EATING PATTERNS OF ADELAIDE CHILDREN ENTERING SECONDARY SCHOOLS AND THEIR UTILIZATION OF SCHOOL CANTEENS

A project submitted in partial fulfilment
for the Degree of Master of Dental Surgery

by

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SIGNED STATEMENT

This research report is submitted in partial fulfilment of the requirements of the Degree of Master of Dental Surgery in The University of Adelaide.

The report contains no material which has been accepted for the award of any other degree or diploma in any University. To the best of my knowledge and belief, it contains no material previously published or written by another person except when due reference is made in the text of the report.

MARGARET A. EVANS.

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SUMMARY

Seven-day diet records were obtained from 438 year 8 children at three Adelaide high schools. Analysis of the eating patterns revealed sex and ethnic differences. In general, the findings showed that breakfast was the meal most frequently missed on weekdays. Most children snacked during the day and only a small percentage relied on three main meals for their daily food intake. The majority of meals and snacks were home-prepared, but on weekdays the canteen was the major source of food during the school day. The type of canteen menu influenced patronage and the canteen which stocked only nutritionally acceptable food items attracted the highest usage even though it had competition from nearby food shops.

Sex differences were pronounced in that males were more likely than females to miss meals, eat alone, patronize food shops and the school canteen. Females tended to snack more frequently than males and to prefer company when eating.

Ethnic differences were found especially in relation to breakfast habits and canteen usage. Greek children were more likely than children of Australian/New Zealand parentage to miss breakfast and rely on the canteen for provision of food during the school day. On weekdays significantly fewer breakfasts were eaten with parents by Greek children than by ANZ children.

TITLE

Eating patterns of Adelaide children entering secondary schools and their utilization of school canteens.

INTRODUCTION

The health of Australians leaves much to be desired. Hetzel states that when countries with similar standards of living are compared, by generally accepted health standards, Australians are amongst the unhealthiest. The three principal causes of death in Australia are coronary heart disease (30 percent), cancer (17 percent), stroke (14 percent); and all three are diet related.[1]

Research from many areas confirms that the dietary pattern of children is a major factor in the development of these diseases in the adult.[2,3] Thus the main opportunity for prevention of the major diseases occurs during childhood. It is necessary to establish correct dietary patterns as early as possible because unfavourable patterns of eating are difficult to change in adult life.[4]

The eating habits established early in life are mainly influenced by the attitudes of parents and the food provided in the home. During school years more is learned in a formal sense about eating and food; a further influence is the eating behaviour of peers.[5,6]

School canteens are in a strong position to influence the eating patterns of children by providing practical applications of the theory taught within the classroom. Depending on the type of foods sold in the canteen, favourable or unfavourable habits are reinforced. During the secondary school years students are

more independent of parents, are affluent and also are influenced strongly by their peers. Parents wishing to control the diet of their children are disadvantaged if canteen menus do not conform with favourable home practices.

For these reasons, canteens are regarded with concern by health personnel if the menus do not comply with the guidelines of the National Health and Medical Research Council.[7]

AIMS OF THE STUDY

This study presents preliminary findings of a more extensive dietary survey which is now being analysed for nutrient and energy content; information on height, weight, skin-fold, and age of menstrual onset also will be available. The purpose of the preliminary report is to investigate the eating patterns of children entering secondary schools with particular reference to their utilization of the school canteen. Information on sex, ethnic origin, meal patterns, missed meals, source of food and canteen usage was sought. Knowledge of these factors is essential before informed comment or recommendations can be made on canteens operating in South Australian secondary schools.

CHAPTER 1

REVIEW OF LITERATURE

1.1 The Role of the School Canteen

The Nutritional Guide for School Food published by the National Health and Medical Research Council (N.H. & M.R.C.) emphasizes that a canteen is physically part of the school and school life. Therefore, it should fulfil the important roles of educating children about nutrition and the provision of foods for good health.[7]

Traditionally, canteens in Australia have been the responsibility of parent groups and, in general, there has been little intervention from the school administration. Voluntary committees were originally formed to run canteens as a periodic fund-raising activity for the school. Over the years a greater variety of foods has been offered and daily lunches provided. The role and function of the canteen in the school have altered considerably, though the service is still recognized as a fund-raising activity. Profit-making and the provision of nutritious meals are not necessarily conflicting objectives. The N.H. & M.R.C. contend that within the present system it should be possible to organize a canteen suitable for students and acceptable to parents and the school. Further, the Council contends that the canteen should be recognized as an integral part of the school and of the students' education. Authorities are urged to accept responsibility by concerning themselves with the role the canteen plays in the

whole school life, the eating habits and food patterns of individual students and in the education and total health of each student.[7]

Storey reported that the education system has by and large failed to grasp the opportunity of using the school canteen as part of a child's overall educational experience for enjoyable survival in a civilized community. Furthermore, the neglect of the importance of the canteen as an educational tool has been tragic and the Achilles heel of dental health and other fields.[8]

In practice, school canteens have been found generally to be undesirable even though canteen committees were aware of the advice of health personnel. The main reason for the wide-spread deterioration of canteen menus appeared to be the emphasis on the fund-raising role.[9,10] Foods containing excessive sugar and of high energy, low nutrient density have been considered by many canteen operators to be particularly profitable.[6,10,11] Surveys investigating the reasons for the sale of unsuitable foods in school canteens have found that the profit motive was most influential in the sale of high energy, low nutrient density foods.[12,13]

Other reasons cited for unsuitable menus were (1) to keep the children in the school grounds; (2) all other canteens sold sweets; (3) control over the consumption of sweets was the responsibility of parents and not the schools; (4) it was in keeping with previous canteen practice and (5) high school students supposedly were old enough to make their own choice of foods.[12]

A South Australian survey confirmed the above and also reported that some canteen operators claimed that canteens provided so small a component of diet as to insignificantly affect dental health.[13]

1.2 Changes in Lifestyle and Supply of Voluntary Labour

Richardson suggested that canteens may have to assume a greater responsibility in the supply of food to students. As increasing numbers of married women joined the work force, children became more dependent on the school canteen for lunches and snacks which should be as good or better than home prepared items.[14] The findings of the Committee of Enquiry into School Canteen Management set up by the South Australian Education Department in 1976 indicated that turnover per student was especially high in areas with a high incidence of single-parent families or where both parents worked.[15] In addition, as the incidence of working mothers increased many canteens experienced difficulties in obtaining voluntary help. A survey of school canteens in New South Wales found that about half the schools studied had difficulty in obtaining voluntary help. The number of mothers participating appeared to be related to the socio-economic status of the area, with more mothers involved in areas with a higher socio-economic status.[12] The Committee of Enquiry also found that a school's ability to attract voluntary help to assist in the canteen varied among socio-economic areas. Schools in areas where both parents worked and where there was a higher percentage of migrant families appeared to have more difficulty in obtaining voluntary help than schools in areas where only one parent worked.[15] Richardson suggested that as voluntary workers became fewer, canteens in the future might need to rely more on manufactured food lines and to consider the provision of items which were less labour-intensive.[14]

1.3 Desirable Food Choices

It has been reported that where a range of commercial snack foods was available the possibility existed that some children would buy a low-nutrient snack in place of a nutritious lunch. Alternatively, when snack foods were bought in addition to lunch, an excessive energy intake could result.[16]

A study investigating the diet of Tasmanian teenagers found that snacks provided by some school canteens furnished a high proportion of the total carbohydrate intake and the snacks were of poor nutritive value. It was found that the type, quality and price of food in the canteen played an important part in determining the nutritive value of the total diet. A large range of low nutrient density foods made it impossible for children to establish good food habits. On the other hand, improvements could be made in the diet of teenagers by providing a reasonable choice of desirable foods in the school canteen.[10] Storey observed that the school canteen could make a significant contribution, for better or worse, to the nutritional intakes of children because in some schools between 60-70 per cent of children bought food items from the canteen.[8] In a survey of 124 Tasmanian schools, Coy found that a considerable percentage of children used school canteen facilities. Sixty-four percent of the schools surveyed did not have a school canteen. In 58 percent of those with canteens, more than half of the pupils used the canteen. In 16 percent more than three-quarters of the pupils used the canteen and in three percent, less than one quarter of the school population used the canteen.[17]

1.4 Reinforcement of Nutrition Education by School Canteens

Steel in Victoria[18] and Shelley in the Northern Territory[5] agreed that the school canteen played a role in nutrition education by reinforcing both home and school teaching. The canteen should provide guided educational experiences because it was an activity which occurred on school premises as part of the school day.[16] Carr emphasized that there was a unique opportunity for contributing to health education by selling and encouraging the sale of nutritious and beneficial foods, and by discouraging and not selling the undesirable ones.[19] A WHO Education Report stated that teachers were most likely to make good use of opportunities for health education when they worked in a school environment which itself was healthful and conducive to good health practices.[20] Stanton observed that in many instances children were taught in the classroom that sweet foods encouraged dental caries and could contribute to obesity. However, the children saw the same foods being sold within the school by the canteen; such a poor example negated all the classroom teaching.[21] Corden confirmed that the example of the canteen was such a forceful teaching medium within the school that it very frequently negated the teaching in the classroom.[6]

1.5 A History of School Canteens in South Australia

The relationship of dental caries and the availability of sweets in school canteens was initially recognized in South Australia when the caries incidence of children attending two area

schools was compared. The schools concerned were Pinnaroo and Lameroo and both drew children from similar farming districts. A senior dental officer of the School Dental Service reported a far higher dental caries rate in the teeth of the Lameroo children and observed that the only significant difference between the two schools was the presence of a canteen at Lameroo. The canteen was operated as a commercial venture and a high percentage of the profits was derived from the sale of sweets. Pinnaroo Area School was situated too far from the shopping centre in the town for the children to walk there so snacks and lunches were brought from home. The dental officer claimed that the presence of the canteen was responsible for the markedly greater prevalence of dental caries at Lameroo.[22]

Statistically significant findings on the dental effects of providing sweets in school canteens were first published in 1969. Fanning et al. reported that 1266 children attending secondary schools where sweets were sold in the canteen had an average of 1.57 more newly decayed tooth surfaces over a two-year period than children at schools where sweets were not available.[23] The findings on secondary school children were later confirmed in primary schools by Roder.[13] Roder also found that frequent users of canteens had higher decay rates than infrequent users.[13]

A subsequent longitudinal study was conducted over a two-year period in eight Adelaide Schools, four of which removed sweets from the canteen at the commencement of the study, and four control schools continued selling these items.[24] The results confirmed that the number of new decayed tooth surfaces at each test school was lower than at the corresponding control school. Detailed

analysis indicated that there were 14.5 percent fewer decayed teeth in the Government schools and 27.3 percent fewer decayed teeth in the Independent schools. Canteens in the latter schools were used more frequently and apparently affected caries increments more appreciably than canteens in the Government schools.

1.6 Profit and School Canteens

Because of the emphasis placed on profit and claims by canteen personnel that profitability suffered markedly if sweets were removed, a survey of 49 schools was undertaken. The findings showed that the profit level per student was comparable for the 22 canteens without sweets and the 27 control canteens.[13] Additional evidence that profit was possible without selling sweets emerged from the two year longitudinal study of eight schools.[24] Four pairs of schools were studied, each pair including a test school which had removed sweets at the commencement of the study, and a control school which continued to sell these items. A representative from the School Dental Service assisted in the establishment of satisfactory menus in three test canteens over a period of four weeks. The fourth canteen achieved adequate improvement without this assistance. All test canteens removed sweets, sweet biscuits and iced buns. The test and control schools were matched according to the socio-economic level of the students, whether they were Government or Independent, and the sex of the students. In general, there was little change in profitability of test canteens after the removal of sweets. One headmaster reported an increase in profit, two indicated no change and the fourth reported a minor reduction which was not considered a serious loss to the canteen.

Three relevant factors appeared to determine whether sweet foods could be removed without affecting profit. The first was the absence of nearby delicatessens so that the canteen was not forced into competition. Second, students were not permitted to leave the school grounds during the lunch or recess periods without a specific parental request. Finally, the attitude of the students was extremely important; if the children supported the removal of sweets the chance of success was greater.

1.7 Move to Improve Canteen Menus and Subsequent Deterioration in Quality

Fanning et al. reported that the South Australian findings, coupled with the importance placed by the WHO and the N.H. & M.R.C. on the school environment as a source of health education, led to a concerted effort by dental health authorities to improve school canteen menus.[25] A steady improvement was achieved from 1969 to 1976 in that the percentage of canteens selling a range of sweets dropped from 76 to 24 percent.[26]

In 1976 a marked regression in menu quality occurred which coincided with the introduction of award wages to canteen managers and a consequent increase in operational costs.

Spiralling costs affected many canteens and the Committee of Enquiry into School Canteen Management was instructed to investigate the growing difficulties which canteens were experiencing. The Committee reported that canteens which had previously been profitable found that they were running at a loss and schools usually attributed this difficulty to increasing costs of paid labour. The report observed that the operation of school canteens for many years had

relied on volunteers.[15] Originally the entire canteen staff gave their services in a voluntary capacity. In time, however, the growth of canteens led to the need for a paid manageress in addition to the volunteer workers. The manageress attended daily, ordered supplies, paid accounts and dealt with day-to-day problems with the school staff. At first an honorarium was received, but later payment was made according to Award rates. Many school canteens needed to employ more than one salaried person because the growing number of women in the work-force made it more difficult to obtain the necessary voluntary labour. This problem was exacerbated by the unwillingness of volunteers to work for nothing in the canteen to provide lunches for the children of mothers who worked. These children often had large sums of money to spend, leading to further reluctance of some mothers to donate their time to canteen work.

1.8 Cost-efficiency Aspects

The Committee of Enquiry made a number of recommendations for consideration by the Minister and Director General of Education and by school councils and canteen committees. Recommendations for cost-efficiency were that perishables such as milk had to be turned over regularly or not stocked at all; that there be no oversupply of daily foodstuffs or non-use of end pieces of food and that the consumption of food by voluntary help be strictly regulated. Schools were also to consider whether it might be prudent to stock a narrower range of goods in school canteens and to eliminate bottled drinks.

Canteen committees were directed to consider whether they had the ability to extend hours of opening to include the period before school. This action might provide additional service to

students and at the same time increase turnover, without necessarily increasing operational costs.

Paid staff in school canteens were not to be employees of the Education Department and the cost of any staff had to be a charge against the operating expenses of each canteen. The Director General of Education was to ensure that a resource person was trained and made available to advise schools on all aspects of canteen management. School councils were urged to discontinue the practice of selling sweets in school canteens.

1.9 Adolescent Nutrition - Increased Nutritional Needs

Kreutler stressed that adolescence was a critical period of rapid development, but many adolescents lacked synchronisation between the physical, emotional and social aspects of their development. As teenagers tried to differentiate themselves from parental beliefs and to keep up with their peers their dietary habits often changed.[27] At the same time nutritional requirements during adolescence were extremely high because of the development of long bones and increased muscle mass formation. Adolescent growth exhibited a maximal acceleration just before puberty with deceleration of growth almost immediately after. The growth spurt began in girls at about 10 or 11 years of age and in boys between 13 and 15 years and continued for about five years, making this a period of high nutritional requirements.[28]

1.10 Snacking Patterns

Dietary surveys have found that during adolescence food intakes were more variable and less nutritionally adequate than intakes of other age groups.[21,29,30,31] Numerous investigations of teenage food habits have indicated that high frequency snacking was part of the adolescent eating pattern.[29,31,32,33,34] A number of factors have been suggested which were thought to be important in the development of snacking habits. Researchers in Australia, the U.K. and the U.S.A. have observed that eating habits have changed drastically during the past 60 years and that many people no longer relied on three main meals for their daily food intake.[35,36,37] Nizel suggested that the quickening tempo of American living has resulted in an increased snacking habit. Snacking was encouraged by the makers of new convenience foods, by the increased numbers of takeaway or fast food outlets and by the marketing and advertising methods of the food processing industry.[37] Brell expressed concern that a similar situation existed in Australia in that advertising of certain foods was having the effect of biasing food choices in a number of directions. The bias was notably towards the purchase of confectionery, snack foods, alcohol and processed foods and, in particular, "diet" and fast foods. The aim appeared to be to sell the commodity rather than to influence food choice on the grounds of health or nutrient content.[35]

Nizel observed that many people ate six or more snacks a day which might lead to the elimination of one or more main meals in favour of snacks. Frequent snacking habits also might lead people to decrease the size of the main meals. This investigator suggested that the changes in the average American eating pattern

and habits of increased snacking were important contributing factors to an excessive energy intake that might lead to obesity. There was also the increased risk of degenerative diseases such as diabetes, hypertension, atherosclerosis and dental caries. In addition, many snack type foods were highly processed and provided mainly energy and a few of the nutrients that were already present in the diet in adequate amounts. Nizel suggested that many teenage girls replaced nutritious foods with snack foods, but did not consume sufficient for their energy requirements because they wanted to look slim.[37] The adolescent self-image is often most inaccurate. For instance, in a study of adolescents Heunemann et al. found that 70 percent of the girls thought that they were too fat, although only approximately 15 percent were actually overweight. Of the males surveyed, 59 percent thought that they were too thin, whereas 25 percent were underweight.[38]

Stanton observed that girls frequently tried to diet when they were not overweight, and many deprived themselves of vital nutrients, especially calcium, iron and vitamins of the B group. On the other hand, boys often had very large appetites to satisfy their requirements for growth and activity and accordingly usually ate enough food to supply their nutritional needs.[21]

A survey of dietary patterns of Year 11 students in N.S.W. found that snacks comprised one quarter of the energy intake of the day's diet. Most snacks were eaten after school.[39]

In an investigation of healthy 11 year old New Zealand children, Harding and Lines found that the majority had something to eat at each major meal. Most children ate five to six times

daily and none ate less than three, or more than eight times each day. Sex differences were not great, but there was a tendency for girls to eat a higher proportion of energy-rich foods in the mid-morning and for boys to eat more on their way to and from school.[40]

Nizel observed that teenagers obtained one third of their total energy intake as between-meal snacks.[34]

Wharton studied the nutritive intake of adolescents in Southern Illinois and found that the girls ate more snacks than the boys. In addition, where snacks provided 20 percent or more of the energy value of the diet, the nutrient intake tended to be more adequate in all nutrients except vitamin A and ascorbic acid.[41]

Hampton et al. found that teenagers tended to omit meals and to snack frequently. A large range of eating frequencies was observed which averaged from two to six times a day over a week's time.[32]

Heunemann et al. found little relationship between the frequency of teenage eating and the overall nutritive quality of the diet, except that when the eating frequency was less than three times a day the nutritive quality usually suffered. In general, adolescents eating regular structured meals, usually augmented by snacks, tended to have better nutrient intakes than those who did not eat regular meals. It was found also that obese boys tended to snack more frequently during the day than non-obese boys, whereas obese girls tended to eat fewer snacks and meals than non-obese girls.[33]

Howe and Vaden suggested that the quality and quantity of snacks played a critical role in the nutritive value of a teenager's

diet. They found that between 22 and 45 percent of the total day's nutrient intake was provided by snacks consumed between meals in the morning, afternoon and evening. There were no significant differences in intakes of snacks based on the sex of the student or on the type of food. Furthermore, rather than attempt to influence teenagers to omit snacks it would be more appropriate to emphasize the importance of selecting nutritious snacks.[42]

Leverton agreed that snacks could contribute to good nutrition and it would be beneficial to have a concept of food on a daily basis and to serve all the kinds of food that were needed for adequate nutrition during the day. However, an acceptance of snacking should not give a licence for overeating or for ignoring total daily nutrient needs.[43]

A number of researchers have pointed out that nutrient-poor, energy dense snacks were frequently eaten in preference to foods of greater nutritional value.[31,44,45,46,47] For instance in an American study Hruban found that when high school students were provided with a wide variety of snacks of which the greater percentage were nutritious, the students tended to select nutritious snacks. On the other hand, when a wide variety of snack foods were provided of which there was an equal percentage of excellent, fair and poor snacks the students tended not to select those which were considered nutritious.[46]

A study of dietary habits and attitudes of adolescent girls in Brisbane indicated that the most popular times for between-meal snacks were the morning break and after school. The girls frequently

used the canteen and most preferred sweet sticky snacks.[47]

Stasch et al. observed that eating snacks instead of meals was a growing trend amongst adolescents. These researchers found that the choice of snack foods was determined by availability rather than by a concern for the nutritional value of the snack.[48] Bowden observed that the change from eating meals to snacking created problems if adolescents were to consume well balanced diets. The need was stressed for nutritious snack foods to be as readily available to the adolescent as non-nutritious snacks. Concerned parents found it difficult to ensure that their children's diets were adequate when a large part of the teenager's day was spent away from home.[49] In addition, other investigators found that an increasing number of adolescents were responsible for preparing their own meals.[31,33] Loucks observed that the inadequate diets frequently resulting from unsupervised, poor food choices of teenagers could reduce growth potential and affect health during the adult years.[31]

1.11 Breakfast Habits

One of the most undesirable food habits frequently encountered in American and Australian teenagers was the eating of an inadequate breakfast, or not eating breakfast at all.[18,34] Nizel observed that girls were more likely to skip breakfast than boys and the reason usually given was the desire of girls to keep slim; in most cases, however, weight was not controlled and the opposite result occurred. Usually skipping breakfast caused the teenager to overeat at other meals or between meals to make up for the one missed.[34] In an investigation of food and eating practices of

American teenagers Heunemann et al. found that the breakfast skippers were the obese boys and girls.[33] A study by Hodges and Krehl reported that many teenagers did not eat breakfast and that the habit was associated with low ascorbic acid intake. In addition, this group of teenagers rarely included vegetables or salads in the evening meal even though these items were available.[50]

There was a growing concern in Australia for the large number of children who were going to school without breakfast.[8,18] Recent surveys in Tasmania, Western Australia and Victoria have shown that a high proportion of children either had no breakfast or an inadequate breakfast.[17,51,52] Several reasons were thought to be responsible for this practice. The child might be following the family pattern, or both parents worked and started work early so that the child had to prepare breakfast. Extra money might be given to buy something to eat and other children stayed in bed too long and did not have enough time to eat breakfast.[18]

It has been suggested that breakfast was increasingly being prepared and eaten at different times by individual family members.[49,53]

Several investigators have reported that breakfast was a very important meal which should supply enough energy to cope with the demands of the body throughout the morning.[8,18,43]

Leverton suggested that omission of breakfast could adversely affect the total nutrient intake of the day. Problems arose as a result of teenagers eating much of their total daily food after school hours and before bedtime. Large quantities of food consumed in a short space of time not only taxed physiologic processes, but meant that during a large part of the day the body's needs for nourishment were not likely to be met.[43]

Steel described how the eating patterns of children changed if breakfast was missed. Because breakfast was not eaten the child felt hungry before school, and during the morning ate snack-type foods which were usually energy dense but of low nutritional value. This pattern continued until the evening meal which in many instances consisted of take-away food.[18] Storey observed that socio-economic status appeared to be related to breakfast habits. With decreasing status the percentage of students either eating no breakfast or an inadequate breakfast increased. The children in the lowest status areas had more money to spend and at mid-morning break appeared to compensate for lack of breakfast by buying more meal-type items, such as pies, rolls and sandwiches.[8]

Studies in the U.S.A. have indicated that diet deficiencies commonly thought to be a problem of low income families were becoming increasingly evident in teenagers from middle and high income families. Many of the latter skipped breakfast in favour of later in the day eating foods that were high in fats and low in iron, calcium and vitamins.[49]

In a study of high school students in the U.S.A., Harris found that 12 percent of the boys and 17 percent of the girls missed breakfast, and only 12 percent of the girls and 14 percent of the boys ate breakfasts that adequately met their nutritional requirements.[54]

In another American study, Myers et al. found that school children from a poor urban area had unfavourable eating habits. During the four days of record keeping 18 percent of children omitted breakfast.[55]

In Australia Webb et al. studied the breakfast habits of a group of older adolescents attending the Queensland Institute of Technology. Breakfast adequacy was not found to be related to sex or age and no relationship was found between breakfast adequacy and the time of the next meal. Approximately two percent skipped breakfast and of those having an adequate breakfast, 67 percent had a morning snack.[56]

A dietary survey of young adults in N.S.W. indicated that fewer men than women tended to omit breakfast.[57]

Loucks studied the diets of a group of adolescent boys and found that many breakfasts were nutritionally inadequate. In addition, during the survey period approximately 18 percent of the boys did not eat breakfast.[31]

A study of eating habits of healthy New Zealand children showed that nine percent did not eat breakfast during the survey period.[40]

Steel emphasized that it was very important to educate parents to recognize the child's need for breakfast. However, the parents who most needed education were often the ones who were hard to reach. They did not attend school meetings and often had language problems or they lacked interest. This author contended that if parents gave children money to buy food, it was imperative that a nutritious choice must be available. Steel stressed that the canteen should give the lead to the child as to the foods suitable for breakfast and the child should not be left to make an uninformed choice.[18] In practice, Storey claimed that the food available at school canteens for students purchasing breakfast was generally

undesirable.[8] Studies in the U.S.A. have demonstrated beneficially nutritional effects and significant increase in maximal work output and work rate, as well as improvements in attitude and scholastic records when a nutritious breakfast was provided at school.[58,59]

1.12 Special Health Concerns during Adolescence.

1.12.1 Changing Lifestyles

Brell claimed that the rapidly changing conditions which existed today influenced the life-style and eating habits of Australians.[35] These changes included a diversity of ethnic groups with different social mores, the economic pressures forcing women from home into the work force, and the highly effective television advertising of foods and drinks which led to undesirable food habits.[8] In addition, food technology combined with intensive advertising, was bringing about a shift from home-prepared foods to the widespread and growing use of highly processed and fast foods. This dietary shift which was continually reinforced by clever promotion made the task of nutrition education more difficult.[4]

In 1978-9, 24 percent of the money spent on food in Australia, apart from confectionery and snacks, was for food consumed outside the home.[60] In the U.S.A., 35 percent of all food dollars were spent on meals prepared outside the home.[61] A quarter of the food dollars went to fast food outlets.[62] In the years between 1963 and 1978, the sales in food stores rose 44 percent; in eating places, 83 percent; and in fast food outlets, 300 percent.[63] Fast food establishments were most popular among customers under 35 years of age who on average chose a fast food restaurant 60 percent of

the time when eating out.[64] It was predicted that the growth in fast food sales would continue due to population increases, changing life-styles and more women entering the work force.[65] Researchers have found that fast foods were becoming a major source of food for the American population.[66,67] Shannon and Parks pointed out that the growing trend of eating fast foods had the effect of reducing the control that mothers traditionally had over the diets of their families.[67] A recent Australian study which examined the food habits and nutritional status of 145 Brisbane children aged 11-12 years showed that the children of working mothers were more likely to have eaten convenience foods for their last evening meal (22 percent of convenience foods for working mothers, seven percent for non-working mothers).[68]

1.12.2 Obesity

Obesity and its complications such as heart disease and diabetes were alarming health authorities.[8,69,70] Obesity, like dental caries, was associated with affluence and the economic and social pressures inducing children to consume energy dense, low nutrient diets and the sedentary life style associated with increased hours spent watching television.[8,71]

Court stated that at adolescence about 5 percent of Australian boys and 8 percent of girls had a weight that was 20 percent greater than the expected weight for height and age.[70]

1.12.3 Dental Caries

A direct correlation has been shown between the consumption of sticky, sugar-rich snacks and dental caries in adolescents. A

recent study by Clancy et al. found significantly fewer cavities in teenagers who had frequent snacks of apples, fruit juices and sugarless gum. These authors suggested that the composition of the snacks was more important than whether snacks were or were not eaten.[72]

Since the introduction of fluoridation in South Australia and an increased emphasis on prevention, advances have been made in reducing dental caries amongst adolescents.[4] However, students attending schools where sweets were available in the canteen were still experiencing increased caries rates.[73]

1.13 Survey Methodology

Gift et al. reported that it was necessary to relate clinical, biochemical and dietary information in order to come to valid conclusions about the nutritional status of an individual or a population.[74] However, dietary surveys were the only method by which actual food intake could be assessed, and surveys could confirm or deny suspicions raised by other methods of assessment.[75] Dietary assessments enabled health care professionals to compare food patterns of an individual or a group with a desirable standard such as the Recommended Dietary Allowance. This assessment was important in analysing the nutritional status of an individual or of a particular ethnic or socio-economic group. Dietary surveys also made it possible to discover trends in eating patterns of specific population sub-groups.[75]

There were several methods for obtaining data on dietary practices. These ranged from the relatively simple method of asking

the subject to recall everything eaten in the last 24 hours, to the time-consuming method of actually observing the subject for a given period and weighing everything eaten. The most appropriate method in any given circumstance would be determined by the aim of the study and the resources available. All of the methods required trained personnel in order to provide valid and reliable data.[76]

Co-operational nutritional status studies amongst various population groups in the U.S.A. have used the dietary record for research purposes. This record consists of a detailed quantitative listing of all foods consumed by an individual during a given time. Whenever dietary records were discussed there has been considerable doubt concerning the minimal number of days a record must be kept to yield accurate information. For example, when studying a community the research worker not only must be certain that the dietary record covered a sufficient period of time to give an adequate picture of nutrient intake, but also must avoid prolonging unduly the period of record keeping lest the interest and co-operation of subjects be lost.[76] One recent study found that few subjects kept accurate records for more than four days and only well-educated subjects maintained accuracy for a longer period, with the result that findings were biassed.[77] Kreutler stated that motivating factors such as visits or phone calls from a trained interviewer, or a reward system, often helped to maintain interest in the exercise.[75]

A review of the literature on dietary study methodologies reported that some authorities maintained that a dietary record covering seven consecutive days, or 20 consecutive meals, was the

shortest length feasible from the stand-point of accuracy. However, nutrition field units operating under the direction of the U.S. Public Health Service obtained dietary information by the one-day diet record because it was believed that a large number of accurately taken one-day records were as useful as a smaller number of seven-day records.[76]

There has been debate regarding the necessity of obtaining data concerning nutrient intake on Saturdays, Sundays and holidays. It was the general opinion of research workers that the eating habits of certain population groups such as college students tended to vary considerably at these times.[76]

The general consensus was that the shortest unit of time to study the dietary intake of an individual was one week.[76] Furthermore, Chalmers et al. considered that a seven-day record was apt to be the maximal period for which subjects could be depended upon to keep records. In fact, on a group basis there did not appear to be sufficient variation from week to week to warrant more than a seven-day record.[78]

It did not appear to make any difference on what day of the week the record-keeping was initiated, but the days had to run consecutively for the length of time estimated to be necessary to achieve the desired degree of precision.[78]

CHAPTER II

MATERIALS AND METHODS

2.1 Sample Studied

The sample consisted of year 8 (first year) students at three Adelaide High Schools. Three different types of canteens were included. School I had a menu that conformed with the recommendations for school food services set out by the N.H. & M.R.C.[7] The canteen sold a wide variety of nutritionally acceptable foods; confectionery, sweet cakes, biscuits and soft drinks were not sold.

School II stocked a wide range of food items many of which were considered unsuitable because they were energy dense but contained few nutrients. A restricted range of nutritionally acceptable foods as well as many undesirable items were sold at School III. The canteens at Schools II and III were open before school and those at Schools I and III had competition from nearby food shops.

The ethnic composition of the sample was determined by assigning students to a particular ethnic group if both the mother and father were born in the same country. For example, if both parents were born in Greece the student was included in the Greek group. If only one parent was born in Greece the student was grouped with other students of mixed parentage.

The ethnic composition of the student population in Schools I and II was mainly Greek and Australian/New Zealand. The major ethnic group at School III was Australian/New Zealand.

Initially in November 1978 the school principals were contacted personally and given a brief outline of the proposed survey. All three expressed an interest in the project and a willingness for their schools to participate. Subsequently letters were sent giving further details of the survey and requesting permission to study the year 8 pupils (Appendix 1). Replies were received and the dates of the survey were confirmed (Appendix 2).

After discussions with the principals and health education personnel it was decided to include the survey in the year 8 health education curriculum, so parental permission for children to participate was not required. One family objected on the grounds of invasion of privacy and the child did not participate.

Details of the sex distribution of the subjects surveyed is shown in Table 1.

The ethnic composition of the sample attending the three schools is shown in Table 2.

2.2 Design of Diet Record Forms

Before the survey discussions were held with nutritionists and teachers in order to design a diet record form suitable for Year 8 students. A preliminary form was drawn up and tested in a pilot study of year 8 students at a number of other Adelaide high schools (Appendix 3).

A number of changes were made as a result of the pilot study. For example, many of the students had large handwriting and more space was required to complete their entries. The wording of the instructions was too complicated for other students and changes were recommended. The statement "record all food and drink" was changed

TABLE 1

SEX DISTRIBUTION OF SUBJECTS SURVEYED

	Male	Female	Total
School I	75	63	138
School II	80	90	170
School III	97	66	163
Total	252	219	471

TABLE 2

ETHNIC COMPOSITION OF SAMPLE

COUNTRY OF BIRTH MOTHER AND FATHER	SCHOOL I		SCHOOL II		SCHOOL III	
	M	F	M	F	M	F
ANZ	14	11	17	14	41	33
Greece	31	22	31	39	2	2
Italy	8	13	3	3	7	0
U.K.	1	1	6	7	5	9
Western Europe	1	3	4	3	4	3
Eastern Europe	1	1	3	3	0	3
Asia	0	1	0	0	1	0
Mixed Parentage	19	11	14	20	36	15
Other Unknown	0	0	2	1	1	1
Total	75	63	80	90	97	66

to "write down all food and drink". (Appendix 4).

An example of a completed day's record was provided so that the students had a clear idea of what was required (Appendix 5). In some instances children could not give an English name for ethnic foods. The instructions were to record the name used at home, or to list the ingredients separately.

2.3 The Survey Team

Before the study commenced a survey team was organized consisting of dietitians and dietetic students, dentists and dental therapists. Members of the team attended training sessions conducted by the senior dietitian who had previously been involved in a number of diet surveys in schools.

During these sessions the team was briefed on the protocol for collecting the data. Interview techniques were explained and demonstrated in order to attain the maximal degree of consistency amongst the interviewers. The diet record form was discussed and aspects of recording foods known to be overlooked were emphasized. The instructor demonstrated how certain questions could evoke subjects to recall information which otherwise would not have been recorded.

A timetable and an instruction sheet with information about the survey and the participating schools were distributed to each member of the survey team (Appendices 6 and 7). A public health nurse who was experienced in survey procedures acted as the co-ordinator and administrator.

2.4 Collection of Data

The survey was conducted at the beginning of the first school term in February 1979. Schools I, II and III were visited in that order and the same procedure was followed at each.

It is doubtful that all Year 8 students could accurately complete a seven-day dietary record without close supervision and encouragement. Accordingly, it was necessary for the survey team to check the completed records for errors and omissions daily on a one-to-one basis.

On the first day of the survey members of the team were assigned to a particular Year 8 group. Prior arrangements had been made with the school authorities for the introductory session of the survey to be conducted at the commencement of the morning lesson period. During this time the interviewers introduced themselves to the class teachers and students and outlined the purpose of the study. Each student was given a diet form for that particular day and the method of recording was explained. The survey team member drew a replica of the form on the blackboard and filled in the breakfast and morning's entry for a volunteer student.

All members of the class then recorded their personal and sociological data and food intake. Questions were encouraged and the students had an opportunity to discuss any problems that were raised.

The forms for the following day were also distributed during this introductory session. On the second morning the previous day's record was scanned by a member of the survey team, when any necessary corrections were made and omissions rectified. If a

student had forgotten to complete the previous day's record, the interviewer assisted the child to recall and record the dietary items. If the interviewer considered that the student's ability to complete the record was unsatisfactory, an additional day's record was required to be completed at the end of the survey period. On Friday the forms for the weekend were distributed in addition to those for the following Monday. On Monday morning the Friday, Saturday and Sunday records were checked and collected. The students who forgot to complete the weekend forms, or were absent from school due to illness, were asked to keep a record of the following weekend. The second set of records was scanned and collected after the main survey ended. A few students who were ill during the entire survey period, and others mainly in the remedial classes were unable to satisfactorily complete the weekend records. It was decided not to persevere in these particular instances. Senior dietitians who were assigned to interview the slow learners in the remedial classes decided whether the task was beyond a particular child's intellectual ability.

Of the 139 year 8 children at School I, 138 were interviewed and 119 completed a seven-day diet record, 32 of whom required extra time during the week following the survey. The 19 children who did not complete the seven-day period belonged to a special class for students experiencing learning difficulties.

At school II 170 students were interviewed and 169 completed the seven-day diet record, one having left school before the completion of the survey to return to Greece for a holiday. Records for days missed were obtained from 13 students in the week following the survey, enabling these children to complete the

seven-day period.

At School III 163 students were surveyed and 150 completed seven-day diet records. Seventeen of the 150 students required additional time to complete the task and they were interviewed the following week. The remaining 13 students failed to complete the week's diet record because of protracted illness and lack of intellectual ability to complete the task.

2.5 Incentives

In order to motivate the students to complete the seven-day records a reward was offered to each child on completion of the task. As an added incentive, a prize was awarded to the class which had the best performance for completion of the records.

2.6 Analytic Method

Before the data were placed on punched cards the information was coded according to school, sex, country of birth of parents, day, meal identification, persons with whom meal was eaten, location of meal and where food was obtained (Appendices 8, 9 and 10).

In order to code the information on meals, six possible eating events were defined. These events included breakfast, lunch, dinner and three snacks. Snacks were defined as eating events between the three main meals. The morning snack included all food eaten after breakfast and before lunch; the afternoon snack applied to food eaten after lunch and before dinner and the evening snack comprised food consumed after dinner.

The children born of Australian or New Zealand parentage formed a sufficiently large group for analysis at each of the three schools. However, sufficiently large groups of Greek children were

present at two schools only. It was decided to present the findings in three groups comprising Total Sample, Australian/New Zealand (ANZ) and Greek, for males and females at each of the schools.

The total sample comprised all children at each of the schools and therefore included the ANZ and Greek groups, as well as other pure ethnic groups and children of mixed parentage.

Table 3 gives details of the sample sizes in the groups analysed.

A computer programme was designed to analyse the data and to provide the findings presented in the results.

TABLE 3

SAMPLE SIZES IN THE GROUPS ANALYSED

		TOTAL SAMPLE	ANZ	GREEK
School I	M	64	14	31
	F	55	11	22
School II	M	80	17	31
	F	89	14	39
School III	M	82	41	2
	F	68	33	2

CHAPTER III

RESULTS

Percentages quoted in the tables and elsewhere in the text were calculated to the nearest whole number.

3.1 Meal Patterns - Persons with whom Meal Eaten.

3.1.1 Breakfast

Table 4 shows persons with whom breakfast was eaten during the week and weekends.

It can be seen that in the total sample a greater percentage of breakfasts was eaten alone by males than by females during the week and on weekends. On week days, more breakfasts were eaten alone by Greek females than by ANZ females, whereas the reverse applied on weekends. More breakfasts were eaten with parents by Greek subjects and by males in the total sample on weekends than on week days.

Table 5 shows the percentages of breakfasts eaten with parents by ANZ and Greek subjects on week days. Significantly fewer breakfasts were eaten with parents by Greek children than by ANZ children.

3.1.2 Lunch

Table 6 shows with whom lunch was eaten during the week and weekends. It can be seen that on week days and weekends more lunches were eaten alone by males than by females.

TABLE 4

PERCENTAGES OF BREAKFASTS EATEN ALONE,

WITH PARENTS OR SIBLINGS

- WEEKDAYS AND WEEKENDS

		WEEK-DAYS				
		Alone %	Parents %	Siblings %	Total Breakfasts Eaten	Missed Breakfasts
Total Sample						
School I	M	47.2	35.8	16.7	246	74
	F	33.3	46.8	18.7	352	23
School II	M	43.8	35.7	19.7	361	39
	F	34.5	47.4	17.9	397	48
School III	M	46.6	38.9	13.1	352	58
	F	32.8	50.0	15.9	302	38
ANZ						
School I	M	40.1	50.0	9.3	54	16
	F	27.3	50.9	21.8	55	0
School II	M	47.4	39.5	10.5	76	9
	F	24.6	60.0	15.4	65	5
School III	M	50.6	36.1	12.8	172	33
	F	30.5	51.6	17.2	151	14
Greek						
School I	M	56.8	22.9	19.5	118	37
	F	37.9	43.7	17.5	103	7
School II	M	42.8	26.8	29.7	138	17
	F	33.3	37.3	28.8	177	18
School III	M	-	-	-	-	-
	F	-	-	-	-	-

TABLE 4 (CONT.)

WEEKENDS

Alone %	Parents %	Siblings %	Total Breakfasts Eaten	Missed Breakfasts
45.4	37.1	12.4	97	31
35.2	46.7	14.3	105	5
48.5	39.6	6.7	134	26
29.4	43.8	18.8	160	18
47.1	42.0	5.9	119	45
33.1	44.4	10.5	124	12
30.0	65.0	0	20	8
38.1	57.1	4.8	21	1
48.3	31.0	17.2	29	5
34.6	38.5	11.5	26	2
54.6	40.0	5.4	55	27
38.7	41.9	9.7	62	4
51.1	29.8	17.0	47	15
34.9	46.5	14.0	43	1
53.1	38.8	4.1	49	13
23.2	46.4	24.6	69	9
-	-	-	-	-
-	-	-	-	-

TABLE 5

BREAKFAST EATEN WITH PARENTS

- WEEK DAYS - ANZ AND GREEK SUBJECTS

	MALES		FEMALES	
	GREEK	ANZ	GREEK	ANZ
Parents	64	57	111	67
Other	192	73	169	53
Total	256	130	280	120

The Chi-square value testing the hypothesis that ANZ males eat the same proportion of breakfasts with parents as Greek males is 14.23. This is significant at the 1% level. The corresponding figure for females is 8.92 which is again significant. The hypotheses are consequently rejected.

TABLE 6

PERCENTAGES OF LUNCHES EATEN ALONE

OR WITH PARENTS FRIENDS OR SIBLINGS

- WEEK DAYS AND WEEKENDS

		WEEKDAYS				
		Alone %	Parents %	Friends %	Total Lunches Eaten	Missed Lunches
Total Sample						
School I	M	21.0	3.5	75.5	257	63
	F	5.2	0.8	92.8	251	24
School II	M	16.7	0.3	82.2	337	23
	F	6.0	2.1	91.0	420	25
School III	M	21.2	5.1	72.4	373	37
	F	7.4	4.5	87.5	312	28
ANZ						
School I	M	31.0	1.7	67.3	58	12
	F	13.5	1.9	80.8	52	3
School II	M	11.1	0	88.9	81	4
	F	10.0	2.9	82.9	70	0
School III	M	21.0	5.4	72.6	186	19
	F	9.4	3.8	86.8	159	6
Greek						
School I	M	21.6	4.0	74.4	125	30
	F	4.0	0	96.0	100	10
School II	M	14.7	0.7	84.0	143	12
	F	3.3	0	96.2	182	13
School III	M	-	-	-	-	-
	F	-	-	-	-	-

TABLE 6 (CONT.)

WEEKENDS				
Alone %	Parents %	Friends %	Total Lunches Eaten	Missed Lunches
16.7	65.6	4.2	96	32
10.4	74.5	9.4	106	4
20.7	58.6	3.5	145	15
13.6	65.4	8.6	161	17
31.9	51.1	3.6	141	23
17.0	64.3	3.6	112	24
28.6	57.1	0	21	7
13.6	81.8	0	22	0
22.2	55.6	0	27	7
12.0	64.0	12.0	25	3
31.5	50.7	2.7	73	9
15.8	66.7	1.8	57	9
12.5	70.1	6.3	48	14
9.1	68.2	13.6	44	0
21.4	67.9	3.6	56	6
11.1	70.8	6.9	72	6
-	-	-	-	-
-	-	-	-	-

Compared to ANZ females, fewer lunches were eaten alone by Greek females both during the week and on weekends. Furthermore, lunch was more likely to be eaten with friends by Greek females on week days. Lunch was eaten with parents more frequently by Greek males than by ANZ males on both week days and weekends. Compared to week days, a greater percentage of lunches was eaten alone by female subjects on weekends.

3.1.3 Dinner

Table 7 shows with whom subjects ate dinner during the week and weekends. On week days dinner was more frequently eaten alone by males in the total sample than by females, and by Greek males rather than by ANZ males. On weekends dinner was eaten alone more frequently by Greek children than by ANZ children.

3.2 Location of Meals.

Table 8 gives details of the location of all meals on week days and weekends. Overall, it can be seen that more meals were eaten at home than at any other location. Approximately one third of the meals were eaten at school during the week. On week days more meals were eaten in restaurants or delicatessens by ANZ females than by Greek females. On weekends, more meals were eaten at home by males than by females, whereas females were more likely to eat with friends and relatives. The table shows that meals were more frequently eaten in restaurants or delicatessens by both males and females in the total sample on weekends compared with week days.

TABLE 7

PERCENTAGES OF DINNERS EATEN

ALONE OR WITH PARENTS OR SIBLINGS

- WEEK-DAYS AND WEEKENDS

		WEEKDAYS				
		Alone %	Parents %	Siblings %	Total Dinners Eaten	Missed Dinners
Total Sample						
School I	M	11.9	80.7	4.5	269	51
	F	3.1	92.2	2.0	256	19
School II	M	10.8	81.4	3.9	381	19
	F	6.7	86.3	4.9	430	15
School III	M	13.6	78.1	5.0	397	13
	F	7.3	85.8	3.5	316	24
ANZ						
School I	M	13.3	78.3	1.7	60	10
	F	7.4	90.7	0	54	1
School II	M	6.2	79.0	8.6	81	4
	F	7.1	81.4	8.6	70	0
School III	M	15.0	77.0	3.0	200	5
	F	4.5	90.0	1.9	157	8
Greek						
School I	M	15.0	75.2	8.3	133	22
	F	2.9	88.4	3.9	103	7
School II	M	13.9	81.3	2.8	144	11
	F	8.0	85.1	4.3	188	7
School III	M	-	-	-	-	-
	F	-	-	-	-	-

TABLE 7 (CONT.)

WEEKENDS				
Alone %	Parents %	Siblings %	Total Dinners Eaten	Missed Dinners
17.4	65.3	3.1	98	30
2.0	81.2	6.9	101	9
10.3	74.4	3.9	156	4
10.6	77.0	3.1	152	16
14.9	75.7	5.4	148	16
5.6	68.0	8.8	125	11
18.2	68.2	0	22	6
0	66.7	19.1	21	1
5.9	79.4	5.9	34	0
7.4	81.5	0	27	1
18.2	74.0	5.2	77	5
7.9	68.3	7.9	63	3
18.8	66.7	2.1	48	14
4.9	78.0	2.4	41	3
15.5	67.2	5.2	58	4
14.3	68.6	4.3	70	8
-	-	-	-	-
-	-	-	-	-

TABLE 8

PERCENTAGES OF ALL MEALS EATEN

AT VARIOUS LOCATIONS

- WEEK-DAYS AND WEEKENDS

WEEK DAYS

		Home %	School %	Transit %	Rest/Deli %	Other %
Total Sample						
School I	M	65.1	29.4	2.0	1.5	2.0
	F	65.0	30.1	2.0	0.8	2.1
School II	M	62.6	31.9	1.1	2.1	2.3
	F	61.9	31.7	1.9	2.5	2.0
School III	M	64.0	30.0	1.3	1.7	3.0
	F	60.9	33.4	1.4	0.9	3.4
ANZ						
School I	M	70.4	23.8	1.0	1.6	3.2
	F	66.8	29.6	1.1	0.7	1.8
School II	M	61.0	31.6	1.3	2.4	3.7
	F	60.8	30.5	2.6	4.3	1.8
School III	M	62.5	30.8	1.7	1.6	3.4
	F	60.7	34.5	1.2	0.8	2.8
Greek						
School I	M	62.5	32.9	2.0	1.8	0.8
	F	62.9	32.7	2.3	0.5	1.6
School II	M	63.4	33.2	0.5	1.3	1.6
	F	63.2	32.3	1.2	1.2	2.1
School II	M	-	-	-	-	-
	F	-	-	-	-	-

TABLE 8 (CONT.)

WEEKENDS		
Home %	Rest/Deli %	Other %
87.0	2.8	10.2
84.3	2.3	13.4
81.6	5.7	12.7
78.3	5.2	16.5
82.3	4.6	13.1
75.7	3.5	20.8
86.8	3.1	10.1
79.7	5.9	14.4
80.3	8.0	11.7
76.5	4.0	19.5
81.1	3.6	15.3
74.3	4.1	13.6
88.2	3.0	8.8
84.3	0.4	15.3
84.1	6.4	9.5
78.6	3.6	17.8
-	-	-
-	-	-

3.3 Source of Food.

3.3.1 Home-Cooked Meals

Table 9 gives details of the percentages of all meals prepared at home on week days and during the weekends. More home-cooked meals were eaten by subjects in the total sample on weekends than during the week. On week days more home-cooked meals were eaten by females than by males in the total sample. However, the reverse applied during weekends. On week days more home-prepared meals were eaten by ANZ children compared with Greek children. Apart from females at School I, the same pattern applied on weekends.

3.3.2 Foodshop Usage during Weekends

Table 10 gives details of the percentages of meals obtained from food shops for all weekend meals. Food shops were defined as establishments from which food was purchased. These included delicatessens, snack bars, restaurants, take-away outlets such as fish and chip, chicken and fast food shops. More meals were purchased from food shops by males than by females in the total sample, and by Greek males compared with ANZ males. However, weekend meals were more likely to be purchased from food shops by ANZ females than by Greek females.

3.3.3 Dinner

Table 11 gives details of the percentages of dinners obtained from home and from food shops during the week and weekends. On week days more home-prepared dinners were eaten by females than by males. On week days a greater percentage of home-cooked dinners

TABLE 9

HOME-COOKED MEALS

PERCENTAGE OF ALL MEALS AND SNACKS

- WEEK-DAYS AND WEEKENDS

		WEEK-DAYS	WEEKENDS
Total Sample			
School I	M	69.4	81.4
	F	73.4	80.1
School II	M	73.2	78.9
	F	72.9	75.6
School III	M	69.0	76.9
	F	73.2	72.5
ANZ			
School I	M	75.6	81.4
	F	78.8	72.0
School II	M	75.7	79.6
	F	74.7	77.9
School III	M	66.9	74.8
	F	73.6	73.4
Greek			
School I	M	62.7	80.6
	F	69.1	81.0
School II	M	68.8	77.6
	F	66.9	74.0
School III	M	-	-
	F	-	-

TABLE 10

FOOD SHOP USAGE: PERCENTAGES OF ALL WEEKEND MEALS AND SNACKS OBTAINED FROM RESTAURANTS, TAKE-AWAY OUTLETS AND DELICATESSENS.

		TOTAL SAMPLE	ANZ	GREEK
School I	M	13.0	12.4	14.8
	F	11.1	19.5	6.9
School II	M	13.1	14.2	16.3
	F	12.4	13.4	11.7
School III	M	20.0	22.2	-
	F	13.9	14.4	-

TABLE 11

SOURCE OF DINNER: PERCENTAGES OBTAINED FROM HOME OR FOODSHOPS - WEEK-DAYS AND WEEKENDS

			WEEK-DAYS		WEEKENDS	
			Home	Food Shops	Home	Food Shops
Total Sample						
	School I	M	86.3	10.8	80.6	8.2
		F	94.1	4.3	75.3	15.8
	School II	M	88.1	9.2	78.2	12.8
		F	90.5	8.4	78.3	9.3
	School III	M	85.4	11.3	79.1	16.9
		F	88.9	8.5	73.6	10.4
ANZ						
	School I	M	78.3	16.7	90.9	4.6
		F	90.7	9.3	52.4	42.8
	School II	M	87.7	7.4	82.4	8.8
		F	90.0	8.6	92.6	3.7
	School III	M	83.0	12.0	75.3	20.8
		F	87.3	10.2	77.8	6.4
Greek						
	School I	M	89.5	9.0	88.3	6.3
		F	93.2	3.9	73.2	9.8
	School II	M	91.0	6.9	74.1	19.0
		F	90.4	8.5	72.9	8.6
	School III	M	-	-	-	-
		F	-	-	-	-

were eaten by Greek subjects than by ANZ subjects. On weekends, however, the reverse applied for males only in these groups.

3.4 Canteen Usage

Table 12 gives details of the percentages of morning snacks and lunches purchased from the school canteen during the week. Between 43 and 64 percent of morning snacks and between 40 and 60 percent of lunches were provided by the canteen for subjects in the total sample. Greater percentages of morning snacks and lunches were obtained from the canteen by males in the total sample than by females. More morning snacks and lunches were brought from home by ANZ subjects than by Greek subjects. The latter were more likely to buy morning snacks and lunches from the canteen. Between 71 and 80 percent of lunches were purchased by Greek males from the canteen at Schools I and II, whereas 46 to 54 percent of lunches were obtained from this source by ANZ males at Schools I, II and III.

For subjects in the total sample lunches rather than morning snacks were more likely to be brought from home. In addition, morning snacks rather than lunches tended to be purchased from food shops. It can be seen that up to seven percent of morning snacks and three percent of lunches were obtained from food shops by subjects in the total sample. More tap water was consumed at morning break than at lunch time.

The percentages of snacks and lunches obtained from the canteen at each school were calculated for the total sample of males and females. Table 13 gives the total number of children at each of

TABLE 12

CANTEEN USAGE: PERCENTAGES OF MORNING SNACKS AND LUNCHES OBTAINED FROM SCHOOL CANTEEN

		Total No. Snacks Eaten	MORNING SNACKS No snacks	Home %	Canteen %	Food Shop %	Water from School taps %
Total Sample							
School I	M	180	172	16.7	63.9	3.9	15.5
	F	206	103	26.7	51.0	4.9	17.4
School II	M	283	157	31.8	58.0	3.2	8.0
	F	364	140	34.5	51.4	2.5	11.6
School III	M	296	160	18.9	62.5	5.7	12.9
	F	340	89	34.1	42.9	7.1	15.9
ANZ							
School I	M	20	51	35.0	45.0	0	20.0
	F	33	27	30.3	51.5	3.0	15.2
School II	M	71	29	45.1	46.5	0	8.4
	F	68	18	47.1	35.3	8.8	8.8
School III	M	154	77	18.8	58.4	9.1	13.7
	F	175	32	32.6	45.7	6.3	15.4
Greek							
School I	M	126	54	10.3	70.6	4.0	15.1
	F	102	29	19.6	58.9	2.9	18.6
School II	M	111	57	18.0	77.5	1.8	2.7
	F	137	78	13.1	77.4	0.7	8.8
School III	M	-	-	-	-	-	-
	F	-	-	-	-	-	-

TABLE 12 (CONT.)

Total No. Lunches Eaten	LUNCHES No lunch	Home %	Canteen %	Food Shop %	Water from School taps %
257	63	36.6	59.1	2.7	1.6
251	24	39.0	57.8	0.8	2.4
377	23	43.8	54.1	0.8	1.3
420	25	45.7	52.1	0.7	1.5
373	37	43.4	52.8	2.1	1.7
312	28	55.8	40.4	2.2	1.6
58	12	44.8	50.0	3.5	1.7
52	3	57.7	34.6	0.8	2.4
81	4	51.9	45.7	1.2	1.2
70	0	61.4	35.7	1.4	1.5
186	19	40.3	54.3	3.2	2.2
159	6	57.9	37.1	3.1	1.9
125	30	14.4	80.0	3.2	2.4
100	10	33.0	64.0	2	7.7
143	12	26.6	71.3	0.7	1.3
182	13	22.5	75.8	0.6	1.1
-	-	-	-	-	-
-	-	-	-	-	-

TABLE 13

CANTEEN USAGE BY TOTAL SAMPLE OF CHILDREN

	MORNING SNACKS			
	Number of children	Total Snacks	From Canteen	Percentage
School I	119	386	220	57.0
School II	169	647	351	54.3
School III	150	636	331	52.0

The Chi-square value testing the hypothesis that the proportion of snacks obtained from the canteen is the same for all schools is 2.39 on 2 degrees of freedom. This value is not significant and so we accept the hypothesis.

TABLE 13 (CONT.)

	LUNCHES	
Total Lunches	From Canteen	Percentage
508	297	58.5
796	423	53.1
685	323	47.2

The Chi-square value testing the hypothesis that the proportion of lunches obtained from the canteen is the same for all schools is 15.23 on 2 degrees of freedom. This value is significant ($p < .001$) and so we reject the hypothesis.

the three schools, as well as the total numbers and percentages of morning snacks and lunches obtained from the canteens. It can be seen that at School I, 57 percent of morning snacks and 58.5 percent of lunches were obtained from the canteen. The corresponding percentages at School II, were 54.3 and 53.1, respectively. School III had the lowest usage with 52.0 percent of snacks and 47.2 percent of lunches obtained from this source. There were no significant differences between the percentages of morning snacks obtained from the three canteens. However, the percentages of lunches obtained from the canteens were significantly different ($p < .001$).

3.5 Missed Meals

Table 14 gives details of meals missed during the week and on weekends.

3.5.1 Breakfast

More breakfasts were missed by males than by females in all groups both during the week and on weekends. More breakfasts were missed during the week by Greek children than by ANZ children. On weekends more breakfasts were missed by ANZ males than by Greek males. A comparison of week days and weekends shows that females were more likely to miss breakfast on week days whereas the reverse pattern applied to males.

Table 15 gives details of the actual number of breakfasts eaten and the percentages of children who missed one or more breakfasts during the week and on weekends. More Greek children than ANZ children missed breakfast on each of the five schooldays

TABLE 14

MISSED MEALS: PERCENTAGES OF BREAKFASTS, LUNCHES AND DINNERS MISSED - WEEK-DAYS AND WEEKENDS

		WEEK-DAYS		
		Breakfast	Lunch	Dinner
Total Sample				
School I	M	23.1	19.7	15.9
	F	8.4	8.7	6.9
School II	M	9.8	5.8	4.8
	F	10.8	5.6	3.4
School III	M	14.1	9.0	3.2
	F	11.2	8.2	7.1
ANZ				
School I	M	22.9	17.1	14.3
	F	0	5.5	1.8
School II	M	10.6	4.7	4.7
	F	7.1	0	0
School III	M	16.1	9.3	2.4
	F	8.5	3.6	4.8
Greek				
School I	M	23.9	19.4	14.2
	F	6.4	9.1	6.4
School II	M	11.0	7.7	7.1
	F	9.2	6.7	3.6
School III	M	-	-	-
	F	-	-	-

TABLE 14 (CONT.)

WEEKENDS		
Breakfast	Lunch	Dinner
24.2	25.0	23.4
4.5	36.4	8.2
16.3	9.4	2.5
10.1	9.0	9.6
27.4	51.6	9.8
8.8	17.6	8.1
28.6	25.0	21.4
4.5	0	4.5
14.7	20.6	0
7.1	10.7	3.7
32.9	11.3	6.1
6.1	13.6	4.5
24.2	22.6	22.6
2.3	0	6.8
21.0	9.7	6.5
11.5	7.7	10.3
-	-	-
-	-	-

TABLE 15

NUMBERS OF BREAKFASTS EATEN

AND PERCENTAGES MISSED - WEEK-DAYS AND WEEKENDS

		WEEKDAYS							
Breakfasts Eaten		None	One	Two	Three	Four	Five	Total	One or more Missed %
Total Sample									
School I	M	5	7	5	1	4	42	64	34.4
	F	1	1	3	1	3	46	55	26.4
School II	M	2	2	1	5	8	62	80	22.5
	F	0	3	4	8	8	66	89	25.8
School III	M	2	3	5	8	8	56	82	32.1
	F	3	0	2	6	5	52	68	23.5
ANZ									
School I	M	1	2	1	0	0	10	14	29.6
	F	0	0	0	0	0	11	11	0
School II	M	0	1	0	2	1	13	17	25.5
	F	0	0	0	2	1	11	14	21.4
School III	M	0	2	4	4	5	26	41	36.6
	F	1	0	0	3	3	26	33	21.2
Greek									
School I	M	3	3	2	1	2	20	31	35.5
	F	1	0	0	0	2	19	22	13.6
School II	M	2	0	0	1	5	23	31	26.8
	F	0	2	1	1	5	30	39	23.1
School III	M	-	-	-	-	-	-	-	-
	F	-	-	-	-	-	-	-	-

TABLE 15 (CONT.)

WEEKENDS				
None	One	Two	Total	One or more missed %
7	7	40	64	27.5
0	5	50	55	45.0
6	14	60	80	25.0
4	10	75	89	25.7
15	16	51	82	38.1
1	10	57	68	16.2
2	4	8	14	42.9
0	1	10	11	9.1
1	3	13	17	23.5
0	2	12	14	24.3
10	7	24	41	41.5
0	4	29	33	12.1
4	7	20	31	35.5
0	1	21	22	4.5
4	5	22	31	20.0
3	3	23	39	41.0
-	-	-	-	-
-	-	-	-	-

as well as both days during the weekend. Greek children were also more likely than ANZ children to omit one or more breakfasts during the week.

3.5.2 Lunch

On week days a greater percentage of lunches was missed by males than by females in all groups. More lunches were missed on week days by Greek children than by ANZ children, whereas the reverse applied on weekends. A greater percentage of lunches was missed by the total sample on weekends compared with week days.

3.5.3 Dinner

On week days more dinners were missed by Greek males than by Greek females. On weekends more dinners were missed by Greek males than by ANZ males. Apart from females at School II, a greater percentage of dinners was missed by the total sample on weekends compared with week days.

A trend that emerged from Table 14 was that on week days breakfast was the meal most frequently missed by the total sample, followed by lunch and dinner in that order.

3.6 Eating Patterns

3.6.1 Three Main Meals Without Snacks

Table 16 gives details of eating patterns in which three main meals without in-between-meal snacks, were consumed during the week and on weekends. Overall it can be seen that a small percentage of three meals only was eaten and this percentage

TABLE 16

EATING PATTERNS: PERCENTAGES OF THREE MAIN MEALS WITHOUT SNACKS - WEEK-DAYS AND WEEKENDS

		WEEK-DAYS	WEEKENDS
Total Sample			
School I	M	5.6	4.7
	F	3.6	4.6
School II	M	7.5	7.5
	F	4.7	5.6
School III	M	7.8	11.0
	F	3.8	8.1
ANZ			
School I	M	5.7	3.6
	F	3.6	0
School II	M	7.1	5.9
	F	5.7	7.1
School III	M	12.2	17.1
	F	1.8	10.6
Greek			
School I	M	5.8	3.2
	F	0	4.6
School II	M	7.1	11.3
	F	6.2	3.6
School III	M	-	-
	F	-	-

increased marginally on weekends. The table shows that a greater percentage of three main meals without snacks was eaten by males in the total sample than by females, both during the week and on weekends. A comparison of week days and weekends shows that in the latter period there was an increased percentage of three meals without snacks eaten by females in the total sample.

3.6.2 Snacks

Table 17 gives details of snacking patterns. In general, it can be seen that high percentages of snacks were eaten by the children in the morning, afternoon and evening.

The table shows that on week days a greater percentage of morning, afternoon and evening snacks was eaten by females in the total sample than by males. More afternoon snacks were eaten by ANZ males than by Greek males. On weekends, greater percentages of morning and evening snacks were eaten by females in the total sample than by males. Fewer evening snacks were consumed by all subjects on weekends compared to during the week.

3.6.3 Three Main Meals and Three Snacks

Table 18 gives details of eating patterns in which three main meals together with three snacks were consumed daily during the week and on weekends. For the total sample the occurrence of this particular eating pattern ranged from 20 to 43 percent on week days and from 12 to 41 percent on weekends. On week days and during the weekend greater percentages of three main meals together with three snacks were eaten by females than by males. On weekends this pattern of meals and snacks was eaten more frequently by ANZ males than by Greek males.

TABLE 17

SNACKING PATTERNS: PERCENTAGES OF MORNING, AFTERNOON AND EVENING SNACKS - WEEKDAYS AND WEEKENDS

		WEEK-DAYS		
		Morning	Afternoon	Evening
Total Sample				
School I	M	51.1	65.2	63.4
	F	66.7	75.7	76.8
School II	M	64.3	64.8	68.9
	F	72.2	75.2	70.6
School III	M	64.9	67.4	70.0
	F	79.3	72.1	75.5
ANZ				
School I	M	28.2	72.5	71.2
	F	55.0	65.5	75.0
School II	M	71.0	72.8	68.8
	F	79.1	81.2	85.7
School III	M	66.7	64.4	65.1
	F	84.5	79.0	79.4
Greek				
School I	M	70.0	64.9	64.2
	F	77.9	82.9	80.5
School II	M	66.1	59.8	71.0
	F	63.7	69.0	68.2
School III	M	-	-	-
	F	-	-	-

TABLE 17 (CONT.)

WEEKENDS		
Morning	Afternoon	Evening
62.5	65.0	56.6
74.6	85.1	69.0
58.8	69.9	66.7
59.1	64.4	68.9
36.9	48.4	61.5
58.4	68.0	61.8
58.1	71.1	61.8
80.8	76.9	54.2
51.4	67.4	65.8
64.5	80.6	68.7
35.7	49.5	55.9
52.9	71.8	60.3
59.7	66.3	49.2
74.5	90.8	75.0
52.3	63.9	70.3
63.4	77.0	70.7
-	-	-
-	-	-

TABLE 18

SNACKING PATTERNS: PERCENTAGES OF THREE MAIN MEALS AND THREE SNACKS - WEEK-DAYS AND WEEKENDS

		WEEK-DAYS	WEEKENDS
Total Sample			
School I	M	20.3	21.1
	F	32.7	40.9
School II	M	24.3	24.4
	F	32.6	23.6
School III	M	26.6	11.6
	F	42.7	16.2
ANZ			
School I	M	11.4	25.0
	F	23.6	27.3
School II	M	31.8	23.5
	F	47.1	32.1
School III	M	24.4	8.5
	F	48.5	15.2
Greek			
School I	M	27.7	14.5
	F	37.3	43.2
School II	M	24.5	21.0
	F	25.6	26.9
School III	M	-	-
	F	-	-

3.6.4 Snacking Frequency

Table 19 gives details of snacking frequencies during the week and on weekends. On week days the snacking frequency of females in the total sample was three, two, one snack, in that order. The snacking frequency for males was two, one or three snacks, in that order. During the weekend a greater percentage of two snacks rather than three snacks or one snack was eaten by Greek subjects. Overall, females snacked more than males and less snacks were eaten by all subjects during the weekend.

TABLE 19

SNACKING PATTERNS: PERCENTAGES OF THREE, TWO, ONE AND NO SNACKS - WEEK-DAYS AND WEEKENDS

		WEEK-DAYS			
		3 Snacks	2 Snacks	1 Snack	No Snack
Total Sample					
School I	M	25.6	34.1	18.5	20.6
	F	38.2	37.8	16.4	6.9
School II	M	27.8	39.3	33.3	9.5
	F	36.6	32.6	23.1	6.5
School III	M	32.4	33.7	22.0	11.9
	F	46.2	30.6	14.4	7.3
ANZ					
School I	M	15.7	48.6	18.6	17.1
	F	23.6	47.3	23.6	5.5
School II	M	34.1	35.3	22.4	8.2
	F	51.4	31.4	11.4	4.3
School III	M	31.7	31.7	21.5	15.1
	F	52.1	25.5	17.6	4.9
Greek					
School I	M	36.8	28.4	15.5	19.4
	F	47.7	41.5	21.5	0
School II	M	25.8	43.2	18.7	11.0
	F	29.2	38.5	23.6	8.7
School III	M	-	-	-	-
	F	-	-	-	-

TABLE 19 (CONT.)

WEEKENDS			
3 Snacks	2 Snacks	1 Snack	No Snacks
27.3	29.7	16.4	22.7
43.6	31.8	16.4	8.2
21.8	31.9	26.3	11.9
27.0	38.2	26.4	7.9
15.0	27.4	34.8	23.2
21.3	42.6	27.2	10.3
32.1	28.6	14.3	25.0
27.3	45.5	27.3	0
26.5	35.3	20.6	17.6
35.7	21.4	42.9	3.6
14.6	28.0	29.3	28.1
22.7	37.9	25.8	12.1
22.6	30.6	22.6	22.6
42.3	50.0	19.2	4.6
29.0	29.0	27.4	14.5
28.2	42.3	20.5	6.4
-	-	-	-
-	-	-	-

CHAPTER IV

DISCUSSION OF THE FINDINGS

4.1 Persons with whom Children Ate Meals

The finding in the present study that breakfast was the meal most frequently eaten alone supports Hayden's observation that breakfast is changing from the traditional family meal to one which is prepared and eaten at different times by individual family members.[53] The high percentage of breakfasts eaten alone would appear to be a reflection of the changing work and meal patterns in today's society.

The social patterns that emerged from the findings on company at meals showed that, in general, females were less likely than males to eat lunch alone at school and Greek females were more likely than ANZ females to eat lunch in the company of friends. Males in the total sample were more likely than females to eat dinner alone on week days.

During the week significantly smaller percentages of breakfasts were eaten with parents by Greek children than by ANZ children. The present survey did not provide information to explain such differences but it is suggested that the mothers' employment may have been a contributing factor. In retrospect, information on whether or not parents worked and their type of employment would have provided valuable additional data. Recent information obtained from the Australian Bureau of Statistics indicates that 89 percent of married Greek women work whereas 56 percent of married ANZ women are in the work force.[79] In addition, it is estimated from statistics

of types of work undertaken by women in different ethnic groups that 90 percent of Greek women have the type of employment that is likely to take them away from home in the early morning.[80] These employment factors may be partly responsible for the finding that Greek children were more likely to eat breakfast alone during the week and also explain why a greater percentage of breakfasts were eaten with Greek parents during the weekends compared with week days.

More dinners were eaten with parents of the total sample on week days than on weekends. It could be speculated that social functions may have caused parents to be absent from home at dinner time at weekends. In addition, it is often customary for some family meals to be less formal on weekends because of sporting and social activities.

4.2 Location of Meals

Only a small percentage of meals (up to three percent) was eaten in restaurants, fast-food outlets or delicatessens during the week. At weekends this figure increased to a maximum of six percent for the total sample, suggesting that families choose this time to dine out.

It has been observed that the number of meals eaten and prepared outside the home is increasing.[60] The present findings indicate that the home and school were the most frequent locations for the consumption of food. However, the future trend may be that more meals will be consumed in restaurants, fast-food outlets, delicatessens and snack bars.

A social pattern for Greek children emerged whereby more meals were eaten by females than by males on weekends at the homes of friends or relatives rather than at restaurants. Although the present study did not reveal reasons for such a pattern it can be speculated that Greek parents may have stricter attitudes towards daughters than towards sons.

4.3 Meals Prepared at Home

The findings of the present study showed that the majority of all meals eaten were home-prepared. On week days up to 73 percent of meals for the total sample were home-cooked and on weekends the percentage rose to 81 percent. The difference between week days and weekends was largely accounted for by meals obtained during the week from school canteens.

Rogers has stated that increasing amounts of food will be prepared outside the home in the future. While the overall effect of such meals on the nutritive value of the diet is not completely known there is sufficient data to be concerned about the nutritional value of many fast and snack foods.[60] It is suggested that the combined effect of many non-nutritious foods obtained from the school canteen and the increased consumption of meals and snacks not prepared at home may be a cause for concern.

During the week more home-prepared meals were eaten by females than by males, suggesting that females were more likely to prepare their own breakfast, lunch and dinner whereas males were more inclined to buy from food shops. This finding is supported by the fact that on weekends more home-prepared meals were eaten by males, possibly because parents who worked during the week had

time on weekends to prepare breakfast and lunch for the family. The finding that on weekends more home-prepared meals were eaten by males than by females may be misleading because a greater percentage of meals prepared in the homes of relatives and friends were eaten by females.

4.4 Canteen Usage

The heavy usage of the canteen for morning snacks and lunches is similar to the findings of Coy[17] in Tasmania and Storey[8] in Victoria. The large proportion of food obtained from canteens failed to confirm claims by some canteen personnel that an insignificant amount of the food intake during the school day comes from this source. The higher usage by males in the total sample compared to females, may be because males were less inclined to bring food from home if they had to prepare it themselves.

The finding that a greater percentage of morning snacks were purchased from the canteen by Greek subjects than by ANZ subjects, may be explained by the fact that more breakfasts were missed by Greek children who were, therefore, hungrier before school and at recess time than ANZ children. The importance of the canteen as a major source of food during the school day is further emphasized when the high percentage of missed breakfasts is taken into consideration. For the many children who missed breakfast the canteen provided the first meal of the day as well as morning snacks and lunches.

The canteen at School I had the most acceptable menu with a wide variety of nutritious foods enjoyed by children. This canteen was more heavily patronized than the other two, even

though it was not open before school and there were a number of food shops nearby. The canteen at School II with the least acceptable menu had no competition from food shops because the school is situated in an area isolated from the shopping centre. Although the canteen was open before school, overall usage was lower than at School I. The lower usage of the canteen at School II may have been due to a reaction on the part of some parents who were concerned about the nutritional implications of obtaining undesirable food from the canteen. A solution to this problem would be for the parents to supply food from home. In fact, greater percentages of both morning snacks and lunches were brought from home by males and females at School II compared with School I.

The canteen at School III stocked a number of nutritionally unacceptable items but the menu was superior to that at School II. Although this canteen was open before school, the usage was the lowest of the three. This finding suggests that the lack of a wide variety of nutritious foods which were acceptable to children may have been the reason children purchased food items from nearby shops rather than from the canteen.

In general, the findings suggest that canteen usage is highest when children have the opportunity of selecting from a wide variety of nutritious items. Furthermore, an unfavourable menu may reduce usage significantly amongst children who have concerned parents.

The present study showed that the practice of opening the canteen before school did not result in a heavier usage by the

children. This finding would appear to be in conflict with a directive of the Committee of Enquiry into Canteen Management that extending the hours of opening will increase turnover.[15] In addition, claims by some canteen personnel that less nutritious items need to be stocked to keep the children in the school grounds could not be supported by the present study. School I had nearby food shops, yet the canteen usage was higher than that at School II where there was an absence of nearby shops.

Various other reasons have been given for the sale of nutritionally unacceptable items in school canteens. For example, the competition from nearby food shops has often been used to justify the inclusion of such items in the canteen menus. It has been argued by some canteen personnel that unless a range of sweets, cakes, iceblocks and soft drinks are sold, the students will purchase these items from local shops and consequently canteen usage and profitability will suffer. These claims were not substantiated by the present study. The canteen which provided a wide range of nutritionally acceptable foods had the highest patronage despite the presence of nearby shops. In fact, menu quality would appear to have been the major factor in determining canteen usage.

The high water intake during the morning compared to that at lunch time was probably due to the markedly increased intake of soft drinks at lunch time, as reported in a preliminary paper.[25]

4.5 Missed Meals

The finding that breakfast was the meal most frequently missed is consistent with other investigations of eating patterns

which indicate that breakfast is the meal teenagers are most likely to omit.[42,55] A number of investigators have claimed that missing breakfast affects eating patterns and nutritional intakes for the rest of the day as well as adversely influencing attitude and scholastic achievements.[43,49,58,59] It might be speculated that the school work of a number of males and Greek children in the present study may have suffered because these children left home in the morning without eating.

The present finding that breakfast was more frequently missed by males than by females conflicts with Nizel's claim that females are more likely to miss breakfast,[34] and also with Webb who reported that breakfast adequacy did not appear to be related to sex, age or the time of the next meal.[56]

The finding that lunch and dinner were more frequently missed by children during the weekends than on weekdays indicated that eating patterns differ on weekends compared with school days. Similar patterns have been observed by other investigators.[76,78] Researchers have found also that weekend diets are less adequate than those on school days.[76] For these reasons, it becomes evident that a meaningful survey of dietary intakes must include weekends as well as days of the week.

4.6 Snacking Patterns

The snacking frequencies reported in the present study support the observations of numerous researchers that snacking is a major characteristic of adolescent eating patterns.[27,29,31,32,34] The findings that eating was restricted to three main meals without snacks by only a small percentage of children and by far

the greater percentage snacked during the day, support the observation that many people no longer rely on three main meals for their total food intake each day.[37] This finding emphasizes the need for greater attention to be given to the quality of snacks.

The tendency for girls to snack more frequently than boys was observed also by Wharton.[41] On the other hand, Harding and Lines[40] found that sex differences were not great but that high energy snacks were more likely to be eaten by females in the morning, whereas this type of snack was more likely to be eaten by males after school. Apart from a trend of decreased snacking in the evenings on weekends, the present findings did not indicate that children snacked more often during any one designated period.

The observation that meals were missed more frequently and snacks were eaten less frequently by males than by females is interesting and may be a cause for concern. Even though the present report does not include the information required to make a nutritional assessment of the diet, research has shown that children who eat regular structured meals, augmented by snacks, have superior diets to those who frequently miss meals and have random patterns of eating.[33] Thus males in the present study may be more at risk nutritionally than females. Further investigation of the nutritional adequacy of these diets is now in progress.

CHAPTER V

CONCLUSIONS

The present study showed that on school days breakfast was the meal most frequently missed or eaten alone.

A number of sex differences were revealed with respect to eating patterns in that males were more likely than females to eat alone at breakfast, lunch and dinner and also to miss these meals. On week days less home-prepared dinners were eaten by males than by females. Food shops were used more frequently by males than by females, and during the week males relied more on the school canteen for snacks and lunches. Males snacked less frequently and were more likely than females to eat three main meals without between-meal snacks.

Ethnic differences were found in that Greek children were more likely than ANZ children to miss breakfast or to eat this meal alone. Greek children also brought less snacks and lunches from home and patronized the canteen more heavily than ANZ children.

The canteen was shown to be the major source of food for children during the school day. Over half of all lunches and snacks eaten at school were obtained from this source. Canteen usage at each of the three schools varied according to the menu provided. The canteen at School I was not open before school and had competition from a number of nearby food shops, but its nutritionally acceptable menu attracted the highest patronage. The lowest usage of the canteen occurred at School III which stocked

acceptable as well as undesirable food items and was situated close to a number of food shops. School II with the least favourable menu had a lower canteen usage than School I even though there was no competition from nearby food shops. The children at this school were the most likely to bring food from home.

Food shops did not appear to be an important source of meals during the week but there was a two-fold increase in the number of meals eaten in restaurants, take-away outlets and snack bars during the weekend.

The majority of children snacked during the day and only a small percentage relied on three main meals for their daily food intake. This finding emphasizes the need for greater concern on the quality of snack foods so that low nutrient density foods are replaced by items that contribute in a beneficial way to the daily diet.

APPENDIX 1

THE UNIVERSITY OF ADELAIDE

BOX 498, G.P.O., ADELAIDE, SOUTH AUSTRALIA 5001

Telephone: (Area Code 08) Telegraphic Address:

Department of Dental Health

17th November 1978

Mr C.H. Brideson,
Principal,
Adelaide High School,
West Terrace,
ADELAIDE, S.A. 5001.

Dear Mr Brideson,

I am writing to confirm the arrangements we discussed earlier this week in connection with the nutrition study to be conducted in 1979 by the Department of Dental Health of The University of Adelaide.

It is intended that all Year 8 students will participate in the study by completing a dietary record of the foods and drinks consumed over a seven day period commencing in February. A similar record will be completed late in November, or early December, to determine whether a change occurs in the child's eating behaviour during the school year. Basically, the main purpose of the study is to determine what children of this age actually eat and whether any of them lack essential nutrients in their daily diet.

As suggested by you, the date for describing the project to the children will be Friday, February 23rd. At this time a sample diet record will be issued to each child to illustrate the manner in which the daily records are to be completed. A sufficient number of blank diet records also will be provided so that these can be distributed each day by the teachers, commencing on Monday, February 26th. On the following Friday, the children will receive three forms, colour-coded to differentiate between Saturdays, Sundays and week days.

I understand that the Year 8 intake in 1979 is expected to approximate 180. On the mornings of Tuesday, Wednesday, Thursday, Friday and Monday, February 27th, 28th, March 1st, 2nd and 5th, a team of health education personnel will scan each child's completed record and before accepting it will confirm that nothing has been omitted. If a child is absent because of illness, a diet record will be completed for the appropriate days of the following week. It is anticipated that the collection of records will be completed by 9.30 a.m. each morning.

../2

APPENDIX 1 (CONT.)

If you are agreeable, in order to stimulate and maintain interest in the project, the children will receive a reward when each of the two seven-day records have been satisfactorily completed.

Please do not hesitate to get in touch with me if you require further information. I await your advice concerning the most convenient time to give the preliminary talk on Friday, February 23rd.

With kindest regards.

Yours sincerely,

Elizabeth A. Fanning
Reader in Preventive Dentistry

EAF/dst

APPENDIX 2

ADELAIDE HIGH SCHOOL

Telephone: West Terrace Campus

Address all correspondence:
PRINCIPAL
WEST TERRACE
ADELAIDE SA 5000

13th December, 1978.

Ref. No. CHB:KET/168/78

Dr. E.A. Fanning,
Reader in Preventive Dentistry,
The University of Adelaide,
North Terrace,
ADELAIDE. S.A. 5000.

Dear Dr. Fanning,

Thank you for your letter of the 11th December concerning the change in date for the description of the project to the students on Friday March 2nd, rather than Friday February 23rd.

As far as I am able to see there are no problems associated with this and we will merely move the whole project back a week. The person on the staff who will be handling this exercise for me is Mr. B. Lee-Gray, Senior Student Counsellor.

Should there be any further problems please do not hesitate to contact me.

Yours sincerely,

C.H. Brideson.
Principal.

APPENDIX 3

THE UNIVERSITY OF ADELAIDE

NAME: ..... M F ☐☐ DATE OF BIRTH: Day Mth Yr ☐☐☐☐☐☐ (0 4 D e c 6 5 - 4th Dec, 1965)

SCHOOL: ..... DAY: .....

FOOD INTAKE DIARY

1. Record all food and drinks consumed today at meal times and in-between meals. Include snacks such as lollies, cakes, biscuits, ice-cream, etc., also sugar or honey you put in tea, coffee and on cereals.

2. Remember to record all kinds of drinks - water, tea, coffee, cordials, soft drinks, TAB or coke, etc.

3. Make sure you say approximately how much you ate, e.g. 1 cup cornflakes, 2 slices bread, 1 teaspoon sugar level or heaped. Butter spread thick or thin.

4. If you had cereal for breakfast, give the brand, e.g. Kellogg's Cornflakes, Froot Loops, etc.

5. State the time when you ate the food, e.g. 7.30 a.m., 4.00 p.m. etc.

6. Record where you ate the food and with whom, e.g. at the table with family or in front of TV, alone, etc.

7. Record any vitamins or medicines you took. Kind .....
Tablets ..... Drops ..... Cough lollies .....

8. Did you buy anything from the canteen today? Yes ☐ No ☐ Tick Box
Details: .....
.....
.....

9. Did you buy anything from other food shops today? Yes ☐ No ☐ Tick Box
Details: .....
.....
.....

10. Did you bring any food from home today? Yes ☐ No ☐ Tick Box
Details .....
.....
.....

APPENDIX 3 (CONT.)

Time	When did you eat & with whom?	Food and drinks consumed	Approximate amounts
		BREAKFAST	
		BETWEEN BREAKFAST & MIDDAY MEAL	
		MIDDAY MEAL	

APPENDIX 3 (CONT.)

- 3 -

Time	When did you eat & with whom?	Food and drinks consumed	Approximate amounts
		BETWEEN MIDDAY & EVENING MEALS	
		EVENING MEAL	
		BETWEEN EVENING MEAL & BEDTIME	

APPENDIX 4

THE UNIVERSITY OF ADELAIDE

Department of Dental Health

COUNTRY OF BIRTH: Mother . . . . . Father . . . . . Date of Birth: Day Mth Yr. 0 4 1 2 6 5 4 Dec. 1965

NAME: ..... M F

SCHOOL: ..... DAY: .....

MY FOOD EATING DIARY

1. Write down all the food and drinks you ate today at meal times and in-between meals. Include snacks such as lollies, cakes, biscuits, ice-cream, etc., also sugar or honey you put in tea, coffee and on cereals.

2. Remember to write down all kinds of drinks - water, tea, coffee, cordials, soft drinks, TAB or coke, etc.

3. Make sure you say approximately how much you ate, e.g. 1 cup cornflakes, 2 slices bread, 1 teaspoon sugar level or heaped. Butter spread thick or thin.

4. If you had cereal for breakfast, tell us the brand, e.g. Kellogg's Cornflakes, Froot Loops, etc.

5. Write down the time when you ate the food, e.g. 7.30 a.m., 4.00 p.m. etc.

6. Tell us where you ate the food and who you were with, e.g. at the table with family or in front of TV, alone, etc.

7. Write down any vitamins or medicines you took. Kind .....

   Tablets: ..... Drops: ..... Cough lollies: .....

8. Did you buy anything from the canteen today? Yes No Tick box ✓

   Details: .....
   .....
   .....

9. Did you buy anything from other food shops today? Yes No Tick box ✓

   Details: .....
   .....
   .....

10. Did you bring any food from home today? Yes No Tick box ✓

    Details: .....
    .....
    .....

Elizabeth A. Fanning,
Reader in Preventive Dentistry.

APPENDIX 4 (CONT.)

2.

Time	Where did you eat & who with?	Food and drinks eaten	Approximately how much
		BREAKFAST	
		BETWEEN BREAKFAST & LUNCH TIME	
		LUNCH TIME	

If you forget what the food is called in English, just write down what you call it at home or write down what it is made of e.g. pastitso or macaroni with meat.

APPENDIX 4 (CONT.)

3.

Time	Where did you eat & who with?	Food and drinks eaten	Approximately how much
		BETWEEN LUNCH TIME AND TEA TIME	
		TEA TIME	
		BETWEEN TEA TIME & BED TIME	

If you forget what the food is called in English, just write down what you call it at home or write down what it is made of e.g. pastitso or macaroni with meat.

APPENDIX 5

4.

SAMPLE

Time	Where did you eat & who with?	Food and drinks eaten	Approximately how much
		BREAKFAST	
7.30	At table with family	Cereal: Kellogg's Cornflakes milk sugar White coffee - milk - sugar	1 cup ¼ cup 1 level tablespoon 1 tablespoon 1 heaped teaspoon
		BETWEEN BREAKFAST & LUNCH TIME	
8.30	On way to school with friends	Cheezels	1 small packet
10.30	With class-mates	Apple	1 large
		LUNCH TIME	
12.15	At school with class-mates	Fritz sandwiches: White bread Fritz Butter Sauce Chocolate doughnut Coke	4 slices 2 slices thin spread 1 tablespoon 1 x 1 can
		BETWEEN LUNCH TIME & TEA TIME	
4.15	At home alone	Milk, chocolate flavoured Sweet biscuits	1 glass 4 x
		TEA TIME	
6.10	At table with family	Roast meat or pastitso or minestrone Baked potatoes Boiled carrots Apple pie or cheese and fruit White tea: milk sugar	1 serving 2 x 3 x 1 serving 1 teaspoon 1 heaped teaspoon
		BETWEEN TEA TIME & BED TIME	
7.30 8.15	Watching TV alone	Wagon wheel Yoghurt pie Coke	1 x 1 x 1 can

If you forget what the food is called in English, just write down what you call it at home or write down what it is made of e.g. pastitso or macaroni with meat.

APPENDIX 6

THE UNIVERSITY OF ADELAIDE
Department of Dental Health

Nutrition Project Timetable

THEBARTON HIGH SCHOOL
70 South Road, Torrensville, 5031. Tel.No.

Preliminary talk		Fri. Feb.	9
Record Day 1		Sat.	10
Scan & collect	8.30 a.m.	Mon.	12
	"	Tues.	13
	"	Wed.	14
	"	Thurs.	15
	"	Fri.	16
Final forms	"	Mon.	19

LE FEVRE HIGH SCHOOL
90 Hart Street, Semaphore South, 5019. Tel.No.

Preliminary talk		Tues. Feb.	20
Record Day 1		Wed.	21
Scan & collect	8.30 a.m.	Thurs.	22
	"	Fri.	23
	"	Mon.	26
	"	Tues.	27
Final forms	"	Wed.	28

ADELAIDE HIGH SCHOOL
West Terrace, Adelaide, 5001. Tel.No.

Preliminary talk		Fri. Mar.	2
Record Day 1		Sat.	3
Scan & collect	8.30 a.m.	Mon.	5
	"	Tues.	6
	"	Wed.	7
	"	Thurs.	8
	"	Fri.	9
Final forms	"	Mon.	12

ELIZABETH A. FANNING,
Reader in Preventive Dentistry.

February 2nd, 1979.

APPENDIX 7

THE UNIVERSITY OF ADELAIDE

Department of Dental Health

Nutrition Project - 1979

The aims of the project are to determine the diet of Year 8 students and also to detect any modifications which may occur due to exposure to three types of school canteens.

The diets will be analysed in terms of nutrient deficiencies such as calcium, iron, protein and certain vitamins. Information will also be available on whether breakfast is omitted, meals are inadequate, where children eat and with whom. The availability of sweets has been shown to have a direct relationship with dental caries. The study involves schools with a nutritionally beneficial canteen and one that sells a restricted range of sugary foods and an unrestricted canteen. Amongst other findings, the study will help to answer claims to the effect that children go elsewhere for sweets if they are not provided at school. The effects of exposure to these three types of canteens may show changes in the eating patterns recorded at the beginning and end of the year.

The study involves all Year 8 students at the following three metropolitan high schools -

Thebarton High School
.. the only metropolitan high school with a canteen menu that is nutritionally acceptable, and

Le Fevre High School and Adelaide High Schools
.. which have acceptable, partially acceptable and unacceptable canteens, respectively.

The three schools draw students from similar economic areas.

The anticipated enrolment for Year 8 at these schools is approximately 135 at Thebarton (nine groups of 15); 196 at Le Fevre (seven groups of 28), and 180 at Adelaide. A total of approximately 500.

Each student will complete a 7-day diet record in February/March and again in November/December. Before the children commence recording their diets, group instruction on methodology will be given at the schools. Sample diet records will be issued and an overhead projector and transparencies will be used to illustrate the manner in which the daily records are to be completed.

In order to stimulate and maintain interest in the project the children will receive a reward when each of the two 7-day records have been satisfactorily completed. If a child is absent because of illness, a diet record will be completed for the appropriate days of the following week, if possible.

During the recording weeks the diet records will be scanned before acceptance and checked to correct errors and omissions. Those responsible for scanning the records will assemble at the schools at 8.30 a.m.

The proposed timetable for the February/March survey is attached.

APPENDIX 7 (CONT.)

Information about the schools which may be helpful -

Thebarton High School (East Campus),
70 South Road,
Torrensville, 5031.

Telephone:

Principal: Mr. D. Morely

School Nurse: Ms. Elizabeth Elder

Adelaide High School,
West Terrace,
Adelaide, S.A.5001.

Telephone:

Principal: Mr. C. Brideson

Snr.Student Counsellor: Mr. B.Lee-Gray

Le Fevre High School,
90 Hart Street,
Semaphore South, 5019.

Telephone:

Principal: Mr. P.B. McDonald

School Nurse: Ms. June Newton.

ELIZABETH A. FANNING,
Reader in Preventive Dentistry.

February 1st, 1979.

APPENDIX 8

THE UNIVERSITY OF ADELAIDE COMPUTING CENTRE

PROGRAM.....
PROGRAMMER.....

JOB NAME.....CHARGE CODE .....

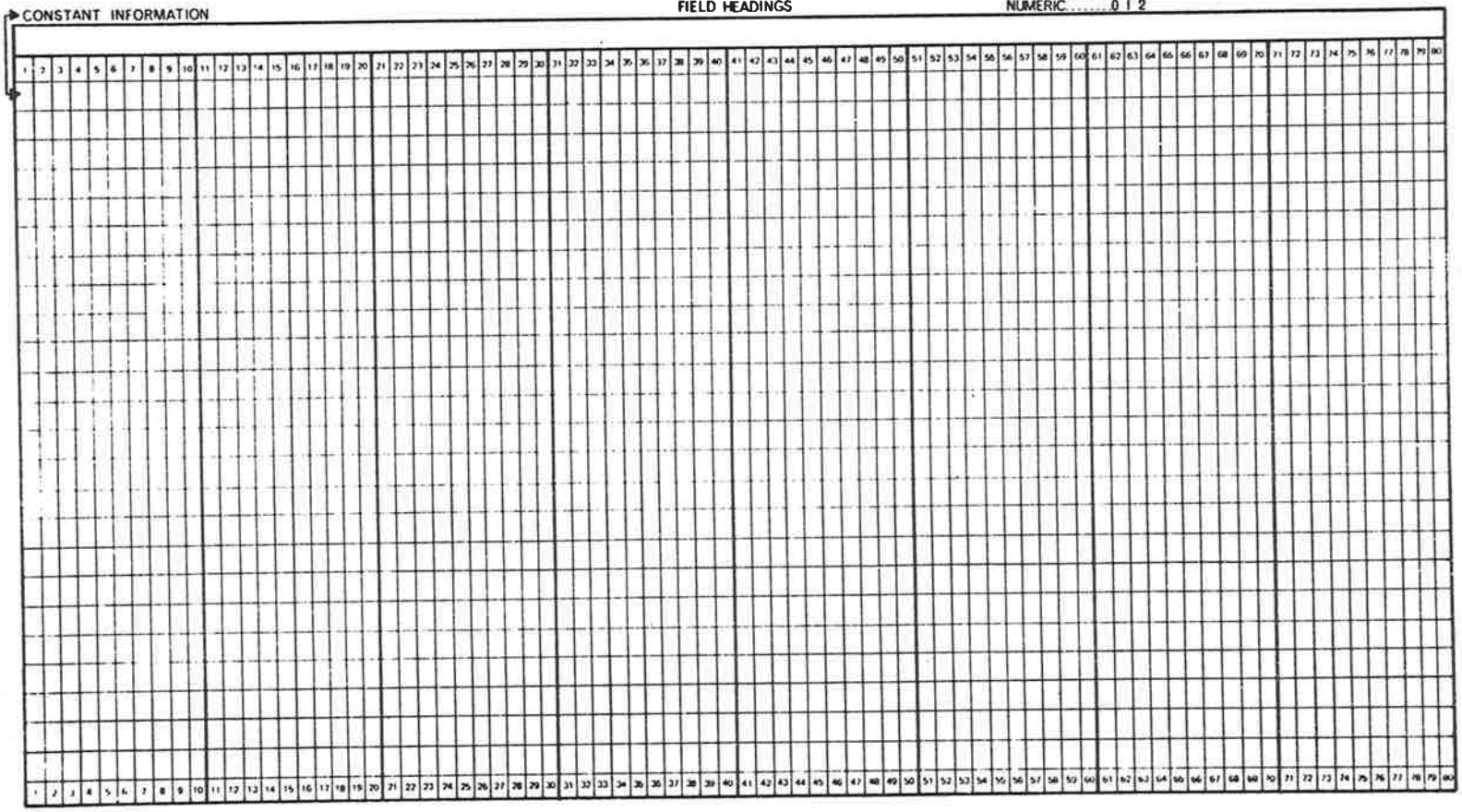
DATE .....
PAGE.....OF.....

DATA CODING FORM

NOTE
ALPHA.....Ø I Z
NUMERIC.....0 1 2

CONSTANT INFORMATION

FIELD HEADINGS



APPENDIX 9

SOCIOLOGICAL DATA CODING

0	Unknown
1	Italy
2	Greece
3	Australia
4	Germany
5	Yugoslavia
6	England
7	Ireland
8	Scotland
9	Wales
10	Switzerland
11	Sweden
12	Ceylon
13	Australian Aboriginal
14	France
15	Holland
16	Portugal
17	Spain
18	U.S.A.
19	Russia (Ukraine)
20	Poland
21	Czechoslovakia
22	Israel
23	New Zealand
24	Singapore
25	Egypt
26	Austria
27	Hungary
28	Lithuania
29	Latvia
30	Lebanon
31	India

Name	1 - 40
blank	41
School	42
Serial No.	43 - 4 - 5
blank	46
Sex	47
blank	48
Date of Birth	49 - 54
blank	55
Country M.	56 - 7
blank	58
Country F.	59 - 60

APPENDIX 10

DIETARY DATA CODING

	Code	Column
Child's ID number		
School and serial number		1 - 4
Day		5
Sunday	1	
Monday	2	
Tuesday	3	
Wednesday	4	
Thursday	5	
Friday	6	
Saturday	7	
Meal Identification		6
Breakfast	1	
Between breakfast and lunch	2	
Lunch	3	
Between lunch and tea	4	
Tea	5	
Between tea and bedtime	6	
With Whom Meal was Eaten		7
Alone	1	
Friends	2	
Relatives, not family	3	
Siblings	4	
Parent present	5	
Location of Meal		8
Home	1	
School	2	
In transit	3	
Relative's house	4	
Friend's house	5	
Restaurant, deli, fast food chain	6	
Where Food Obtained		9
From home	1	
School canteen	2	
Other food shops	3	
Friend	4	

2/..

APPENDIX 10 (CONT.)

Leave blank	10 - 20
Food code and amount eaten (gms)	
First food	21 - 30
Second	31 - 40
Third	41 - 50
Fourth	51 - 60
Fifth	61 - 70
Sixth	71 - 80
Additional foods go to next alternate line	21 - 30 etc.

Within each block of 10 columns

1	2435	6	7 8 9 10
blank	Food code	blank	amount in gms

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