research methods used by behavioural scientists to the problem of changing eating behaviour was discussed in section 6.4. The considerable gaps in the knowledge that is needed for effective nutrition education were discussed in this section and the need for further research stressed.

The strategies involved in the implementation of the proposed guidelines on the nutritional aspects of school meals are exactly analogous to those involved in the implementation of dietary guidelines in the community as a whole. A provision strategy needs to be employed by school caterers to ensure availability of foods from which a balanced meal can be chosen. At the same nutrition education in school is important both to stimulate demand for such foods and also to provide guidance in the
choice of a balanced meal from the foods available. Liaison between caterer and nutrition educator is necessary to ensure that supply and demand coincide. It is therefore suggested that the proposed guidelines on the nutritional aspects of school meals should be seen as part of an overall national nutrition policy.

The interaction between nutrition education in school and in the community was discussed in section 6.5, it is therefore suggested that nutrition education in school should be seen as an important aspect of a nutrition education strategy such as is discussed above.

A number of initiatives both in the provision of food by the food industry and caterers, and in nutrition education in schools and in the community have been discussed in this chapter. It is suggested that these provide perhaps the strongest argument of all in favour of a national nutrition policy, to co-ordinate the expertise of all those involved in separate initiatives and to learn from the evaluation of these various projects, so that the implementation of dietary guidelines in school and community may be more effective.
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CONCLUSION

In this thesis the argument has been developed that, on the grounds that the school meal still has an important role in the nutrition of schoolchildren in the 1980's, the government should once again assume responsibility for the nutritional aspects. It is suggested that the previous nutritional standards should be replaced by 'guidelines on the nutritional aspects of school meals' to take account both of current nutritional thinking and the present socio-economic context of school meals. It is also suggested that such guidelines should be seen as one aspect an government national nutrition policy.

The history of the school meals service from the beginning of this century until the 1980 Education Act is traced in Chapter One, with the changing socio-economic conditions, and against the background of the developing knowledge of the role of nutrition in the growth and health of children.

From the Second World War onwards the school meal was seen as an important part of national welfare provision, and the contribution made by the school meal to the nutrition of schoolchildren was seen as an important one. Nutritional standards, first set in 1941, established the nutritional content as equivalent to a main meal of the day.

The school meals service was reviewed in 1975, and two very thorough reports 'Nutrition in Schools' and 'Catering in Schools' (DES, 1975 a & b) laid the foundations for a more flexible service consistent with social and economic conditions and nutritional needs of the times. While recognising the difficulties of applying set nutritional standards in a system allowing more flexibility and freedom of choice, it was felt that previous nutritional standards, different only in detail, should remain.

The changes in school meals provision following the 1980 Education Act, which removed from Local Education Authorities the obligation to provide a meal of set nutritional standard, except for those children entitled to free school meals, were examined in Chapter Four. The rationale for these changes was overtly economic, and the main effect of this Act was to force many authorities to give commercial considerations higher priority than nutritional ones.

Consistent with this more commercial approach, to meet consumer demand, there were changes in the type of food served, and a large scale transfer to a 'cash cafeteria' form of service, where the nutritional
value of the meal consumed was very much more dependent on the child's choice of food. Obviously, set nutritional standards, as prevailed before this Act, could no longer be applied.

Concern was expressed by a number of authorities regarding the effects on children's health of such changes. It was suggested that Local Education Authorities would need to find ways of providing a more cost effective service, yet at the same time, fulfilling their traditional role in meeting children's nutritional needs.

Over the same period of time, from the mid 1970s onwards, there has been a revival of interest in the relationship between nutrition and health, attention now being focused on diseases and conditions caused not by inadequate nutrition or a deficiency of nutrients, as was more often the case in pre-war days, but instead by overnutrition or an imbalance of nutrients.

The changes in food consumption and nutrient intake, the trends in mortality and morbidity statistics, and the development of the idea that diet was an aetiological factor in many of the current 'diseases of affluence', were examined in Chapter Two. This idea lead to the suggestion that dietary modifications would help in the prevention of such diseases. The need for a Government initiative firstly, to endorse suggested dietary goals which attempted to quantify these modifications, and secondly, to provide a co-ordinating policy to facilitate their achievement, was also discussed in this chapter.

The complexity of the issues involved in the implementation of dietary guidelines were recognised. This lies in the inter-relationship between the consumer, the food industry, the government and the scientific community. It was concluded that, despite controversy, there was sufficient consensus of opinion to be able to formulate quantified dietary goals. It was also concluded that further research and discussion was required on several of the issues involved in the achievement of dietary goals.

The evidence relating to the importance of nutrition in the growth and health of schoolchildren and adolescents was discussed in Chapter Three, emphasizing that the diets for these groups must provide sufficient energy and nutrients for growth.

On the other hand, the evidence concerning the relationship between childhood and adolescent diets and the aetiology of degenerative diseases in adulthood was considered, and it was concluded that there is sufficient
evidence to justify the application of current dietary recommendations, with minor modifications, to the diets of these groups.

Also referred to in this chapter, were the social and economic changes which had occurred over approximately the same period of time, from the mid-1970's onwards which, with changes in welfare provision, had contributed to adverse changes in socioeconomic circumstances of some families. The concern expressed over the effects of these changes on the nutrition, and thus the health and growth of children from these families was noted.

It was thus concluded that, on all these grounds, there was no room for complacency or lack of interest in the role of nutrition in the health and growth of schoolchildren. The evidence relating to the important role of the school meal in the overall nutrition of schoolchildren, particularly in those children from lower socioeconomic groups was discussed in Chapter Four.

It is thus suggested in this thesis, firstly, that the 1980 Education Act, changing the provision of school meals, was based on inadequate consideration of the importance of nutrition in the health and growth of schoolchildren in the 1980's, and secondly, that the Government should acknowledge the important role of the school meal in the nutrition of this group, and once again assume the responsibility for ensuring that this role is fulfilled within the nutritional, social, and economic context of the 1980's.

Towards this end, suggested guidelines for nutritional aspects of school meals are discussed in Chapter Four. It is suggested that these should incorporate;

- quantified dietary goals based on current dietary recommendations. These could be used as the basis for evaluating and monitoring the nutritional value of school meals, and also, together with dietary guidelines, which translate these goals into foods, as the basis of planning and purchasing for school meals.

- suggestions for implementing dietary guidelines. These should emphasise firstly, the importance of nutrition education to guide children's choice towards a balanced meal, and, secondly, the role of the caterer, not only as provider of foods from which a balanced meal may be selected, but also as an acknowledged member of the nutrition education team.

An empirical study of the nutritional value of midday meals in a
sample of London secondary schools is described in Chapter Five. This study, by a comparison of 'traditional meals' with cash cafeteria meals, and an examination of food choice in school meals, indicated the need for both dietary goals and dietary guidelines to guide purchasing and menu planning, and also for nutrition education to guide children's choice towards a combination of items from the cash cafeteria which form a balanced meal. This study also, by a comparison of school meals and midday meal alternatives, indicated the potential contribution of the school meal to the nutrition of schoolchildren.

In Chapter Six the implementation of the proposed guidelines on the nutritional aspects of school meals were examined in the context of the wider issues involved in, and strategies suggested for, the implementation of dietary guidelines in the UK.

It was proposed that, since the achievement of dietary goals would involve a modification of food habits, strategies for the implementation of guidelines both in schools and in the community as a whole would need to recognise the interaction of two sets of factors on eating behaviour, those associated with availability of foods and those with acceptability. It was suggested that a combination of strategies would probably be needed, those which influenced the availability of foods from which a balanced diet could be chosen and those aimed at creating demand for such foods.

The role of the school caterer and the food industry in the provision of foods from which a balanced diet could be chosen, and some of the steps taken in this direction were therefore examined.

The actual and potential relationship between nutrition education, both in schools and in the community, and eating behaviour was also examined.

It was concluded that, just as liaison between school caterers and those involved in nutrition education was necessary for the implementation of the guidelines for school meals, the role of a national nutrition policy would be to co-ordinate the activities and interests of all those involved in the provision and consumption of food and in nutrition education to ensure that supply and demand coincided. It was suggested the proposed guidelines for school meals should be an aspect of such a government nutrition policy.

It was suggested in this chapter that the view that nutrition education had not been effective, in the past, in changing eating behaviour was not a valid argument against an educative strategy. However
such a strategy would have to go beyond just providing nutritional knowledge to take into account all the factors influencing behaviour.

This chapter examined the suggestions that there was a need to use the research findings and methods of the behavioural scientist as the basis of nutrition education. The many gaps in knowledge in this area and need for further research were emphasised.

It was concluded that an important aspect of a national nutrition policy should be an educative strategy, and that there was a need for an independent body to co-ordinate the activities and interests of all the various agencies at present involved in nutrition education to ensure consistency of message and effective communication. It was suggested that nutrition education in schools should be seen as an important aspect of this nutrition education strategy.
APPENDIX I

Tables of mean values for all nutrients analysed for all sampled meals each day in a boys school and a girls school - traditional service and cash cafeteria meals.

Tables of dispersions of analysed data - standard deviations, range of values, distribution of values, for sample days in sample schools.
Table 1  Preliminary nutritional analysis of school meals at a boys school

Figures are means of data.

<table>
<thead>
<tr>
<th></th>
<th>TRADITIONAL SERVICE</th>
<th>CASH CAFETERIA SERVICE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DAY 1</td>
<td>DAY 2</td>
</tr>
<tr>
<td>% RDA</td>
<td>(21 MEALS)</td>
<td>(23 MEALS)</td>
</tr>
<tr>
<td>ENERGY</td>
<td>37.8</td>
<td>29.5</td>
</tr>
<tr>
<td>PROTEIN</td>
<td>38.1</td>
<td>33.7</td>
</tr>
<tr>
<td>THIAMIN</td>
<td>28.5</td>
<td>25.5</td>
</tr>
<tr>
<td>RIBOFLAVIN</td>
<td>36.1</td>
<td>26.3</td>
</tr>
<tr>
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<td>52.4</td>
</tr>
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<td>20</td>
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<td>73.6</td>
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<td>47.5</td>
</tr>
<tr>
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<td>20.9</td>
<td>12.5</td>
</tr>
<tr>
<td>CALCIUM</td>
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<td>58.2</td>
</tr>
<tr>
<td>IRON</td>
<td>42.3</td>
<td>34.8</td>
</tr>
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<td>CARBOHYDRATE g</td>
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<td>108</td>
</tr>
<tr>
<td>FAT g</td>
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</tr>
<tr>
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<td>24.2</td>
</tr>
<tr>
<td>% ENERGY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FAT</td>
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<td>39.2</td>
</tr>
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</tr>
<tr>
<td>SODIUM g</td>
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<tr>
<td>ZINC mg</td>
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<td>3.02</td>
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Table 2 Preliminary nutritional analysis of school meals at a girls school

Figures are means of data.

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</thead>
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<tr>
<td></td>
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</tr>
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<td>(33 MEALS)</td>
<td>(30 MEALS)</td>
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<td>THIAMIN 57</td>
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</tr>
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<td>49.8</td>
<td>37.6</td>
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<tr>
<td>IRON 40.5</td>
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<tr>
<td>PROTEIN g 28.9</td>
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<td>17.1</td>
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<td>SUGAR g 29.7</td>
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<tr>
<td>SODIUM g 0.76</td>
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</tr>
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<td>ZINC mg 3.96</td>
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### Preliminary nutritional analysis of alternatives to school meals at a boys school

Figures are means of Data

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<tr>
<td></td>
<td>LUNCHES</td>
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<td>LUNCHES</td>
</tr>
<tr>
<td></td>
<td>(25 MEALS)</td>
<td>(5 MEALS)</td>
<td>(3 MEALS)</td>
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<td>ENERGY</td>
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</tr>
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<td>30.2</td>
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<tr>
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<td>CARBOHYDRATE (g)</td>
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<td>83.2</td>
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</tr>
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<td>14.7</td>
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### % ENERGY

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<td>37.7</td>
<td>44.1</td>
</tr>
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<td>54.0</td>
<td>53.8</td>
<td>47.9</td>
</tr>
<tr>
<td>PROTEIN</td>
<td>6.0</td>
<td>8.3</td>
<td>7.3</td>
</tr>
</tbody>
</table>

| SUGAR (g) | 48.8 | 22.8 | 38.3 |
| DENTARY FIBRE (g) | 0.97 | 2.04 | 5.97 |
| SODIUM (g) | 0.41 | 0.5 | 0.95 |
| ZINC (mg) | 1.12 | 1.56 | 1.81 |
Table 4. Preliminary nutritional analysis of alternatives to school meals at a girls school

Figures are means of data.

<table>
<thead>
<tr>
<th>% RDA</th>
<th>HOME LUNCHES (4 MEALS)</th>
<th>PACKED LUNCHES (25 MEALS)</th>
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</tr>
<tr>
<td>PROTEIN</td>
<td>12.4</td>
<td>25.8</td>
</tr>
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<td>THIAMIN</td>
<td>9.0</td>
<td>27.9</td>
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<td>RIBOFLAVIN</td>
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<td>FOLATE</td>
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<td>11.4</td>
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<tr>
<td>VITAMIN C</td>
<td>32.1</td>
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<td>VITAMIN A</td>
<td>31.8</td>
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<tr>
<td>IRON</td>
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<td>9.9</td>
</tr>
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<td>SUGAR (g)</td>
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<td>25.9</td>
</tr>
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<td>DIETARY FIBRE (g)</td>
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</tr>
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<td>SODIUM (g)</td>
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<td>0.83</td>
</tr>
<tr>
<td>ZINC (mg)</td>
<td>0.798</td>
<td>1.74</td>
</tr>
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</table>
Table 5. Dispersion of analysed data at a boys school

Traditional meal service

<table>
<thead>
<tr>
<th>% RDA</th>
<th>MEAN</th>
<th>S.D.</th>
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Table 6  Dispersion of analysed data from a boys school
Cash Cafeteria

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Table 9  Dispersion of analysed data from a boys school
Off premises lunches.

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<td>25£</td>
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<td>25£</td>
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<td>20£</td>
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Table 10  Dispersion of analysed data from a girls school
Packed lunches.

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APPENDIX II

Circular to all ILEA Heads of Schools,
Divisional Educational Officers, Inspectorate
from the Education Officer (ILEA)
'School meals - A move to healthier catering'

Circular to all ILEA Heads of Kitchens
from Education Catering Branch (ILEA)
'Catering for a healthy diet'
You will no doubt know that, following the University of Surrey Report on 'Cash Cafeterias' the Authority adopted as part of its nutritional standard for school meals, the recommendations made by the National Advisory Committee on Nutrition Education (NACNE). About one third of the proposed changes should be introduced during the 1980's and the Education Catering Branch has already started to introduce changes to menus and dishes to accord with the recommendations.

Attached for your information is a copy of the advice being issued by the Education Catering Branch to Heads of Kitchens this term, suggesting changes which do not incur extra financial or training resources.

Fortunately, the present nutritional standard is not far removed from the aims of 'NACNE', but it will be necessary to find different sources of protein, fat and carbohydrate to replace some of the animal fat and white sugar without losing the total energy and other nutrients. Children also need to be persuaded to eat more fresh vegetables and wholemeal items to increase fibre.

If your school intends to take some education initiative in healthy eating likely to require catering support, it would be helpful if you would contact the catering organiser in the first instance, as there may be supply, organisation or financial considerations.

Further changes will need more research and training, and will be made as quickly as resources and customer acceptance permits.
CATERING FOR A HEALTHY DIET

As a result of recent medical concern about the long term damage to health caused by people's eating habits, it is now ILEA policy to adopt the guidelines recommended by the National Advisory Committee on Nutrition Education (NACNE) to change eating patterns gradually over the next 10-15 years. A nationwide campaign has been introduced by local health authorities to advise everyone about what constitutes a healthy diet including much more nutrition education in schools.

The aims of NACNE are:

(i) To reduce the amount of sugar in the diet.

(ii) To reduce the amount of fat and oil, particularly animal fat, in the diet.

(iii) To replace the energy from sugar and fat with an increase in cereal products (flour, bread, rice, pulses etc.) and fresh fruit and vegetables including potatoes.

(iv) To increase the natural fibre in the diet by using more unrefined products such as wholemeal flour.

(v) Reduce salt.

New initiatives in nutrition education are being introduced in schools with the recent publication of new guidelines on the teaching of nutrition.

It is important that children who are looking for good nutrition should be able to find the ingredients for a healthy diet in the school menu and some changes will be required in future food provision and menu planning to meet the changes which, it is hoped, the drive for good nutrition will create.

For the Catering Branch this will mean alterations to the Recipe Book and new guidelines on menu planning and costing which will take time and training. Changes will have to be introduced gradually if we are to continue to keep the menu attractive for children who will only be persuaded to eat a better diet if it is appetising and to their liking.

Our present standard of menu planning and provision already meet many of the requirements.
For example:

(i) Heads of Kitchen have already been advised to stop using sugar as a decoration, to limit canned pie fillings, fruit in syrup etc. and to put no sugar in pastry or any other recipe where it is not required.

(ii) Both the fat and oil in current use are vegetable based and low fat skimmed dried milk is already used for cooking. Margarine and salt have already been deleted from all milk pudding recipes.

(iii) All schools are encouraged to introduce salad bars and to encourage children to eat more raw vegetables. Fresh fruit should be available as a choice on most days. A great selection of wholemeal bread, cereals and pulses is readily available and these are included in many of the new vegetarian recipes.

In order that you are making the best possible use of available resources the following guidelines should be followed as an introduction to the longer term programme of change. Remember that many primary children take very small portions and our aim is to ensure that they get enough of the right type of food.

PRIMARY AND SPECIAL SCHOOLS AND SECONDARY SCHOOLS WITHOUT CASH CAFETERIA

1 Many primary schools now have salad bars which should give all children the opportunity of choosing raw vegetables every day. If you have not already started a salad bar ask your organiser to help you to introduce one. Infants will need help with the service, but older children should be encouraged to help themselves. Do not forget your nursery children - they should have a tray of mixed salad or raw vegetables most days.

2 Rice or pasta should be available on the salad bar or on the hot counter, but not on both.

3 Bread should be available as part of your salad bar and should give a choice of white or wholemeal and with or without margarine.

4 Potatoes should continue to be offered on most days with an emphasis on baked or boiled with fried or crust being limited to once per week in primary schools. Chips should be well drained before service.

5 Fish fingers should be cooked in the oven rather than deep fried, sausages and beefburgers should also be oven cooked and drained well before service.

6 Wherever possible use fresh food rather than tinned or manufactured items. Most manufactured foods contain added salt, sugar and preservatives and should be used in moderation.

Solid pack apples, rhubarb and apricots are sugar free and solid pack plums have very little sugar.

Make your own beefburgers and fish cakes rather than buying them in. It is accepted that many children prefer manufactured products, but part of the aim will be to change this preference. Freshly made items contain less fat and additives.
7 Introduce some wholemeal flour into pastry and crumble by replacing 1 or 2 ozs in each lb of flour with wholemeal flour.

\[\text{e.g. 14 oz plain flour } \rightarrow \text{ 1 lb flour on recipes} \]
\[\text{2 oz wholemeal flour}\]

Use the new wholemeal biscuit recipes and try shortbread using 1/2 white and 1/2 wholemeal flour. New wholemeal flour recipes will be added to the Recipe Book in the near future.

8 Do not add salt to sweet dishes and use salt sparingly in savoury dishes. Remember that much of the salt used in cooking is thrown away and that tinned vegetables in brine should be well rinsed. Discuss with your Head Teacher the removal of salt pots from dining tables.

9 Increase the number of times you use chicken and fish which have a high protein content, but a lower fat level than pork, beef or lamb. Increase the variety of fish dishes—do not always serve it fried in batter.

10 Make regular use of the vegetarian recipes. If at first they are not well received keep trying small quantities to make them more familiar.

SECONDARY SCHOOL - CASH CAFETERIAS

Secondary children are less likely to stay in school unless the food provided is what they want to eat. At present this tends to be fast food similar to that purchased from local shops, but as nutrition education changes attitudes cash cafeterias must be responsive to the needs of those who want to change.

All the guidelines for primary schools should be applied to the meal of the day and more emphasis should be placed on the fresh food in the menu.

(i) Always have a vegetarian selection and make more use of pulses.

(ii) Always have a good selection of salads and raw vegetables.

(iii) Always have both white and wholemeal bread and rolls available. Introduce a choice of wholemeal biscuits and baked items.

(iv) Always have fresh fruit and fruit juice available.

(v) Always have baked and boiled potatoes as an alternative to chips.

(vi) Check your frying practice to ensure that oil stays in the pan and does not soak into the chips.

(vii) Respond positively to any approach from the school. Discuss any request for change with your organiser who will advise on menu planning and cost implications.

W. FRASER
rector
ucation Catering Branch
May 1985