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**THE EFFECT OF A NUTRITION AND
HEALTH EDUCATION PROGRAMME ON
THE DIETARY CHOICES
AND BODY COMPOSITION MEASURES IN
10-12 YEAR OLD
NEW ZEALAND CHILDREN**

A thesis presented in partial fulfillment
of the requirements for the degree of
Masters of
Science in Nutritional Science
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DECLARATION

The work presented in this thesis is the original work of the author except as acknowledged in the text. I hereby declare that I have not submitted this material either in part or whole for a degree at this or any other institution.

Christina Denton

ABSTRACT

Childhood dietary patterns are formed at a young age and influenced by a number of factors including the media, family members and school environment. With the increasing prevalence of childhood overweight and obesity it is therefore important to educate children on appropriate dietary and lifestyle behaviours.

This research aimed to investigate: (1) the effects of a 12-week nutrition and health education programme on the dietary intakes of children aged 10-12 years; and (2) the effects of the education programme on children's body composition measures including height, weight and body mass index values.

Two New Zealand intermediate schools were chosen for the study and consisted of two hundred and forty four children (aged 10-12 years) in the intervention school and one hundred and six children in the control school. At baseline and at 3 months, dietary intake and body composition was assessed in the children. The intervention school also received a 12-week health and nutrition education programme taught by class teachers and consisting of nine different modules looking at healthy lifestyle and nutrition behaviours. Dietary intakes were measured by a food frequency questionnaire (FFQ) that collected information on the daily frequency of foods consumed within the last 4 weeks. Height and weight measurements were collected and this allowed body mass index (BMI) values to be calculated. The food frequency questionnaire has been previously validated against twenty four hour dietary records and the New Zealand Food Composition Database 2000 (NZFCD).

There were no significant differences between the two groups for body composition values. Both groups displayed some significant differences ($p \leq 0.05$) among dietary intake between baseline and follow-up with changes in median number of servings per day. A larger number of changes were seen among intervention subjects and may have been attributed to the school education intervention programme however no definite conclusions can be made. Other influences such as ethnicity, socioeconomic status and other lifestyle factors may have affected results but these were not investigated. Although results were inconclusive, significant findings from the study are encouraging for future studies. Limitations and future recommendations are provided.

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DEDICATION

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GLOSSARY

The following terms and abbreviations are used throughout the thesis:

DEXA	dual energy x-ray absorptiometry
BMI	body mass index
SF's	skinfolds
mg/d	milligrams per day
mg	milligrams
g	grams
kg	kilograms
kcal	kilocalories
cm	centimetre
m ²	metres squared
HDL	high density lipoprotein
LDL	low density lipoprotein
RDI	recommended daily intake
FFQ	food frequency questionnaire
NZFCDB	New Zealand Food Composition Database
USA	United States of America
UK	United Kingdom
NZ	New Zealand
MISH	Millennium Institute of Sport and Health
NZEO	New Zealand European and Other
CNS	National Children's Nutrition Survey

CHAPTER ONE

INTRODUCTION

The promotion of healthy eating patterns during childhood is important for maintaining general health and well-being as well as preventing risks for diseases in later life. During the early years of a child's life, behavioural patterns are acquired and eating habits are established, where they are then practiced and carried on into later life (1). Childhood dietary patterns have seen an increase in the amount of dietary fat and sugar levels over the last two decades with these more palatable foods replacing the intake of fruit, vegetables and cereals. This reduction in fruit and vegetable intake has been shown in children only consuming 1-2 servings per day instead of the recommended 5+ a day (2), (3). High intakes of fruit and vegetables are known to be beneficial to health and have often been associated with reduced prevalence of stroke, cancer and cardiovascular diseases (4), (5), (3). School lunches now consist of higher amounts of takeaways, chips, cakes, biscuits, chocolate confectionary and sugary foods instead of the more healthy low fat items (6), (7). One of the main contributors to the high amounts of sugar intakes are the increased consumption of carbonated soft drinks, where this has seen an increase of 100% among US children between 1980 and 1994 (8).

Many studies (9), (10), (11), (12), (13), (14), (15) have shown that there is a direct relationship between the eating patterns of children and the risks for chronic disease development such as cancer, diabetes, obesity and risk factors for cardiovascular disease (16), (17), (18). Childhood overweight and obesity has become of particular concern during the recent years, where the prevalence among a number of countries including the United States (US), United Kingdom (UK), Australian and New Zealand (NZ) has increased between two-four fold (19), (20).

The use of education intervention programmes within primary and intermediate schools has been well documented over the years and is known to improve the dietary and fitness patterns of young children (21), (22), (23), (24), (25), (26), (27), (28). Children aged 8-15

years are at a perfect age to introduce the use of nutritional education modules within schools due to the greater need for improved nutrition patterns as children struggle to cope with the physiological demands of puberty. Within New Zealand schools, there is currently a lack of nutrition education and intervention programmes for this particular age group. Many school based programmes around the world have shown dietary improvements and consequent health benefits within young children. Programmes should aim to educate children on healthy lifestyle, nutrition and activity patterns where emphasis should be placed on targeting the high risk populations such as the lower socioeconomic areas and children with higher body weights (1).

CHAPTER TWO

REVIEW OF LITERATURE

Introduction

Dietary intake during childhood is important for growth, long-term health and the development of appropriate lifelong eating behaviours. It is a time when dietary patterns are developed, and food preferences are learnt which then continue on into later life. Areas of childhood diet have been linked to a variety of diseases such as obesity, diabetes, cancer and risk factors for cardiovascular disease in adulthood (7), (11), (29).

Children's dietary patterns have seen a large increase during the last few decades in the amounts of high fat and high sugar foods such as takeaways, chips, cakes, biscuits, high sugar drinks and chocolate confectionary with carbonated soft drinks being the largest contributor to sugar intake (6), (7). School lunches now consist of over 30% fat compared to a recommended US daily intake (5) of no more than 30%, where a high proportion of children from the UK, USA, Australia and NZ purchase their lunch from the school tuckshops or vending machine. This has seen a notable decrease in the consumption of fruit and vegetable intakes as well as a reduction of important vitamins and minerals in the diet including fibre and calcium. This is due to the reduced intakes of milk, fruits and vegetables, breads and grains which contain beneficial nutrients which help reduce the risks of chronic diseases later on in life (3)

Factors that influence childhood diet are the child's family, school environment and media and advertising industry. The family environment is where children learn and adopt parental food behaviours, receive most of their daily meals and view their parents as nutrition role models. It is therefore the parent's responsibility to educate and teach their children on appropriate dietary patterns as well as monitor the frequency of convenience meals and snacks. Schools also influence the dietary intake of children where teachers, peers and the school tuckshops can play a vital role. A large proportion of children's daily foods are consumed within the school environment as well as appropriate dietary choices

learnt and children are educated on overall health and lifestyle choices. School intervention programs provide an ideal way for children to learn healthy nutrition behaviours and increase physical activity levels. It is therefore important to introduce schools to nutrition and health education modules as well as increase the levels of physical activity, where this can be done through the use of education intervention programs.

The main purpose of this literature review was to:

- Review the dietary patterns of 10-12 year old children and discuss the main effects it has on their lifestyle and overall health
- Discuss the main influences that effect children's eating patterns
- Evaluate the role that nutrition education programmes have on children's nutrient and/or food intakes
- Compare dietary intakes and body mass index (BMI) levels among children both worldwide and in New Zealand
- Discuss the main health effects that dietary patterns have on children

A computer-based literature search was conducted using both Medline and PubMed, using key words: child diet, childhood obesity, nutrient intake, intervention programs, school education programs, overweight, exercise, body mass index, television viewing, and parents. The search was narrowed down by combining key words and limiting searches to child and adolescent based studies as well as including countries that were relevant to the NZ population.

Childhood dietary intake

Children's dietary patterns are formed at a very young age, and are then carried on into adulthood. Food preferences and eating habits are progressively learnt and practiced as children grow and develop. Children's schools and families play a key role in influencing dietary intakes and are seen as important role models and key learning environments for healthy nutrition behaviours (1).

Changes in dietary patterns among children in recent years has led to an increase in the obesity epidemic (9). There has been an increase in fast food consumption by over 300% between 1977 and 1996 as well as an increase in sugar-sweetened drinks (30). Many countries have moved towards a high fat and higher refined carbohydrate diet, thereby experiencing an overall shift in their dietary structure (9). Saturated fats have increased where foods such as takeaways, cakes, biscuits, chips and chocolate confectionary have become the preferred foods for children's lunches (6). School lunches now consist of a limited amount of fruits and vegetables and a larger amount of fatty food items (6). Fruit and vegetable intake has decreased over the years and been replaced by higher amounts of chips, biscuits and sugary foods resulting in many lunches containing over 30% fat (6).

One of the major contributors to the large dietary change is the increased amount of sugars in the diet (31), (32), (30), (33), (8), (34), (16), (35), (36), (37). On average adolescents and children are consuming 20% of their total energy from added sugars, with the greatest source coming from non-diet soft drinks (7). U.S data shows (7) that in children aged 6-17 years, the main sources (90%) of added sugars are from non-diet soft drinks, fruit drinks, sugars and sweets, sweetened grains, sweetened dairy foods and pre-sweetened cereals.

In general the main dietary changes that have taken place among a number of countries are the large increase in the consumption of fat, saturated fats and added sugars therefore resulting in a reduction of fibre and total cereal intake (9). In particular regions such as Asia, Latin America, Northern Africa, the Middle East and urban areas of Sub-Saharan Africa have experienced these dietary effects with dietary fat intakes reaching over 30% instead of the recommended 25% by the World Health Organisation (WHO) (38). This has led to an increase in the prevalence of a number of diseases over the years including obesity, heart disease, diabetes, osteoporosis as well as other chronic diseases later in life (7). Changes among dietary fat intake within other countries have also been seen but not as significant as these.

One of the suggested reasons for this change in diet is socioeconomic status (SES), it has been found (9) that a higher energy dense diet and a lower activity pattern among poorer

populations may be the main contributors. Poverty has been associated with lower food expenditures, lower fruit and vegetable consumption and lower-quality diets. This has been replaced by high-fat and high energy-dense foods which are found to be more affordable for many populations (39).

Children's diet has been well documented over the years by using large nationally representative and nationwide surveys that can track the changes throughout time (9), (40). The National Diet and Nutrition Survey (40) in Britain examined the nutritional status, diet and activity levels among children aged 4-18 years old. The survey showed that on average children are eating less fruit and vegetable servings per day, as well as a lower intake of minerals, in particular vitamin D than when measured in 1983. Energy and fat intakes were compared among 10-11 year old children in 1983 with 1997, where females experienced a reduced fat intake from 78.9g/day to 67.2g/day as well as male intakes from 87.6g/day to 75.8g/day. No differences in overall energy intake were found, however when income status was taken into account differences were seen among boys depending on whether their parents received financial assistance from the government or not. Carbohydrate ingestion as a percentage of total energy intake was 51.6% and 51.1% for boys and girls respectively, with the main contributors being breads and cereals, followed by vegetables and savoury snacks. Total sugars, preserves and confectionery altogether contributed to 11% of total carbohydrate intake with chocolate confectionery amounting to half of that value. Drink consumption contributed to 11% of energy intake with two thirds coming from soft drinks (40). This study shows the large amount of food consumption and nutritional changes that have taken place among British children aged 4-18 years old between 1983 and 1997. The major concern within this population is the low intake of important vitamins and minerals from many fruits and vegetables which has been replaced by the more palatable foods such as cakes, biscuits, buns and pastries.

Sugar intake

High amounts of sugar consumption in children's diets is a frequent pattern seen among many different studies around the world, where soft drinks in particular have shown to be the greatest source of sugars (8), (40), (31). Ludwig et al (8) examined the intakes of sugar-

sweetened drinks in the USA where he found intakes to have increased by 100% among USA children between 1980 and 1994. The study looked at the contributing factors that sugar-sweetened drinks had on increased body weight and obesity rates. Sugar-sweetened drinks were measured among 548 multi-racial children from Massachusetts, USA during a 19-month period as well as measures of body weight, fat percentage, physical activity and dietary intake. Children's body composition values were estimated using body mass index and triceps skinfold measures (8). Sugar-sweetened drinks were found to increase the odds of becoming obese by 1.6 times for every additional glass consumed each day for children aged 11 years. Results were only significant for increases in body mass index and were identified to be one of the many contributors to obesity rates. Increases in height, weight and body mass index values may also be due to physiological changes in growth during puberty (41). Previous literature (42), (41) on growth and development has shown changes in BMI and body fat percentage during childhood and adolescence that occur in accordance to normal physiological development. However these results were based on body mass index values where other studies (43), (44), (45) have previously shown varied results and accuracy levels with this form of body mass measurement in children. Other studies (6), (31), (46), (40) have shown that high intakes of sugary beverages increase overweight and obesity in young children.

Trioiano et al in 2000 (46) also examined dietary intakes of children and adolescents from the United States. Dietary 24-hour recalls from the third National Health and Nutrition Examination Survey (NHANES III) (1988-1994) were examined as well as the first and second national surveys. The main objective of the study was to access secular trends in energy and fat intakes among youths aged 2-19 years. Data was collected by household dietary interviews where 11,723 respondents reported all foods and beverages consumed in the previous 24 hours. All foods and beverages were analyzed using the US department of agriculture survey nutrient database. Children aged 6-11 years completed the health and nutrition surveys with half the children (55%) filling them out alone, over a quarter (22%) were completed by a family member and another quarter (23%) were completed by both family member and the child. In the adolescent group of 12-19 year olds, over 99%

reported their own dietary intakes. These differences in data collection may have affected the overall analysis and accuracy of the dietary intakes (46).

Results from the third National Health and Nutrition Examination Survey study showed that for children aged 2-18 years mean energy percentage from total and saturated fat decreased between the periods 1970-1994. Only small differences were seen between the two sexes and age groups with a mean intake of 35.5% of energy from fat and 12.2% for saturated fats. Although an overall decrease in energy and fat intake was seen during the 24 years, percentages still remained above recommended daily allowances of 25% as recommended by the World Health Organisation (WHO) (46), (38). Overall, mean energy intakes of the three National Health and Nutrition Examination Surveys showed a slight decrease and stable value for children aged 2-5 years and 6-11 years, but energy increased in children aged 12-19 years by 400 KJ. This may have been due to higher intakes of sugary foods or larger portion sizes eaten. Female overweight children did not show an increase in reported energy intakes throughout the three surveys, which may show the lack of association between energy intake and overweight prevalence, or diets were underreported as is common for overweight people. Other possibilities for this increase in weight gain may have been attributed to a decrease in physical activity which can also shift the energy equation to a positive balance, therefore resulting in a weight gain among the children (46).

Food guide pyramid

The food guide pyramid is part of the dietary guidelines (5) and is a useful education tool when determining and tracking dietary intakes. It includes information on daily diet and recommends an appropriate number of servings for each of the five main food groups whilst suggesting healthy food choices (16). The American food pyramid (5) recommends that children aged 9-18 years consume 9 servings of breads and cereals per day, 3-4 servings of fruits and vegetables, 3 servings of dairy and 2 servings of meats, poultry and fish per day. By following these guidelines, this ensures that children are receiving adequate nutrients from the four major food groups that are necessary for growth and overall health. No definition for daily servings of fats, oils and sweets are given, but it is

recommended that children eat these sparingly and go easy on foods high in fat or sugars (5).

Dietary guidelines for children in the US have been compared with that of actual food intakes in order to see whether children are consuming the right amounts of macro and micro-nutrients. Brady et al (16) compared the results of the dietary information for 110 children aged 7-14 years with that of the pyramid recommendations. Twenty-four hour recalls were administered by trained interviewers as well as measures on height and weight. Results were compared with the recommended number of servings from the food guide pyramid from the five main food groups. These included grains, vegetables, fruits, dairy and meats. When compared to the US food guide pyramid, children showed a large proportion of their diet (46%) consisted of fat and sugars together with a very low amount of dairy (4.3%) and fruit (3%) as opposed to the recommended intakes (10.5%) from each group. Vegetable servings (9%) were also below the recommended daily intake in their diet (16%) with dark green-deep yellow vegetables not even reaching one third of total vegetable servings. Overall the diets of the US children were not in accordance to the recommended US dietary guidelines. When diets were compared to a hypothetical diet, results showed a large difference between the two with US children reporting much higher amounts of total energy intakes as well as lower intakes of all five main food groups. Reasons for these differences may have been due to inadequate reporting of dietary intakes from children with high amounts of variability seen in self-reported intakes. Population samples were also gathered from the South-East of USA and inhabitants are known to consume higher amounts of fat in their diets (16).

This study was supported by Munzo et al (47) who showed that in children (aged 2-19 years), only 1% met all the food group recommendations, with 5% meeting the recommendation in four or more food groups and 16% meeting none. Surveys (48) conducted on children aged 10 years compared intakes of diets from 1973-1994 and showed that over the years percentage of energy from protein and carbohydrate has increased over the years while total fat percentages decreased from 38% to 33%. This resulted in no overall change in total energy intakes. When fats were broken down into

food sources, a decline was seen in the consumption of fats/oils, mixed meats, pork, eggs, milk and desserts with an increase in consumption of poultry, cheese and snacks (48). Recent studies (49), (50) still show children's diets to contain large amounts of high energy dense foods with a lower intake of fruits and vegetables. Therefore it is necessary to work towards strategies for reducing takeaways and other high energy and sugary foods with an emphasis on ways to increase fruit and vegetable intakes.

Fruit and vegetable consumption

Children should be aiming for at least five servings of fruit and vegetables per day as recommended by the World Health Organisation (2), (38). Unfortunately children's intakes of fruits and vegetables are being replaced by high amounts of sugars and calories. Research has shown (4), (5), (3) that by eating a diet rich in fruits and vegetables that this may protect them against illnesses such as cardiovascular disease, stroke and cancer. By consuming at least five servings per day, this can help lower blood glucose levels, blood lipid levels, manage weight and decrease the risk of certain cancers (51).

Children are currently not eating enough servings of fruits and vegetables per day with data showing intakes of as little as little as 1-2 servings, with girls consuming more servings than boys (52), (2), (3). Fruit and vegetable intake among U.S. children (multi-ethnic) aged 12 years showed that on average they consumed 3.9 and 1.6 servings per day of fruits and vegetables. In comparison to the 5-a-day guidelines, only 37% and 2% of children met the criteria for fruits and vegetables. However, limitations such as over and under-reporting may have contributed to differences in validity and reliability measures (51). A U.S study (33) showed that children's (8-10 years) intakes of fruits and vegetables are being replaced by high amounts of soft drinks and sweetened beverages. Food records showed that students who consumed high intakes of soft drinks and total sweetened beverages reported lower consumption of fruits and had higher calorie intakes.

Breakfast meals

Missing breakfast is common problem among young children worldwide and is seen to be associated with various health-compromising behaviours such as overweight and obesity

(53). Children who miss breakfast are more likely to increase snacking time, miss lunch meals, and engage in a sedentary lifestyle than those who frequently eat breakfast. Children who regularly consume breakfast in the mornings have shown positive effects on cognitive performance with an increase in the speed of information retrieval in working memory as well as improved academic performance (54). A study by Keski-Rahkonen (55) looked at a sample of 5,548 16-year old children and 4,660 parents in Finland investigating how often they ate breakfast and what factors influenced this. In total 13-16% of adolescents were found to have breakfast less than once a week with a higher percentage among children whose parents frequently missed breakfast. The main factors associated with missing breakfast were smoking, infrequent exercise, a low level of education, regular alcohol consumption and high body mass index values in both adolescents and adults. These results were supported by Siega-Riz et al (56) who found that between 1965 and 1991 in US children (15-18 years) breakfast consumption decreased in both girls (14.8%) and boys (19.7%) respectively.

Parents play an important role in their child's breakfast consumption, therefore it is important for nutrition intervention strategies and education modules to target the whole family environment rather than just the child itself (55). Cho et al (57) looked at the differences between children who are eating breakfast in the mornings compared to those who were missing it. The study looked at the relationships between breakfast types, energy intake and children's body mass index levels. Data from the third National Health and Nutrition Examination Survey (NHANES III) showed that those who ate cooked cereals, ready to eat cereals or bread breakfasts had significantly lower BMI values compared to children who missed breakfast or had meat or egg type meals. This showed us that children who eat a healthy breakfast in the mornings will maintain a healthier body weight than those who miss breakfast or include an unhealthy meal (57).

Lunch meals

Children's lunch meals in the USA often consist of an a la carte programs or vending machines which contain of fried foods, snack bars and sweetened beverages with few low-fat food items such as fruits or vegetables (58). Findings from the second School Nutrition

Dietary Assessment study in 2001 (58) showed that more than 90% of schools included a la carte programs at lunchtimes. Seventy-six percent of high schools, 55% of middle schools and 15% of elementary schools had vending machines available within school grounds. Other schools who didn't provide this meal program offered a school food store, snack bar or canteen within the school. Overall the School Nutrition Dietary Assessment found that most schools rarely had fruit available and mainly offered higher fat foods rather than low-fat options (58).

Kubik et al (58) designed a school-based dietary intervention trial called the 'Teens Eating for Energy and Nutrition at School' (TEENS) study among 4,050 seventh grade (11-12 year olds) students in Minneapolis, USA. The main aims were to create a 'snapshot' of the school environment by looking at influences such as availability of a la carte programs, vending machines, consumption of fried foods, fruit, vegetables and total fat consumptions. Twenty-four hour dietary recalls were collected from 598 students over an 8-10 week period with 5 main measures used for analysis. They were: Total fruit servings per day, total vegetable servings per day, and percentage of total energy from total fat and saturated fat. All schools participated in the USDA's (United States Department of Agriculture) National school lunch program where food records, a la carte menus and vending machines were analysed by trained specialists. Overall, results showed that there was a significant association between the school a la carte program and the student's daily consumption of total fats, saturated fats, fruits and vegetables. This was emphasized by the fact that those students who were not exposed to an a la carte program at school reported intakes that met or came close to meeting dietary recommendations and those who were exposed to these programs did not. One possible explanation was due to the large amount of high-fat foods and calorie dense beverages in the a la carte school programs, where these foods are decreasing the consumption of fruits and vegetables. Among the a la carte foods, fried potatoes were seen as the 'preferred' vegetable chosen by all children. Similar results were seen in the vending machines where they were negatively correlated with fruit consumption among seventh graders showing that high-fat, low nutrient dense foods were being chosen over fruit. This study shows the association between certain factors within the school environment and the dietary behaviours of young adolescents. With the high amount of

time spent at school, it is important for children to have healthier foods choices within school tuckshops, menus and vending machines.

Other studies (59), (60) have shown that middle school children, ages 11 to 13 years, consume excessive amounts of high-fat, high-sugar snacks averaging 8g of fat and 23g of sugar per snack item. Over 88.5% of the school tuckshop foods had high fat and/or high sugary foods, with chocolate confectionary accounting for one third of the tuckshop sales (60). Possible interventions that were suggested to improve food quality was to limit sales of chocolate candy as well as substitute low-fat varieties of cakes, biscuits, chips and crackers into the school tuck-shops (60).

Children's school packed lunches also provide information into what children are eating whilst away from home as well as exploring the role of parental influence. US children's school lunches were analysed (6) to help identify the more common food items that were taken to school. Observations were made in 1,381 school lunches from 24 middle schools, grades 6-8 (aged 11-13 years) around San Diego, California. Foods were recorded each day by trained assessors who wrote detailed descriptions of all food items in the bags as well as the portion size and number of each item. Total fat, saturated fat, and sugar content was assessed using a nutrition data system. Overall about 86.5% of the bag lunches included a sandwich or entrée, where the main spreads included meat (52.5%), cheese (25.7%) and peanut butter (23.5%). Fruit was seen in 46.6% of all school lunches where vegetable intake only achieved 5.5%, with the main form of snacks including non-chip snacks (41.6%) and savoury chips (39.6%). These snacks were seen to be more common than biscuits (28%), chocolate confectionary (17.2%), cakes and pies (9.7%). Each bag averaged a mean of 596.2 total kilocalories (kcal) with 186.3kcal coming from dietary fat (29.7%) and 55.8kcal saturated fat and 191.7kcal from sugar. Boys generally had a larger size lunch than girls and then lunches were also larger in the older children. Student's lack of knowledge about fat content and preparation methods used in making lunches was a small limitation within the study. In certain cases predetermined default quantities were determined by assessors and used for items that could not be directly observed (e.g. mayonnaise on a sandwich) (6). In another study differences have been seen within the

nutritional quality of bagged school lunches among both gender and ethnic groups (61). A study by Jones et al (61) showed that boys bring their lunches to school more often than girls, while European children have more days with bagged lunches than any other ethnic groups. Girls request more low-fat items in their lunches than boys where this may be due to girls being more weight and diet conscious than boys.

Family environment

Parents and caregivers play a vital role in children's dietary patterns, as they are often the person who prepares their school lunch's everyday. More care and attention needs to be paid to giving children larger amounts of low-fat options within their boxes and cutting down on high-fat snack foods (61). Children's eating patterns including portion sizes, meal frequency, dietary quality and place of consumption are continually changing. We no longer see the traditional pattern of the family eating at the kitchen table but rather a higher proportion of meals at the local takeaway restaurants (62).

Research has shown (63), (62) that school-age children are consuming over one-quarter (27%) of their meals away from home, with a higher percent of middle school children (40%) eating at home (7 nights) than high school children (20%). In New Zealand 75% of children's meals are prepared at home compared to only 47% in the United States, therefore showing that a high proportion of US children's meals are eaten at fast food outlets or restaurants instead of at home (64). The quality of dietary intake has shown to be positively associated with the frequency of meals at home (62). Neumark-Sztainer et al (62) looked at the frequency of family meal patterns in Minneapolis/Minnesota, USA looking at whether it was associated with the quality of children's diets (aged 11-18 years). Fruits, vegetables, grains and calcium-rich foods were positively associated with the frequency of family meals and negatively associated with soft-drink consumption. Important nutrients such as protein, calcium, iron, folate, fibre and vitamins A, C, E and B-6 all showed positive associations with the frequency of family meal patterns. However, other factors within the family environment and dietary assessment methods cannot be ruled out as influences for these findings (62). These included family cohesion and the

living environment as well as underreporting of dietary foods within the food frequency questionnaire.

Changes in portion sizes of foods

Portion sizes or the amount of foods consumed per eating occasion have shown a steady increase between the years 1989-1991 and 1994-1996 (50). Children's dietary intakes in the US showed that portion sizes of soft drinks were significantly larger in surveys from 1994-1996 compared to 1989-1991 as well as other foods including grains and cereals for all age groups 2-19 years. Smaller portions in 1994-1996 were seen in foods including mixed dishes (macaroni and cheese, pizza) bacon, chicken, margarine and mayonnaise. However, the majority of foods showed significantly larger portions between the years 1994-1996 (50).

Summary of childhood diet worldwide

The main areas of concern in childhood diets are the large increases in high energy and high sugar foods. This has led to an overall decrease in fruits and vegetables as well as limiting important nutrients such as calcium, fibre and important vitamins and minerals. Children's school lunch meals often consist of large amounts of chips, cakes, biscuits, confectionary and carbonated drinks, where sweetened beverages and soft drink consumption provide the greatest percentage of added sugars (7). Emphasis needs to be put on creating a healthy environment within schools and family environments, whereby targeting foods from tuckshops and vending machines as well as working together with parents.

New Zealand and Australian data on childhood diet

Childhood diet in New Zealand is becoming an increasing concern as the consumption of high energy dense foods and limited physical activity is leading to an increase in weight and disease prevalence. New Zealand has a high rate of adolescent obesity with estimates varying between 20-30% depending on the child's age, gender and ethnicity (65). The average child's diet is reported to be high in energy and fat and low in fibre, fruits and vegetables (66). Only half of New Zealand children are eating the recommended daily

intake of fruits and vegetables. Two out of five children are eating 2 or more fruit servings per day and three out of five children are eating 3 or more vegetable servings per day. Fruit and vegetable intake has been replaced by more palatable foods such as biscuits, chips, confectionary and fast foods (67).

Until recently little research had been done on the dietary intakes of New Zealand children. However, in 2002 the Ministry of Health (37) collected dietary information from 3,275 multi-ethnic children aged 5-14 years from around New Zealand. Food intakes, eating patterns, food securities and the frequency of foods eaten were recorded along with a number of other measures including physical activity, dental health and anthropometric values. Energy intakes were shown to be higher among males in comparison to females whilst Maori children consumed the most energy. In all age group's, bread was eaten the most (13%) followed by potatoes, kumara and taro (8%) then biscuits (6%), beverages (6%) and milk products (6%). Further investigation of the total energy consumption showed that fat intakes varied with age and ethnic group. Pacific Peoples (35%) consumed the largest dietary fat intakes followed by Maori (34%) and NZ European/Other (NZE0) (32.4%) with 11-14 year olds consuming the largest intakes. The main sources of dietary fat came from potatoes, kumara and taro (9%) where children mainly consumed these as potato crisps, crisps and wedges. This was followed by milk (8%), biscuits (7%) and butter (6%), margarine (6%), pies (6%) and pastries (6%) as the other main contributors. Total sugar intake ranged from 103g in males to 140g in females with the major source coming from beverages, followed by fruits and confectionary (37). The 2002 National Children's Nutrition Survey has provided an insight into the dietary patterns of New Zealand children aged 5-14 years. The results of this study may encourage Government, Public Health units, schools and children's families in designing strategies for improving children's diet and help reduce rates of overweight and obesity within New Zealand (37).

Influences on childhood dietary intake

Parental influences on eating patterns

It has been suggested that parents play a major role in the decision making process of children's food preferences and eating habits. They are often viewed as a nutrition role model to their children, portraying both positive and negative images of food and body types (68), (69), (70). Children's eating behaviours begin at a young age and are associated with the parent's knowledge and attitudes of different foods. Parents exert control over meal timings, size and social context of meals and snacks, as well as setting the emotional tone of eating occasions (71). This may lead to influences on children's body weight and interferences with eating habits and food choices. These have been known to be associated with childhood obesity (69), (3).

Robinson et al (69) examined the parental behaviours that were thought to influence childhood obesity in children aged 8-9 years. Telephone surveys of the parents of 792 third-grade students from a multi-ethnic and socioeconomic background were conducted. One on one interviews were conducted on 656 parents or guardians, mainly on the child's mother (82.8%) and looked specifically at household educational level. Parent's perceptions of their own weight, parental control over children's food intake and perceptions of their child's weight were also gathered. Only a weak association was found between overweight girls and parents who had less control over food intake. Those who had a greater control over their daughters reported less overweight teens. These results were only significant when other factors such as parental body mass and weight perception, education level and child's age were accounted for. This showed us that parental eating patterns largely affect what is eaten by their children and thereby affects their overall body weight.

In other studies child-feeding questionnaires (CFQ) have been used (72), (71), (73) to determine how much influence the parents have over their child's eating habits and include questions such as 'whether children should be free to eat whenever they are hungry' or 'whether mothers felt they needed to regulate their children's eating habits' and if they

'used certain foods as rewards' (72). These studies show support for the hypothesis that parents who had higher control over their child's diet had children with problems in regulating energy intake as well as a reduced responsiveness to energy density of foods. It was also shown (72) that these children also display larger amounts of body fat stores, especially seen in the girls. By restricting children's diet and inhibiting access to the more palatable foods (high in fat and sugars) children are more prone to rebelling against their parents and having higher intakes of these. In the long term this may cause unwanted effects on their health as well as causing behavioural changes to their dietary intake and food selections (74). Because these foods have been restricted, the child's attention is more focused on this unwanted behaviour. Greater amounts of parental control have been seen in girls rather than boys, where mothers in particular are more concerned and use greater amounts of dietary constraint with their daughters rather than sons (75), (76). This may be due to the fact that parents, especially mothers may pass on their dietary perceptions to their daughters by encouraging dietary restraints at an early age. Unwanted effects on the child's eating behaviours can be caused as well as diminishes in the extent to which they learn to use their own hunger and satiety cues during eating. Problems such as overweight, body dissatisfaction and eating disorders may result from this (76). These findings relate to many animal behavioural models done in the past in which restricting access or permission to food items produced elevated intakes of these inhibited substances (72). Future studies should aim at reducing the use of dietary restraints and encouraging parent-child interactions during child feeding with a greater emphasis on nutrition education (76).

Children have a high degree of power over adults when wanting to obtain sweet foods or snacks from their parents. This is mainly influenced from television advertisements, menus at child daycare centres and perceptions of other peer groups (77). Sweet foods such as chocolate, chocolate confectionary, cakes, biscuits and fizzy drinks are more easily obtained by younger children (<7 years) and with parents below the age of 35 years. This is mainly due to the greater amount of advertisements targeting a younger, more vulnerable generation as well as the limited education level of the parents. This is also highlighted by the fact that younger children are more able to out-manoeuvre their parents when receiving sweet snacks. Children's ability to obtain sweet snacks from parents emphasises the need

for family involvement in improving childhood diet. Education on health promotion and dietary patterns should target all families with emphasis on parents with younger children and lower income households (77).

Media influence on eating patterns

Television advertising is known to influence the type of food choices made by young children. Food advertising during prime time child-viewing times comprises 63% of all advertisements in the UK and over two thirds in the USA, with 60% of these containing ads for sugar-coated breakfast cereals (78). Advertising in the USA and UK showed that 56-63% of children's commercials were taken up by food advertisements during peak time with confectionary, snack foods and breakfast cereals being the main advertisements. In these advertisements, over 80% were foods high in fat, sugar and salt and overall accounted for 44-76% of all children's food advertisements.

Lewis and Hill (78) examined the effects of children's food advertising on 103 nine-year olds as well as monitoring 91 hours of children's broadcasting. The study involved videotaping four commercial stations broadcasting in the UK over a 91 hour period during prime time children's viewing. Results showed that during the 91 hours of broadcasting, over 828 advertisements aired on television and included between 49-63% food advertisements, followed by toys and entertainment with less than 10% viewing times. The highest food category advertised was cereals and confectionary/savoury snacks which accounted for 60% of the food or overall total advertisement time (78). The advertising of high fat food products may play a role in influencing children's food choices (78).

More recently, Halford et al (79) looked at the effect of television food advertisements on the food consumption patterns in children. A total of 42 children (18 male, 24 female) aged 9-11 years were selected from a UK primary school. Children were categorised into one of three groups; lean, overweight and obese based on children's body mass index (BMI) values using the revised 1990 reference standards (80). All children watched a series of three cartoon videos over a two week period which contained either advertisements not related to foods or food-related advertisements. Sixteen advertisements were then repeated

and children had to recognise ones that they had already seen. Following the television viewing session, children were given a selection of packet-type foods to choose from and included: ryvita wholegrain crackers, jelly sweets, chocolate and butter puffs. Behaviour questionnaires were then given to children to assess the eating in response to the food-related stimuli. Overall results showed that the obese and overweight children recognized significantly more food related advertisements than the lean children and ate larger amounts of food. Higher fat food choices were made by all children following the food related advertisements and lower fat foods were eaten after the non-food advertisements (79).

Both studies (78), (79) have highlighted the large effects that television food advertisements have on children's eating patterns. It supports the fact that television viewing is not only a sedentary behaviour but that it can influence children's adiposity levels by promoting the consumption of unhealthy food items.

Lack of physical activity and increased viewing of television and computer usage has lead to a 60% rise in childhood overweight and obesity over the years (81). The largest sedentary behaviour in the Western society is television viewing, where worldwide studies have found links between children's BMI and amount of television watched (82), (83), (84), (85), (86). It has been suggested (20) that some of the possible reasons for such high rates of television viewing are due to:

- Larger amounts of children's television programmes broadcasted
- Ease of television availability
- Lack of monitoring by parents
- Use of television by parents as an electronic babysitter
- Lack of outdoor play areas
- Unsafe neighbourhoods

Greater action is needed in reducing the levels of food advertisements and encouraging children to participate in larger amounts of physical activity rather than watching television.

Childhood overweight and obesity

Overview/Prevalence

Over the past 10 years, a number of studies (43), (87), (88), (20), (13), (19), (89), (69), (90), (91), (92), (93) have shown a large increase in the prevalence of overweight and obesity among children worldwide. In children of all ages and ethnicities, rates have increased up to three-fold over the past 25 years in both developed countries and industrial countries (13). Rates of obesity have shown an increase of 2.3 to 3.3-fold over 25 years in the USA and a 2.0 to 2.8-fold increase over 10 years in the UK (13). Australian data has had a 2-4-fold increase in the prevalence of obesity and a 60-70% rise in overweight adolescents in the past 12 years.

Booth et al (19) examined the population prevalence of overweight and obese children and adolescents (aged 7-15 years) from 1969 to 1985 to 1997 in Australia. During this time five independent population surveys were administered among groups of randomly selected students from government high schools in both urban and rural areas around Australia. Each survey assessed a wide range of health-related measures such as blood pressure, height, weight, anthropometric measures including waist girth as well as other fitness based components. Results showed that during 1985-1997, the population prevalence of obesity increased by 2-4-fold and 60-70% for overweight adolescents with a combined increase of 2-fold. Mean body weight among boys increased by 3.2kg and by 2.7kg in girls. During 1969-1985 there was no apparent change in the prevalence among girls but in the boys an increase of 35% was seen. However, results did not show a full representation of the Australian population as data was only collected from 3 states instead of the full 8; therefore a national trend cannot be certain. A further limitation of the study was the precision of weight measurement of the five different surveys, where body weight of the children was measured on similar scales but the weight precision varied by up to 0.4kg.

New Zealand prevalence of childhood overweight and obesity

Studies among New Zealand populations have increased due to the increased awareness of overweight and obesity among developed countries. The 2002 National Children's

Nutrition Survey (37) showed that 21% of New Zealand children (aged 5-14 years) are currently classified as overweight and nearly 10% of children are obese. Prevalence's were based on Cole et al (44) cut-off values for body mass index (BMI) and showed Pacific children to have to highest proportion of overweight and obesity levels followed by Maori and New Zealand European/Other (NZEО). Overweight levels in males were highest for children aged 11-14 years (23.7%) and lowest in males aged 5-6 years (16.4%) while values remained constant in girls. Obesity levels for females showed the largest increase in age groups, where the younger children (5-6 years) had a prevalence of 6.7% and the older children (7-14 years) showed a prevalence of over 11.5%. Proportion of obese males was similar in all three age groups (8-9%). Limitations of the anthropometric assessment method were recognized and stated in the 2002 survey results and included: inappropriateness of method for the different New Zealand ethnic groups and individual children.

Turnbull et al (93) evaluated the prevalence's among New Zealand's ethnic groups including Maori, Pacific Peoples and New Zealand European/Other (NZEО) children. Over time this study also explored the differences between the schools socioeconomic status, child's gender and ethnicity. With a multiethnic sample group of 871 children the study compared the body mass index (BMI) values of 11-12-year old children between the years of 1989-2000 in Hawkes Bay, New Zealand. Body mass index was measured by standard height over weight measurements using portable stadiometers and scales. Differences were seen during the 11-year period in both overweight and obesity among all ethnic populations and gender groups. Initial body mass index (BMI) values increased from 11% to 20.9% among overweight children and from 2.4% to 9.1% for obesity. When children were broken down into ethnic groups, Maori and Pacific People showed the largest percentages followed by New Zealand European/Other (NZEО) children, although NZEО were found to have a higher relative risk for being overweight and obese between the 11-years. Body mass index (BMI) values were found to be higher than some other developed countries, however method of measurement should be taken into account, where this study used standard scales for weight collection but did not account for clothing weight and rounded each measure to the nearest kilogram which may have affected results (93).

Levels of obesity have also been examined in New Zealand Pacific children aged 3-7 years (94) due to the high rates of obesity in previous studies (37), (88), (95). Forty-four children from Dunedin, New Zealand were recruited through a community network from Pacific communities and had to match a criteria which included: lived in New Zealand for at least 2 years, between ages 3-7 years, adequate health and parents from Pacific decent (94). Prevalence of obesity was assessed by anthropometric skinfold measurements (arm, chest, waist and calf), dual energy X-ray absorptiometry (DXA) and height and weight measures. Definition of obese children included four anthropometric indices including: percentage of body fat >30%, weight for height Z-score > 1.65 SD, body mass index > 95th percentile and above the age and sex-specific cut-off for adults, as defined by Cole et al (44). Data was then compared to the National Center for Health and Statistics and National Health and Examination Surveys I and II reference data. The main findings showed Pacific children to be taller and heavier than the reference population with larger girths and levels of subcutaneous fat. Levels of obesity were found to be high in all areas of measurement with prevalence's ranging from 34-49%. Prevalence of obesity using the body mass index value of 30kg/m² for young adults (44) showed 42% of children to be obese while the sum of skinfolds and body mass index (BMI) value over 95th percentile showed 49% obese. Dual energy X-ray absorptiometry (DXA) measurement showed 34% of children obese and high trunk fat was seen in 61% of children. Potential limitations of the study should also be noted when looking at results, where selection bias (non-random and small sample) and errors in the body fat assessment methods for this ethnic population may have affected results. Nevertheless, obesity levels still showed to be larger in Pacific children (34-49%) aged 3-7 years than Caucasian children (7-13%) living in Dunedin (94).

Summary of childhood overweight and obesity prevalence

To summarising the prevalence of obesity in New Zealand, studies (94), (96), (97), (88) have shown us that there is a large concern in the levels of overweight and obesity in this country. Children as young as 5 years old showed overweight and obese percentages of over 16% and 8% in New Zealand and at the age of 14 years nearly 10% were classified as obese (37). This is seen largely among Pacific and Maori children followed by New Zealand European and Other (NZE0) (94), (97). Other international studies (43), (87),

(88), (20), (13), (19), (89), (69), (93) have shown us the high amount of overweight and obesity prevalence's around the world, in particularly in developed countries.

Education intervention programmes

Schools play an important role in children's health and dietary patterns; they are seen as an ideal setting for promoting healthy nutrition and physical activity. They create a positive environment and provide opportunities for kids to practice healthy behaviours, which can be carried on into adulthood (98). Health and nutrition intervention programs have been developed as a way of improving overall health as well as educating children on proper dietary and exercise habits. Studies (99), (100), (101), (102), (28), (27), (103), (104) have shown that education programs may help improve dietary intake and exercise levels and may reduce the likelihood of adult onset diseases such as cardiovascular disease and diabetes mellitus (101).

A nutrition education program (28) in Crete, Greece was carried out in 471 first-grade primary school children. The aims of the study were to increase the awareness in both children and parents on factors relating to a healthier lifestyle and encourage improved dietary habits and physical activity. An education program called 'know your body' was used and adapted from the American Health Foundation. Modules including dietary issues, fitness, dental health hygiene, smoking and accident prevention was produced for pupils in grades 1 to 6 (ages 5-10 years). Each teacher completed a total of 13-17 hours within the academic year including both practical and theory based sessions. There were 288 in the intervention group and 183 pupils in the control group who were randomly selected from 20 schools. Dietary intake, physical activity, anthropometric measures, biochemical indices and health knowledge questions were recorded prior to the study beginning, then again at 3 years into the intervention study. Small short-term changes were seen in high-density lipoprotein (HDL) cholesterol and low-density lipoprotein (LDL) cholesterol. There was a slight increase in HDL cholesterol and a slight decrease in LDL cholesterol. However, only the LDL cholesterol intake reached statistical significance, as it showed a decrease in the intervention group and an increase in the control group. The positive changes in lipid levels were most likely caused by the increased physical activity in the children both during

and out of school hours. Despite an increase in health knowledge in the intervention group no dietary changes were seen within the 3-year study (28).

School education programs among 8-10 years olds have been examined at by Arbeit et al (21) where they introduced a Heart Smart cardiovascular school health promotion within four schools in Louisiana, USA. The main components of the Heart Smart program consisted of four categories: (a) cardiovascular risk factors; (b) school lunches; (c) physical fitness; and (d) cardiovascular health knowledge. Five hundred and thirty fourth and fifth graders (age 8-9 years) participated in the study, where each school was randomly assigned to an intervention or control condition. Each subject received cardiovascular risk factor screening whilst intervention subjects also received a cardiovascular health curriculum module, a superkids-superfit fitness program and a school lunch program. The main dietary objectives of the program were to provide approximately one third of the RDA for total energy, 20g of total dietary fat, 6g of saturated fat and 600mg or less of sodium (21). The components of the lunch intervention included, modified recipes to achieve desired food composition, daily food choices in order for students to make food selections and undergo decision making and daily salad bars composed of cardiovascular healthy choices. All recipes were modified so that salt intake was reduced by 50%, simple sugars by 50% and fat by 30%, with types of fat being changed from saturated to unsaturated. Results of the school lunch program showed that children who had the largest cholesterol reduction had the greatest number of cardiovascular healthy food choices with over 61% choosing three or more healthy foods than control subjects. High-density lipoprotein (HDL) levels significantly increased in the intervention school in comparison to the control populations, this showed improvements in eating habits as well as other influences from the exercise program. Improvements in overall health were seen from both the school lunch and exercise program, however physiological data showed greater improvements in health from the school lunch program. The Heart Smart program demonstrates the advantages and improvements that can be seen when implementing an education program into a primary school. Modifications to children's dietary and physical activity patterns through an exercise and nutrition intervention program has shown improvements in children's health and lifestyle choices (21).

Nutrition and fitness intervention programmes

Combined nutrition and fitness programs have been implemented in a number of countries including Australia (27), U.S.A (21) and the U.K (25), (105). In Australia (27) a nine month nutrition and fitness program for 10-12 year old children was conducted on 1,147 children. Each child was randomly allocated to one of five health and exercise programs and consisted of mixed gender classes. Programs were designed by a group of teachers, researchers, and health and education professionals. The main aims of the nutrition modules were to increase children's intakes of fruit and vegetables, wholegrain breads and cereals as well as decrease fat, sugar and salt. Fat percentage was aimed at having an intake of no more than 33% of total energy, sugar was set at no more than 12% of total energy and fibre intake was increased to 25g/day (27). The five health and fitness programs used were (1) fitness, (2) fitness and school nutrition, (3) school nutrition, (4) school and home nutrition, (5) and home nutrition or the control group. Modules were assessed by the collection of nutrient intake, anthropometric measures, fitness, blood pressure, and blood cholesterol tests both before and after the intervention. Results showed that fitness values increased significantly in all physical activity programs. The girls showed the highest benefits with a higher fitness value and smaller increase in the triceps skinfold and greater lowering in diastolic blood pressure. Reasons for these gender differences may have been attributed to the lower initial fitness level of the girls at baseline, which resulted in higher and faster gains from the fitness programs (27). Dietary improvements were seen in several of the programs and included decreases in percentage of energy from sugar and increases in fibre intakes, especially in the home nutrition groups. The study showed that programs should incorporate both dietary changes and fitness programs in order to help improve cardiovascular and other health risks, where strategies should focus toward the high risk populations such as children with unhealthy body weights and from lower socioeconomic areas (27).

Breakfast and lunch intervention programs

School breakfast and lunch programs are often implemented in schools, and are thought to improve children's food choices as well as increase food consumption (106), (58).

A study by Belderson et al (106) looked at an implementation of a school breakfast program among English children. The main aims of the study (106) were to compare the energy and nutrient intake of school children who attended the breakfast club with those who did not. This could also determine whether breakfast club participation showed any improvements in dietary pattern. The study looked at the effects of a breakfast club among three schools located in Southern England. Children aged 9 to 15 years were chosen based on whether they ate at the breakfast club for at least 3 days per week for most of the school term. Control subjects were randomly chosen from classes that consisted of the breakfast club attendees. Each subject completed a 3-day weighed food diary which was analysed using dietary software in order to estimate approximate nutrient intake. Height, weight and body mass index values were recorded and calculated for each subject as well as general questionnaires gathering information on gender, ethnicity, special dietary habits and journey time to school. Overall, a total of 111 children were involved in the study, with 28 from school 1, 29 from school 2 and 54 from school 3. Results showed that those who attended the school breakfast-club had significantly higher intakes of total energy percentage from fat, saturated fat, sodium and lower intakes of carbohydrates than the control subjects. Each school differed in the size of the differences but still remained consistent across all schools (106). This finding was different to what was expected as other studies (107), (56), (55), (54) have shown that children who regularly eat breakfast experience greater dietary and school performance benefits than those who miss breakfast. Possible reasons for these differences were that the breakfast club contributed to the poor dietary intakes and also that these children may have habitual diets that are unhealthier than other children (106).

School lunch and breakfast intervention programs have been studied among 7-9 year olds in the USA. The Child and Adolescent Trial for Cardiovascular Health (CATCH) Eat Smart food programs were developed in order to lower total amounts of fat, saturated fat and sodium content of school breakfasts and lunch meals (108), (24). The study involved a

breakfast or lunch intervention program among children for a period of 2 ½ years. Intervention programs (108), (24) involved 59 and 96 elementary schools who received prepared breakfast and lunch foods. The main components consisted of (a) 30 specific eat smart guidelines including meal planning, food preparations, food purchasing and program promotion; (b) Eat Smart nutrient criteria which involved fat and sodium standards and modifying recipes and school meals to fit this criteria; (c) initial and follow-up training of school food service staff and (d) provision of Eat Smart materials. Schools received modified lunch and breakfast meals that provided students with lower total fat, saturated fat and sodium levels. Objectives were based on national dietary goals which were to lower total fat content to no more than 30% of total energy (22g at lunch meals), lower saturated fat to less than 10% total energy (7.5g at lunch), and reduce sodium by 25% (600-100mg at lunch meals). The study (108) (24) collected five consecutive days of school menus, recipe and vendor product information from both control and intervention school children at three separate periods throughout the study. The breakfast intervention (108) showed a greater decrease in saturated fat with similar decreases between both groups in energy from total fat. No changes were seen in sodium levels or other nutrients. Overall no significant changes occurred with the children in the schools breakfast program. Reasons for this result may have been due to the type of food preparation, recipe modification and fat-lowering strategies. The lunch intervention program (24) showed a significantly greater reduction in energy from total and saturated fat among the intervention group than the control group. Total energy showed a significant decrease in the intervention group which was due to the reduction in fat and sodium levels in both groups. The Child and Adolescent Trial for Cardiovascular Health Eat Smart lunch intervention program (24) provided an effective technique for reducing total fat and saturated fat content in children's school lunches, however more promotion and student participation is needed for implementing an appropriate breakfast program (108) for children aged 7-9 year olds.

Peer-modelling and reward based intervention programmes

Peer-modelling and reward based intervention programmes have shown (109) to be effective in influencing children's tastes for fruit and vegetables. Early studies (110), (111) have shown children are more likely to imitate a model whose behaviour is being rewarded,

as well as those who they look up to or admire. Lowe et al (109) designed a fruit and vegetable intervention study in order to assess whether a peer-modelling and reward based programme could increase consumption in children. Four hundred and two children aged 4-11 years were recruited from three schools in Britain and took part in a school food programme. Children received morning snack-packs in the morning containing two 20g portions of either fruit or vegetables, and in addition to this some children also received lunch packs containing either 60g or 80g of fruit and cooked vegetables. Peer modelling videos were viewed by the children and involved heroic 'food dudes' who fought against the evil 'junk punks' and enjoyed a variety of fruits and vegetables. Rewards were also given at both home and school environments and consisted of food dude items such as stickers, pens, pencil cases, rulers and erasers. Parents received homepacks which provided alternative ways of reaching the '5-a-day' target and other tips to encourage higher fruit and vegetable consumption. All children showed an increase in fruit and vegetable consumption after the intervention programme with an overall increase of 131g or 2.18 portions. Fruits and vegetables were analysed on a preference scale both before and after the intervention where results showed significantly greater preference after the intervention (109).

Education intervention programme summary

The current education intervention programmes that have conducted on children worldwide have shown a large number of improvements on the dietary patterns and physical activity levels (21), (22), (24), (25). Education programs combined with physical activity modules have shown the greatest benefits on children's blood pressure levels and reductions in energy, fat and sugar levels. The school environment is where children consume a large proportion of their dietary intakes with a large number of children purchasing their breakfasts and lunch meals from the school tuckshop or vending machines. Behaviours are learnt and dietary patterns are influenced by children's peers, teachers and the overall school environment. With the development of school breakfast and lunch programs, children can benefit from healthier food items and learn appropriate meal choices as well as emphasizing the importance of breakfast meals. Other education modules have focused on dietary issues, fitness, dental health hygiene, smoking and accident prevention with the

main dietary aims looking at increasing children's intakes of fruit and vegetables, wholegrain breads and cereals as well as decreasing fat, sugar and salt intakes. Previous literature (112), (1) has shown us that education intervention programmes need to look at the appropriate time and intensity of the intervention as well as the involvement of families and other community members. By providing the teachers with adequate training of the education modules focusing on the major health and nutrition goals, then further education intervention programmes will be effective and beneficial to school children worldwide.

New Zealand intervention programmes

There are currently no New Zealand nutrition education or intervention programmes that have been evaluated for children aged 8-15 years. The National Heart Foundation in New Zealand has launched a national nutrition programme for children called the School Food Programme (113). The main aims of the programme are to improve health of the community by:

- Influencing policy development that promotes healthy food choices
- Assisting students in developing the attitudes and skills, which will enable them to make food choices consistent with the Food and Nutrition Guidelines
- Increasing student access to food which is nutritious, safe and sufficient in quantity

Heartbeat awards have been developed by the Heart Foundation to recognise and award schools commitment to developing a healthier food environment. The awards include bronze, silver and gold heartbeat levels and are awarded from a high set of nutritional standards (113).

McDonald's restaurants in New Zealand are now pitching healthier alternatives to their meals by introducing a variety of salads with low fat dressings, smoothies, cereals and new drink options including milk, orange juice and water (114). Children's happy meals are also including healthier food options with the choice of Anchor milk, low-fat yoghurt, fruit and smoked chicken foldovers. Other future changes for children include lowering the fat and energy content of chicken McNugget meals as well as phasing out the option of 'super-sizing' fries and drinks items (114). Although many fast-food restaurants in New Zealand are including a larger range of healthier foods, emphasis still needs to be on reducing the

amount of takeaway foods and including a larger number of lower fat and sugary foods into children's diets. With the incorporation of more education intervention programmes within New Zealand schools, greater improvements among children's dietary and physical activity patterns can be seen.

Dietary assessment methods – Methodology of questionnaire

In order to assess an accurate measure of a child's typical dietary intake one must develop an appropriate method and technique for collecting this type of data. Many different dietary assessment tools have been used previously in schools with methods such as 24-hour recalls, food records, food frequency questionnaires and direct observation being included (115). The main dietary assessment methods used in assessing childhood dietary intakes are (1) diet history (2) 24-hour diet recall (3) food records and (4) food frequency questionnaires (116). The diet history method obtains information on past diets from an individual in the form of an interview or questionnaire. Usual meal patterns, food intake and food preparation methods are collected from each subject. The twenty-four hour dietary recall method involves the collection of food intake over a period of 24-hours, involving an interviewer and a respondent. Detailed descriptions of all food items eaten over the past 24-hours are recorded as well as ingredients, cooking methods, brand names, portion sizes. Food records include a written description of the actual intake of food and beverages (preferably weighed) over a specific time period of either 3, 5, or 7 days.

Food frequency questionnaires (FFQ's) look at the measurement of usual food intake and are useful for assessing individual food intakes among larger populations. The ease of administration and convenience of a self-administered questionnaire has shown food frequency questionnaires to be a popular method among many studies.

Underreporting of energy intake is a common problem among dietary assessment methods. This can be influenced by the educational level, race, sex and age of the subjects which can have an affect on eating habits and the reporting of dietary intakes (116). Other common errors that are seen among these dietary assessment methods in children are: problems in recalling food intakes without the assistance of parents/caregivers where difficulties are

usually seen in children's memory ability, portion size estimations and names of foods (117). Table 1 looks at the four main dietary methods used for measuring food intake among children, including the advantages and disadvantages for each method.

Food frequency questionnaire (FFQ)

Food frequency questionnaires (FFQ) are a low cost and easily administered form of dietary assessment used to assess a wide range of populations in a number of studies. The questionnaires are designed to assess usual eating habits, over recent months or years, and comprise of a list of foods most informative about the nutrients or foods of interest for that population. The respondent chooses the answer that best describes how often he/she eats these foods in terms of number of times per day, per week or per month. Responses are standardized, therefore FFQ's can be analysed in a relatively short time period which allows a large number of individuals to be investigated at a low cost. Questionnaire's are usually self-administered due to the ease of understanding and straight forward format, but can be completed by an interviewer if needed, especially with younger children (118).

The validity and reproducibility of the food frequency questionnaire has been studied in among Norwegian children on the self-reported intakes of fruit and vegetables (119). One hundred and fourteen 6th grade pupils (11-12 years) from two primary schools in Norway were invited to participate in the study. Each child received a questionnaire at the beginning of the study and then 14 days later. Questionnaires included a short food frequency questionnaire (16 items) and a 24-hour food recall in order to produce data on both individual and group intakes of fruit and vegetables. Participants also received seven pre-coded food diaries with instructions on how to enter their daily food intakes for 7 days. Reproducibility of the food frequency questionnaire showed no differences between the two time periods with similar results seen when analyzing girls and boys separately. The combined intake of fruits and vegetables among girls showed significantly higher intakes for the first questionnaire compared to the second. The 24-hour food recall showed no differences between the two periods for fruits and vegetables separately but a significant difference was seen when fruits and vegetables were combined. Correlations ranged from 0.62 for fruit intakes to 0.83 for potato intakes. Validity of the 24-hour food recall

compared to the 7-day food diary showed higher food intakes from the food recall but overestimated values were seen in the intakes of fruit and juice. The food frequency questionnaire showed significantly higher intakes than observed from the 7-day food diary. Correlations ranged from 0.21 for fruit and potato intakes to 0.32 for total intakes of fruits and vegetables, showing that a low level of fruit and vegetables were eaten by these children. Overall the study helps show the many challenges that exist while reporting children's dietary intakes. A greater amount of valid estimates are seen with the use of 24-hour report than food frequency questionnaires or 7-day food diaries however a small degree of overestimation was observed. Problems often occur within the food frequency questionnaire due to the suitability of the method for young children. A certain degree of skills are required to fill out the questionnaire which includes basic reading, thinking, recall and arithmetic which may be difficult for the younger children (119). A study by McPherson et al (117) also looked at the validity and reliability of dietary assessment methods and found higher correlations in the validation standard for 24-hour recalls and dietary records than food frequency questionnaires.

In New Zealand there have only been one recent study (120) that has focused on evaluating the repeatability of food frequency questionnaires among children. Metcalf et al (120) developed a 117-item food frequency questionnaire for children aged 1-14 years where they looked at the daily food intake and frequency over the past 4-weeks. Four hundred and twenty eight children were recruited from around New Zealand with a range of ethnic backgrounds including Maori, Pacific Peoples and New Zealand European/Other (NZE0). Food frequency questionnaires were administered at the beginning of the study and then again 13 days later in order to evaluate the repeatability of the questionnaire for gender, ethnicity and age groups. Foods were divided into categories and included standard servings as well as natural portions for foods such as fruits, eggs and slices of bread. Questionnaires were completed by the child and/or caregiver/parent where seven frequency categories were listed for each food and included never or less than once per month up to twice or more times per day (120). Results of the two tests were then analysed for each of the major food groups with three statistical tests showing the correlations between the two food servings. In general, most food groups showed similar results between the two

questionnaires with repeatability's ranging from 0.50 for breads to 0.82 for fruits. Only small differences between the two administrations were seen apart from reporting higher intakes of vegetables, snacks and sweets in the first questionnaire. Correlations were found to be higher in boys than girls, and generally lower among Pacific children. Highest values were seen in the 1-4 year age group and lowest in the 5-9 year age group. Reasons for the gender differences were possibly due to girls having a greater variety of foods in their diets than males. Ethnic differences were unknown but may have been due to a number of factors such as lifestyle differences, poor recall, regular feasting and a greater variety of food consumption. The food frequency questionnaire showed repeatability to be higher than other child or adolescent questionnaires where food correlations were similar between the two questionnaires. However because of the limited data more research is needed within the New Zealand population (120).

Food frequency questionnaires have been used in a wide range of studies due to the ease and cost efficient method of assessing dietary intake among large populations. However, many questions have been raised about the suitability of assessing childhood diet as limitations are seen in children's ability to recall foods and estimate portion sizes (119). Because of the common errors seen with the use of food frequency questionnaires on children, two and three-dimensional pictures are often incorporated to help enhance portion size estimations (117). Other newer tools for improving the accuracy of children's portion estimates are the use of reference books with life-size photographs of portion sizes where they are viewed as being both easy and accurate (121), (122).

Table 1: Summary of the four main dietary assessment methods (118)

Dietary assessment method	Definition of method	Advantage	Disadvantage	Reliability	Validity
Diet History	<ul style="list-style-type: none"> Trained interviewer conducts a 1-2hr interview about meal patterns to a subject/respondent. Usually includes two or more dietary methods (FFQ, 3-day analysis) Obtains information on foods consumed, portion sizes, recipes & frequency of foods consumed over recent past. 	<p>Provide information on meal patterns, food consumption & nutrient intake.</p> <p>Provide data on usual intakes of wide variety of nutrients.</p> <p>Subject involvement is minimal.</p>	<p>Increased costs.</p> <p>Need qualified, trained interviewers.</p> <p>Less used because of face-to-face interview.</p> <p>Requires memory and conceptualization.</p> <p>Long time to administer & complexity of interviews.</p> <p>Increased response burden.</p> <p>Not suitable for children, as can't recall all foods.</p>	Good reproducibility	Difficult to assess
24-hour diet recall	<ul style="list-style-type: none"> Interviewer asks respondent/proxy (child) to recall all foods and beverages consumed over the past 24-hour period. Obtains information on food descriptives & amounts (using portion sizes measurement aids). Reflects a single-days intake rather than usual intake Provides quantitative estimate of food & nutrients 	<p>Ease of administration.</p> <p>Short time to administer.</p> <p>Allows large numbers to be administered with minimal resources and compliance.</p> <p>Increased response rate & decreased burden.</p>	<p>Several days are required to estimate usual intake.</p> <p>Increased cost due to the estimation of food portions & computer coding.</p> <p>Does not provide a reliable estimate of an individual's intake due to day-to-day variation.</p> <p>Hard to assess children, as they may need others to help recall all food consumed.</p>	Day-to-day variation in food intake reduces overall reliability.	Accuracy depends on the subject's recall/memory. Portion sizes are difficult to assess accurately in children.
Food records	<ul style="list-style-type: none"> Foods & beverages are recalled including preparation, ingredients & food amounts for a specific time period. Usually recorded for 3, 7 or 14 days. Provides quantitative estimate of food & nutrients. 	<p>Increased level of accuracy and reliability due to multiple days of food intake provided.</p> <p>Foods are described more in-depth.</p> <p>Portions can be measured more accurately & provide a more close estimation of the foods consumed.</p>	<p>Tend to underestimate energy intake.</p> <p>Increased response burden- time consuming.</p> <p>Requires effort & accuracy by the subject and requires more editing & processing time.</p> <p>Hard to use with children as may require help with recall & measuring.</p> <p>Poorer response rates compared with FFQ & recall methods.</p>	Multiple days provide reliable information on less frequently consumed foods. Foods eaten away from home are less accurately described than those eaten at home.	Accuracy is higher as portions are weighed & measured. Captures more than one day of food intake.
Food frequency questionnaire (FFQ)	<ul style="list-style-type: none"> Looks at the frequency of foods & beverages consumed over a specific time period (1 month, 3 months or 1 year). Usually done by self-administration. Provides a qualitative estimate of foods & nutrients. 	<p>Decreased costs.</p> <p>Ease of administration.</p> <p>Good method for large subject numbers.</p> <p>Reduced subject burden with increased response rates.</p> <p>Short time to administer.</p>	<p>Large amount of work required for development and validation.</p> <p>Provides little information on food preparation methods.</p> <p>Overestimates energy intake and some other nutrients, especially in kids.</p> <p>Portion sizes may be unreliable.</p> <p>May not be suitable for all populations, especially different cultural groups.</p>	Reliability is influenced by heterogeneity of population. Food lists may not contain cultural foods usually eaten. Many FFQ have been calibrated rather than validated against other methods.	More useful for qualitative intakes. Potential for systematic bias.

Validation of dietary assessment methods

Validation of dietary intake is usually assessed by the use of biochemical markers or more recently used is the doubly labeled water technique. There are two main uses for biochemical markers in dietary intake, these include:

1. Food and nutrient assessment
2. A tool for validating dietary assessment methods

Epidemiological studies often use this method for measuring actual dietary intake in studies of disease occurrence as it is the most accurate form of measurement. Within-food variation can be seen among individual food intake where some foods may vary in concentration, processing, storage and preparation. Biochemical markers are a much more reliable source of assessing nutrient intake as other methods such as food composition tables may not be fully accurate (123). There are several different approaches to biological marker measurements, these include:

1. Direct measurement - The most frequently used method where direct assays of the concentration of a nutrient or its metabolic products in a tissue or fluid are measured. Markers of nutrient intake have to be determined individually for each nutrient and for each type of biological specimen.
2. Functional assays – The measurement of biochemical functions that depend on specific nutrients. Dietary intake of nutrients is determined by the activities of several nutrient-specific enzymes (e.g. glutathione peroxidase (selenium) and erythrocyte transketolase (thiamine)).
3. Tolerance tests – Involves the subject taking a blood or urine sample before and after the administration of a test dose of the relevant nutrients (e.g. vitamin A and the relative dose-response test). Those that are poorly nourished frequently retain larger amounts of the test dose than well-nourished subjects, who may excrete most of the test dose (123).

The other common use for biochemical markers is to investigate the accuracy of other dietary assessment methods and eliminate any known errors. This method is highly accurate and is less vulnerable to correlated errors that may occur if a subject completes two self-administered forms of dietary assessment (e.g. food frequency questionnaires and 24-hour recall).

The use of biochemical markers and the validity of dietary assessment methods have been examined in a group of older women (124). One hundred and sixty women aged 50-65 years were recruited in a 1-year study where each participant completed four 4-day food records as well as two 24-hour urine collections. Body weight, overnight fasted blood samples and body weight was also recorded at each evaluation session. Testing was conducted four times during the year. Seven other dietary assessment records were also investigated over the year, including two different food frequency questionnaires, two versions of 24-hour recalls and three types of food diaries. Using biological markers in analyzing the validity of the different dietary methods showed that estimates of nitrogen, potassium and carotene intakes from food recalls yielded higher correlations with urinary nitrogen, urinary potassium and serum carotenoids than estimates of food frequency questionnaire. However, once energy levels were adjusted for, correlations from nitrogen and potassium in the food frequency questionnaire and the 24-hour recalls greatly improved.

A more recent approach to validating dietary assessment methods is the doubly labeled water technique (DLW), which is designed to measure energy expenditure from free-living subjects. The doubly labeled water technique is a form of indirect calorimetry based on the differential elimination of deuterium (H^2) and oxygen (O^2) from body water following a dose of water with these two stable isotopes. Oxygen is eliminated from the body as water and carbon dioxide, while the deuterium is eliminated as water. Carbon dioxide production is therefore the difference between these two elimination rates (125). Although this method is considered to be the 'standard' in validation of dietary assessment methods, it also holds a large number of limitations such as cost of equipment, validation of only one nutrient at a time and the method not being available to all populations. Table 2 summaries the three methods of validation in dietary assessment methods, outlining the main advantages and disadvantages of each.

Table 2: Summary of the validation methods used in dietary assessment

Summarised from: (125), (124), (123) (118)

Validity method	Definition	Advantages	Disadvantages
Biochemical markers	Used to validate the accuracy of dietary assessment methods or as predictors of dietary intakes of nutrients	<ul style="list-style-type: none"> • Provides a good index of true intake • Can be used as a validation method against other dietary assessment methods or in analyzing food and nutrient intake • Objective measurement • Less prone to correlated errors 	<ul style="list-style-type: none"> • Subject to sources of bias and misclassification • Not directly related to intake • Need careful consideration in sampling and analysis
Doubly labeled water technique	Indirect calorimetry method which uses 2 isotopes to measure the production of carbon dioxide to find energy expenditure	<ul style="list-style-type: none"> • Most accurate method of validating dietary assessment methods • Used to measure energy expenditure for 3 days to 3 weeks • Free of bias • Low subject burden 	<ul style="list-style-type: none"> • Very expensive to use • Measures energy only • Can only validate one nutrient at a time • Time consuming • Method may not apply to all populations, especially those who are obese or consume high levels of alcohol
7-Day weighted food record	Used as a reference to validate other dietary assessments methods as well as determining true nutrient intake of an individual	<ul style="list-style-type: none"> • Most accurate method in assessing nutrient intake • Assesses true nutrient intake • Multiple days provide reliable information for less frequently consumed foods • Portions can be weighed or measured for improved accuracy 	<ul style="list-style-type: none"> • Tends to underestimate energy intake • Time consuming • Method may not apply to all populations, especially young children where they may need helping in filling out food records • Inaccuracy of portion size reporting due to conceptualization and memory errors

Methods for assessing anthropometric data in children

Body mass index (BMI) is defined as weight (kg) divided by height (m)² and is commonly used for measuring body weight and height among children. In adults, body mass index has achieved international acceptance as the standard method for estimating healthy weight, overweight, obese and underweight subjects. It is considered to be an accurate measure of body mass with a high correlation to body fat ($r = 0.7-0.8$) and body composition. The World Health Organisation (WHO) guidelines define healthy adults with a BMI between 25-30kg/m², underweight as below 20kg/m², overweight with a BMI over 25kg/m² and those with a BMI over 30kg/m² as obese (126). However in children, BMI measurements are not entirely valid due to factors such as linear growth making it far more difficult to assess (127). In children and adolescents body mass index values vary substantially by age, gender and pubertal stage; therefore it is necessary that cut-off values are both gender and age specific. In order to make comparisons across studies worldwide, an international reference is useful. In 1995 the WHO committee recommended that the 85th percentile be used based on data from an earlier study done in the USA in defining adolescent

overweight in 10-19 year olds. More recently the International Obesity Task Force (IOTF) further proposed a new international body mass index reference in defining overweight and obese children aged 2-18yrs (43). Percentile curves were drawn at age 18 years using cut off points of 25 and 30kg/m² for adult overweight and obesity values. Resulting curves were averaged to provide age and sex specific cut off points for children aged 2-18 years (44).

New Zealand data on assessing child anthropometric values

Most New Zealand studies (88), (93), (126), (128) have measured children's height and body weight levels through the method of body mass index (BMI). The only problem in using body mass index on New Zealand children are the effects it has on different ethnic groups. Although in 2001, Tyrell et al (88) showed that there was no significant differences in the relationship between body mass index and body composition in different ethnic groups and that the same standards should be used in children of all ethnicities. A study by Turnbull et al (93) looked at the changes in body mass index in children aged 11-12 years in Hawkes Bay, New Zealand. Body fat was measured by BMI calculations alone based on results of Tyrell et al's study (88) who found that there was no relevant difference between BMI and percentage body fat in New Zealand school children. Because body mass index does not take into account a child's pubertal stage of development or age it is often harder to correlate BMI with an accurate measure of body mass and height for children aged 8-15 years (128). Estimations of body fat percentage by dual-energy X-ray absorptiometry has shown (45) to be more accurate in measuring a child's body mass than BMI calculations. A fat free mass equation has also found (96) to be a more suitable predictor of body fatness in children than body mass index measurements, especially in Maori and Pacific People. Percentage body fat (%BF) can be calculated by fat mass (FM) derived from the difference between body weight and fat free mass (FFM). Values are then placed into the body fat percentage equation ($100 \times \text{FM} / \text{body weight}$) (96). Further work is required in providing an accurate body mass index calculation for young school children, whereby taking into account the gender, age, pubertal stage and ethnic group. Most of the research (45), (45), (126), (88), (94), (93) has looked at the prevalence's of children who are overweight or obese and associations between body mass index, therefore more

research is needed in defining an accurate measure a healthy body weight range for children of all ages (45).

Summary of the main findings

The literature review shows the current dietary changes and major influences among childhood diets worldwide and in New Zealand.

The main dietary changes seen in children worldwide were:

- Consumption of dietary fat has increased over the recommended 25% with increases in saturated fats and added sugars. This has resulted in a number of decreases in essential nutrients including fibre, calcium and iron intake (9), (7).
- US adolescents and children are consuming 20% of their total energy from added sugars, with the greatest source coming from non-diet soft drinks, followed by fruit drinks, sugars and sweets, sweetened grains, sweetened dairy foods and pre-sweetened cereals (7).
- High intakes of sugary beverages can help increase overweight and obesity among children and can increase the odds of becoming obese by 1.6 times for every additional glass consumed each day for children aged 11 years (8).
- Average fruit and vegetable consumption among U.S. children (aged 12 years) was 3.9 and 1.6 servings per day of fruits and vegetables with only 37% and 2% of children met the criteria for the US dietary guidelines (51). Fruit and vegetable intakes are being replaced by high amounts of soft drinks and sweetened beverages where students who consumed high intakes of soft drinks and total sweetened beverages reported lower consumption of fruits and higher calorie intakes (33).
- A large number of children are missing breakfast meals with 13-16% of adolescents eating breakfast less than once a week. These children are more likely to snack during the day, miss lunch meals and engage in a sedentary lifestyle (55).
- Lunch meals were found to consist mostly of la carte programs or vending machines which contain of fried foods, snack bars and sweetened beverages with few low-fat food items such as fruits or vegetables (58).

- Children are consuming over a quarter (27%) of their meals away from home where a large number of meals are consumed at fast food outlets and restaurants (63), (62).
- Portion sizes or amount of foods consumed per eating occasion have shown a steady increase between the years 1989-1991 and 1994-1996 (50).

The main dietary changes among New Zealand children were:

- Energy intakes in children (aged 5-14 years) are larger among boys than girls with Maori children having the highest energy intake followed by Pacific children and New Zealand European and Other (NZE0) children.
- The main sources of dietary fat came from potatoes, kumara and taro which were commonly consumed as potato crisps, chips and wedges. Other major sources of dietary fat came from milk, biscuits, spreads, pies and pastries.
- Sugar intakes among children average 103-140g/day with over a quarter of their intake coming from sweetened beverages and one fifth from sugary foods, fruits and confectionary.
- Only half of New Zealand children are eating the recommended daily intake of fruits and vegetables with two out of five children eating two or more fruit servings per day (37).

The current dietary patterns among children have been linked to a variety of diseases in later life prevalence's including obesity, diabetes, cardiovascular disease and cancer. Childhood prevalence's for overweight and obesity have shown an increase of 2.3 to 3.3-fold over 25 years in the USA and a 2.0 to 2.8-fold increase over 10 years in the UK (13). New Zealand data shows that 21% of children aged 5-14 years are classified as overweight and 10% as obese (37).

The main form of anthropometric assessment among children has been the use of body mass index (BMI) values or weight (kg) divided by height (m)². However, accuracy of this method has been questionable among young children due to factors such as age, gender and pubertal stage influencing results. Other methods such as dual energy X-ray

absorptiometry (DEXA), percentage body fat equations and 85-95th percentiles have also been used to measure body fat levels in children (45), (96), (43).

Dietary changes have largely been influenced by peers, television, advertising, schools and family environments. Parents who exert greater control over children's meal patterns and food choices showed children with larger intakes of the more palatable and restricted high fat foods (74), (75), (76). This helps emphasise the need for incorporation of parents and family members into improvements in dietary and health levels.

The school environment is perfect opportunity to introduce education intervention programs where they should aim to incorporate both nutrition and fitness modules in order to help improve cardiovascular and other health risks. Positive changes have been seen in lipid and blood pressure levels as well as overall improvements in dietary and physical activity levels (28), (21). Overall, studies have shown that strategies and intervention programs should focus toward high risk populations such as children with unhealthy body weights and from lower socioeconomic areas (27). Together, families and schools can create a health education program that will improve children's nutrition, health and exercise patterns.

Future research needs – What needs to be done?

- More research and interventions programmes conducted on New Zealand school children.
- Greater support and co-operation for children from other sources e.g. families, schools, peers, health organisations and food companies.
- Increase child nutrition and health education modules in schools as well as increase exercise levels.
- Monitor what food goes into school tuck shops and work towards promoting healthier options.

In order to improve dietary habits among children, appropriate strategies need to be put into place and reflect a child's age, gender, ethnicity and regional differences in food consumption patterns (3). Suggested directions from the American Dietetic Association are: (3)

- Incorporate behavioural strategies that work on enhancing self-efficacy and self-esteem in children.
- Implement nutrition intervention and education programs within school environments.
- Help children gain confidence so successful changes in eating and physical activity can take place.
- Develop and implement strategies for educating parents and caregivers on how to foster a more healthful lifestyle in the home environment.

Health promotion within the school setting is the best way for a child to learn appropriate nutritional knowledge on eating habits, food choices and a healthy lifestyle in order for them to carry it on into adulthood. Previous studies (129), (109) on education programmes have shown us the main strategies that need to take place in order to result in a successful programme. The main features that contribute to an effective programme include incorporating the right amount of time and intensity of the intervention as well as incorporating the whole family into the programme (1). School-based nutrition education should aim at including information on food preparation, storage, social and cultural aspects of food and eating as well as general nutrition knowledge. Positive images on body

image and enhancing self-esteem should also be included. This way the child can develop appropriate healthy food choices with the support of teachers and parents. For programmes to run smoothly and effectively, adequate training for teachers should take place well before the programme begins. With appropriate training, teachers will have a greater awareness and motivation in the module which will help explicit a behaviour change within the children (1). Schools that provide lunch or breakfast meals need to consider the types of foods they are offering within canteens and vending machines. Meals offered should aim towards a more healthful approach which is demonstrated in the education programmes whilst cutting out the more energy dense foods (129). Larger amounts of fruit and vegetables should be sold in schools, and should cut down on packaged snacks, confectionary, chocolate and fastfoods. Soft drink consumption has increased by 65-74% in adolescents between the years 1977-1994 (18). During this period of time, milk consumption also showed a large decreased. It was suggested (18), (130) that the high amounts of soft drink consumption may be replacing the more nutritious beverages such as milk and some fruit juices which is highlighted by the low calcium intakes found among children. School canteens should therefore replace the sales of cordial and high sugar soft drinks with water and low-energy milk drinks.

CHAPTER THREE

AIMS

The main aims of this study are:

1. To see if a nutrition and health education programme can influence the dietary habits of 10-12 year old New Zealand children.
2. To examine the effects that a 12-week nutrition and health education programme has on body composition measures including height, weight and body mass index (BMI).

The study was developed and implemented because of the limited knowledge regarding child nutrition education programmes within New Zealand schools. Children aged 10-12 years were chosen because previous studies (25), (131), (132) have shown that children of this age need greater dietary improvements and dietary guidance than other populations. Children of this age group also face added nutritional demands during the stages of growth and development where a greater amount of essential nutrients are required (41). These dietary patterns accumulate at a young age and carry on into adulthood; therefore making children of this age ideal for a school education intervention programme.

A direct relationship has been shown (10), (9), (14), (13) between the eating patterns of children and risks for chronic disease development with a large increase in children's body weights. Body composition values have been associated with dietary intakes where previous studies (133), (134) have shown lower body mass index (BMI) levels to be associated with school education programmes.

CHAPTER FOUR

METHODS

Subjects and study design

Two primary schools in Auckland New Zealand, within close geographical proximity to each other were selected and approached to participate in the study. Schools were chosen based on their larger population size, close location and equal decile level. Both schools were from a lower socio-economic region and were classified as decile three schools¹. Each school contained a variety of ethnic groups which allowed the study to examine a wide cross-section of the population.

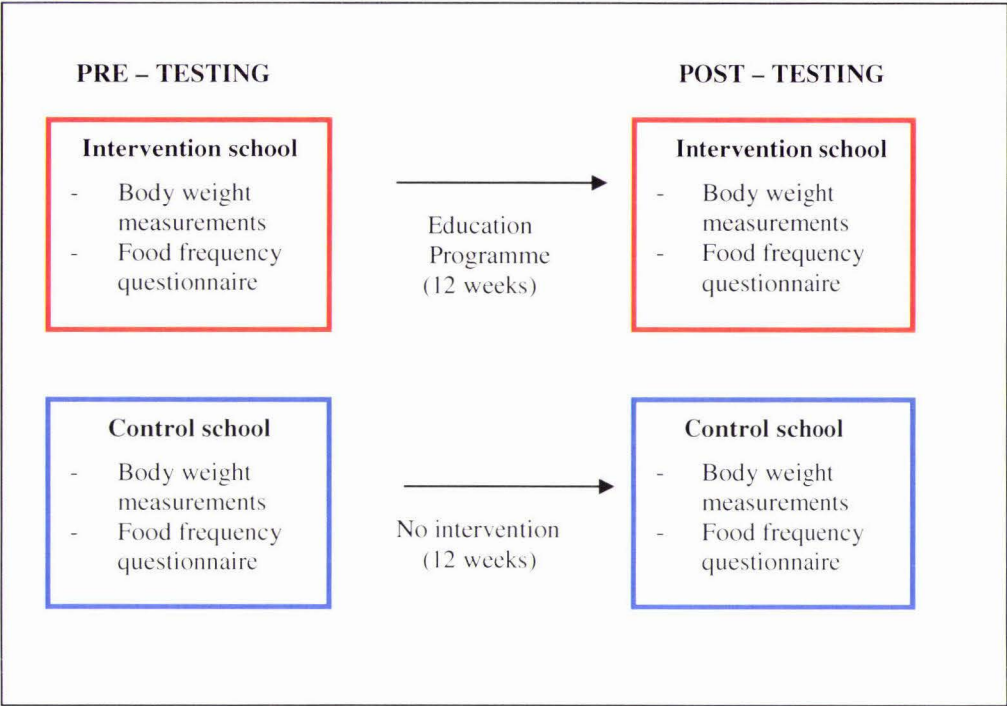
Five hundred and sixty five children aged 10-12 years were selected from the larger school for the intervention group. This accounted for subjects that would not consent to the study, yet left a larger enough number for an effective result. Two hundred and sixty-two children aged 10-12 years were recruited for the control school. Principal and teachers of both schools attended an information meeting explaining the study's main aims, design and procedures. Intervention school teachers also received information about intervention modules and programme layout. All students and families received information letters and consent forms (see appendix A) describing the study's purposes and what was required from them. All parents and participants were required to sign consent forms before the child took part in the study. All non-consented subjects were eliminated from the study leaving total of 543 in the intervention group and 255 in the control group.

Two separate testing periods and distribution of a questionnaire was given to remaining subjects from both schools. Initial testing was done on each consented subject at the beginning of the study and repeated at three-months, with procedures consisting of a height and weight measurements and a food frequency questionnaire. Subject's date of birth, gender were recorded at the beginning of the pre-testing sessions. The intervention school

¹ Decile rating of New Zealand schools range from 1-10 with 1 being the lowest

received a 12-week education programme which began immediately after initial testing. No intervention programme was given to the control group (see figure 1).

Figure 1: Diagram showing layout of the study



Funding

The study was supported by The Millennium Institute of Sport and Health (MISH) in Auckland, New Zealand.

Testing procedures and equipment

Body measurement

All testing sessions were conducted on school grounds during children’s physical education periods. Children’s height and weight were recorded inside a private cubicle with one recorder and one measurer present. Weight was measured using a set of electric scales (Tanita Bodyfat Analyzer, Model TBF-105), which was calibrated using a known 5kg weight. Height was measured using a portable stadiometer (Kabi Pharmarcia Stadiometer,

Pat No. 4.694.581) and recorded in centimetres (cm). The stadiometer was calibrated by comparing a one-metre ruler (known measurement) against the base of the stadiometer in order to check its accuracy of measurement. Body composition measurements were calculated using body mass index (BMI) values with the equation $\text{weight (kilograms)} / \text{height (metres)}^2$. All height and weight measurements were performed by the same trained assessor (Level 3 ISAK anthropometry accreditation) in order for results to remain consistent, valid and reliable (see figure 2).

Figure 2: Set-up of equipment for body composition measurements



Measurement of nutrient intake

Each subject received a food frequency questionnaire (FFQ) (see appendix B) to fill out within class time. Teachers read out each question individually, making sure each child understood what was required from them, as well as clarifying any unknown food items. Instructions were printed on the front of each questionnaire for children to read prior to starting the task. Questionnaires consisted of 118 questions, and were divided up into 13 specific food and beverage classifications.

Food and beverage classifications were:

1. Fruit
2. Vegetables

3. Mixed dishes
4. Eggs, meat, poultry and fish
5. Pies, fastfoods, sausages
6. Breads and cereals
7. Spreads and sauces
8. Convenience meals/snacks
9. Dairy
10. Biscuits/cakes
11. Snacks and sweets
12. Milks
13. Other drinks

To understand the eating patterns of the subjects, children were asked how often they consumed each food and beverage item over the past 4 weeks by ticking the box that best represented their frequency.

Questionnaire choices were:

- Never or less than once a month
- 1-3 times a month
- 1-2 times a week
- 3-4 times a week
- 5-6 times a week
- Once a day
- 2 or more times a day

Validation

Validation of the food frequency questionnaire was completed by Metcalf et al (120) in 1999. The questionnaire was developed from four hundred and twenty eight children aged 1-14 years (224 girls, 204 boys) from Auckland, Feilding and Shannon in New Zealand. An even ethnic representation of the population was chosen, including Maori (137), Pacific People (143) and New Zealand European/Other (NZEO) (148) nationalities. Twenty-four hour food dietary records were collected between May and September 1999 and then

converted to nutrient intakes using the NZ Food Composition Database 2000 (NZFCD). From these diets, 117 of the most popular foods for all ethnic groups were selected for the food frequency questionnaire.

Intervention Programme

A nutrition and health promotion programme was taught by class teachers to the intervention school for 12-weeks during one hour of class time per week (see appendix C). Resources were teacher based for increased compliance and designed to fit into the school curriculum so that no major adjustments to timetables were needed. The programme consisted of nine different modules that aimed at encouraging students to consider their own attitudes and behaviours towards a healthy and balanced lifestyle. Each module consisted of class activities and participation exercises, helping the students become more involved at making healthier lifestyle decisions.

The resources were developed by The Millennium Institute of Sport and Health (MISH) and Nestle foods and previously used among Australian schools over the past 5 years. Modules were modified to suit New Zealand school children. The study coordinators were available at all times to answer any questions relating to education modules or any problems teachers and students encountered.

Module outline:

Module 1	Good life
Module 2	Good health
Module 3	Food and you
Module 4	Fit body
Module 5	Mind power
Module 6	Get active
Module 7	Fuelling your body
Module 8	Role modelling
Module 9	You are part of a great sporting nation

Data analysis

Each subject was coded based on their school and testing session, then placed into an excel spreadsheet on a computer database. Foods were entered based on their frequency per day, where each box represented a fraction of a day. Boxes were divided by the days in a week in order to get a fraction per day.

Coding system:

- Never/less than once a month and 1-3 times per month were equal to zero.
- 1-2 times a week = 0.25 times a day
- 3-4 times a week = 0.5 times a day
- 5-6 times a week = 0.75 times a day
- Once a day = 1 time a day
- 2 or more times a day = 2 times a day

Each food and beverage item was placed into one of the 22 food categories in order to calculate the frequency of foods per day for each subject. The food categories were; fruit, starch vegetables, other vegetables, meat/vegetable dishes, red meats, chicken, fish, takeaways, breads, cereals, spreads, sauces, soup, rice/pasta, eggs, dairy, cakes/biscuits, desserts, snacks, sweets, cold drinks and hot drinks. Food items that did not fit into categories or that consisted of large outliers (more than 10 times per day) were recorded as missing data.

For each subject, dietary intakes were matched from baseline to follow-up and placed into an excel spreadsheet. Those subjects who were not present for both testing sessions or that were not given permission to participate were eliminated from the study. This left a total of 244 subjects in the intervention group and 106 in the control group. A large number of children did not fill out nutrition questionnaires adequately or failed to report their names, therefore data could not be used.

Statistical Analysis

Data was analysed using the statistical program Statistical Package for Social Sciences (SPSS) 10.0.1 for Windows (1999). Descriptive statistics for each food item within a subject included medians and the 25th and 75th percentiles.

Baseline results of the dietary intake between both groups showed non-normal distribution; therefore a Mann Whitney test was used to determine significance of the data. Comparisons were made between baseline and follow-up in the two groups and then the differences were compared. The significance level was set at $p < 0.05$ for all tests.

CHAPTER FIVE

RESULTS

The purpose of this research was to investigate the effectiveness of a 12-week school health and nutrition education programme on children's (aged 10-12 years) dietary intakes and body composition. Dietary patterns were investigated at the start of the programme (baseline) and again at 3-months (follow-up) for an intervention and control school. A food frequency questionnaire (FFQ) was used to assess the frequency of foods eaten per day during a four week period. Children's height and body weight values were measured and body mass index was calculated at baseline and follow-up.

Subject characteristics and anthropometric values are presented for each school at baseline and follow-up for the study. This follows an overall assessment of dietary intakes as a whole in order to determine whether there were any significant differences ($p \leq 0.05$) between the two testing periods for each school.

Subject characteristics

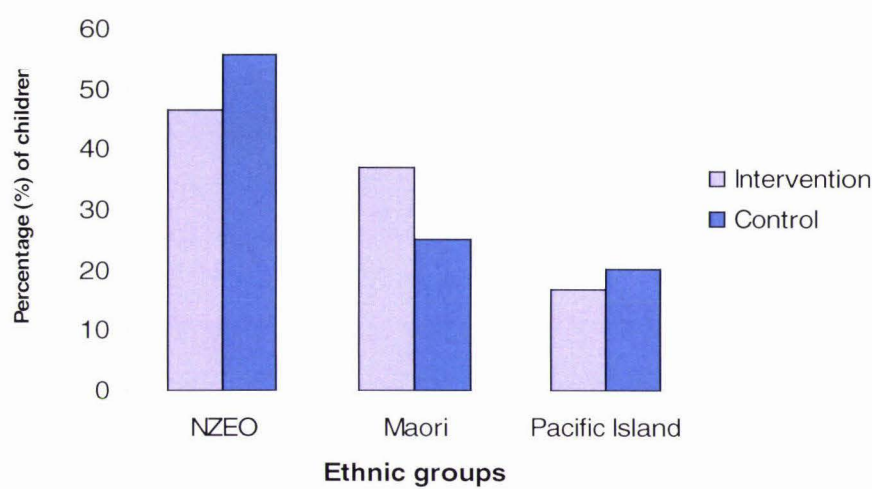
All participants in the study resided in West Auckland, New Zealand and attended intermediate schools within the area. Both schools were classified decile 3 as stated by the Ministry of Education, New Zealand (135) which indicates a lower socioeconomic status. The age of children at baseline ranged from 10-12 years with an average age of 11 years, 8 months in the intervention school and 12 years, 1 month in the control school. In the intervention school, 244 children consented to the study with 49% of the group being male and 51% female. In the control school there were 106 children who consented, with 46% males and 54% females.

Ethnic groups

Subjects from either school were from a wide range of nationalities with a high percentage falling into the NZ/European & Others (NZE0) category, followed by Maori and Pacific Island. The Pacific Island category included Cook Island, Samoan, Nuiian and Tongan

ethnicities. Indian and Chinese/Korean subjects were included into the NZ/European and Other (NZEO) category. A higher percentage of the control group were categorised as New Zealand European and Other (NZEO) (55.7%) than the intervention group (46.5%). The control group also showed a lower percentage of Maori children (37%) and higher number of Pacific children (20%) compared with the intervention group (25%, 17%) respectively.

Figure 3: Ethnic groups of all children participating in the study



Baseline characteristics

At baseline the data was non-normally distributed, so a statistical test (Mann Whitney U) was used to compare the characteristics of the schools. Median values of dietary intakes and anthropometric values were compared within each school and range of error was determined by the 25th and 75th percentiles.

Anthropometric Indicators

In both the control and intervention schools there was an increase in median height, body weight and body mass index values from baseline to follow-up with similar increases in boys and girls. Median body weight, height and body mass index values were higher among subjects in the control group both at baseline and follow-up. However, none of these body composition differences were significant in either group (minimum p=0.94). Refer to table 3.

Table 3: Median anthropometric values for control and intervention groups at baseline and follow-up

Groups	Height (cm)	Weight (kg)	BMI (kg/m ²)
Intervention groups			
Baseline	152.5 (147.2, 158.0)	46.1 (38.7, 55.40)	19.5 (17.5, 23.0)
Follow-up	153.7 (148.3, 159.5)	48.0 (39.8, 56.9)	20.0 (17.8, 24.40)
Control groups			
Baseline	155.5 (150.30)	50.8 (42.60, 61.90)	20.8 (18.40, 24.20)
Follow-up	157.5 (151.50, 163.0)	53.3 (44.10, 64.20)	21.0 (18.10, 25.20)
Median (± 25 th and 75 th percentiles) ²			

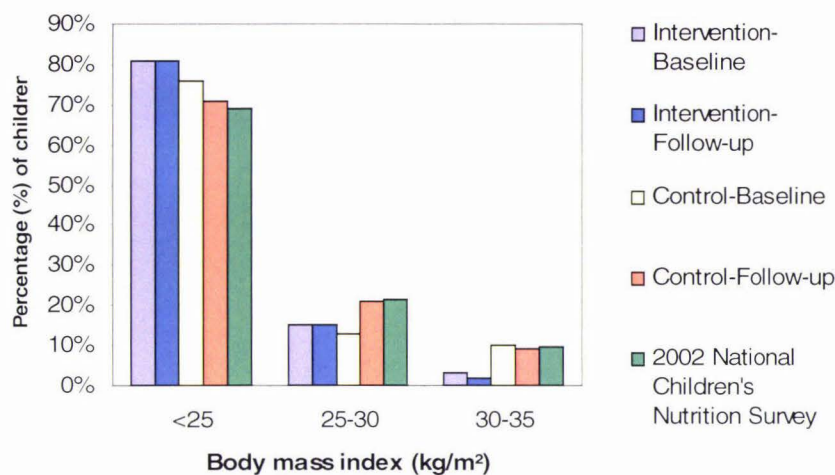
Using international cut-off values (136), most children (71-81%) were classified into the healthy range category of <25kgm² for body mass index (BMI) in both schools. Of these subjects, 15-21% had a body mass index between 20-25kg/m² and 34-51% had a body mass index under 20kgm². A larger number of children were classified as obese (30-35kgm²) in the control school (10%) compared with the intervention school (3%). Less than 1% of all subjects were categorised as extremely obese or >35kg/m².

Body mass index values were compared with the 2002 National Children’s Nutrition Survey (CNS) results for New Zealand children (aged 5-14 years). Survey results showed a lower proportion of children (69%) had a body mass index within an acceptable range of <25kgm² while 21.3% and 9.8% were classified as overweight and obese. A higher

² Numbers in brackets indicates the 25th and 75th percentiles

proportion of children were classified as overweight and obese in the CNS compared to both study groups. However results in the control group at follow-up showed similar values to the survey (see figure 4).

Figure 4: Body mass index representation of subjects at baseline and follow-up compared to the 2002 National Children's Nutrition Survey



Growth curves

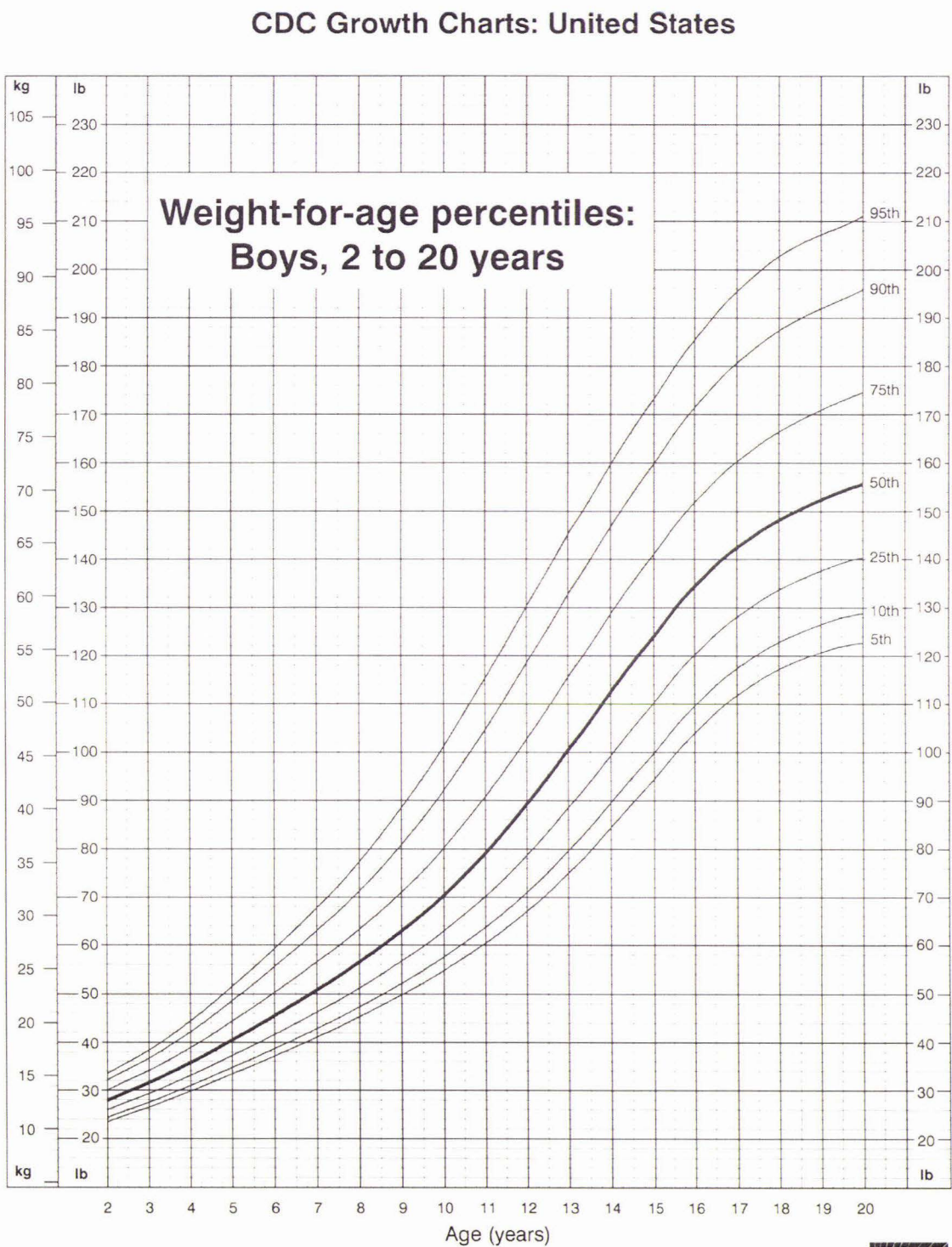
Baseline median height and body weight values for boys and girls in the control and intervention group were plotted against the 2000 United States growth curves for children aged 2-20 years (137). Each group is represented by a different colour and shows the median values along with the 25th and 75th percentiles as the range of error (see figure 5-8). While there are currently no available New Zealand growth charts, the US growth charts are used on New Zealand children.

When children's body weight values were plotted against the US growth charts, 31% of the girls and 17% of boys were above the 95th percentile for the control group and 21% of girls and 24% of boys in the intervention group. Intervention girls and control school boys showed a greater number of children to be over the 95th percentile for weight. Overall body weight values for children ranged between 27-122kg in both schools with boys showing the

heaviest values. The intervention school showed the largest body weight values with the heaviest girl weighing 112kg and boy weighing 122kg.

Height for age growth charts showed 31% of girls and 10% of boys in the control group and 32% of girls and 25% of boys to be over the 95th percentile. The intervention school showed both boys and girls to have a greater percentage of children over the 95th percentile for height than the control school. Height values ranged from 133-180cm for both schools.

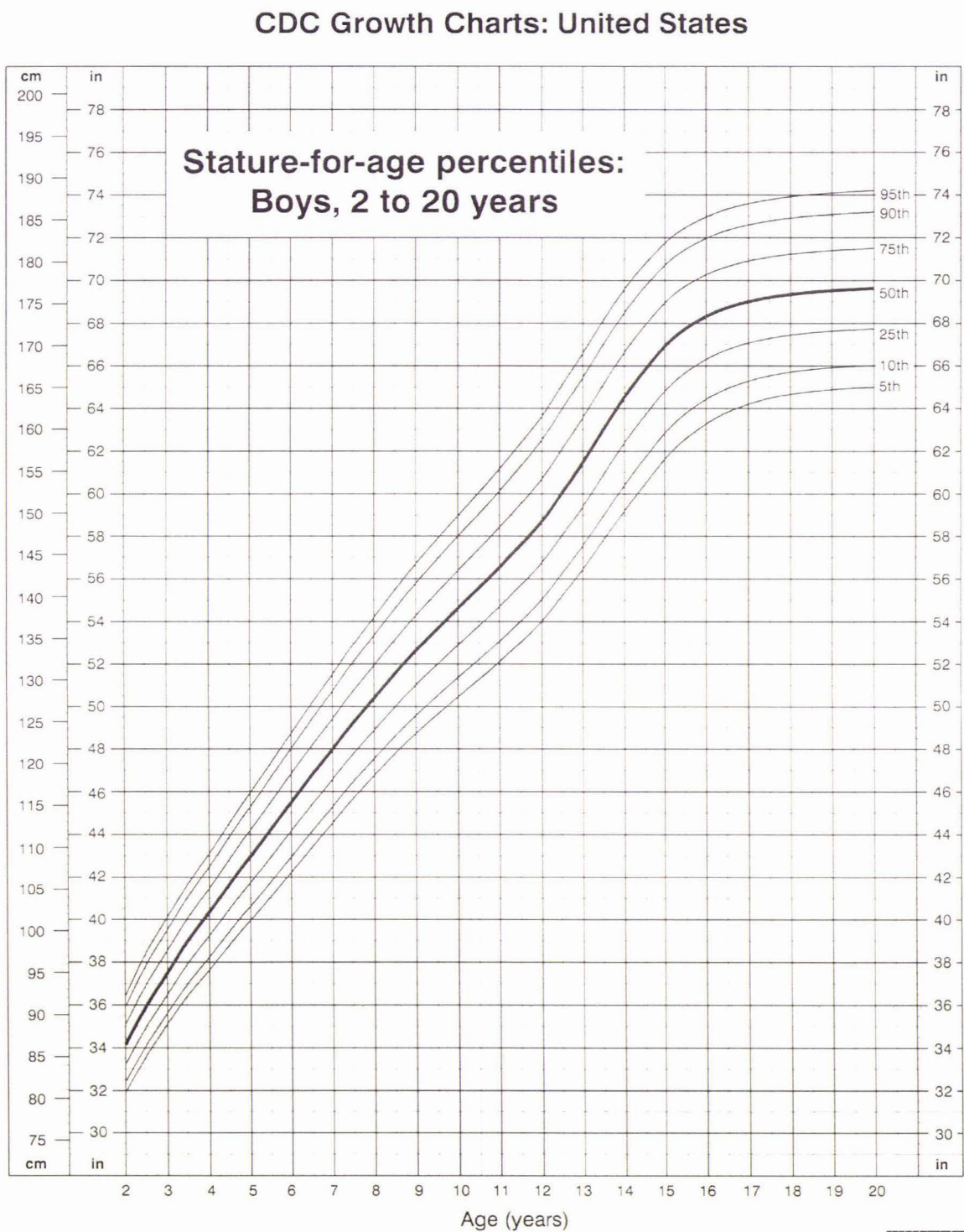
Figure 5: Weight for age percentiles for boys aged 2-20 years



Published May 30, 2000.
SOURCE: Developed by the National Center for Health Statistics in collaboration with
the National Center for Chronic Disease Prevention and Health Promotion (2000).

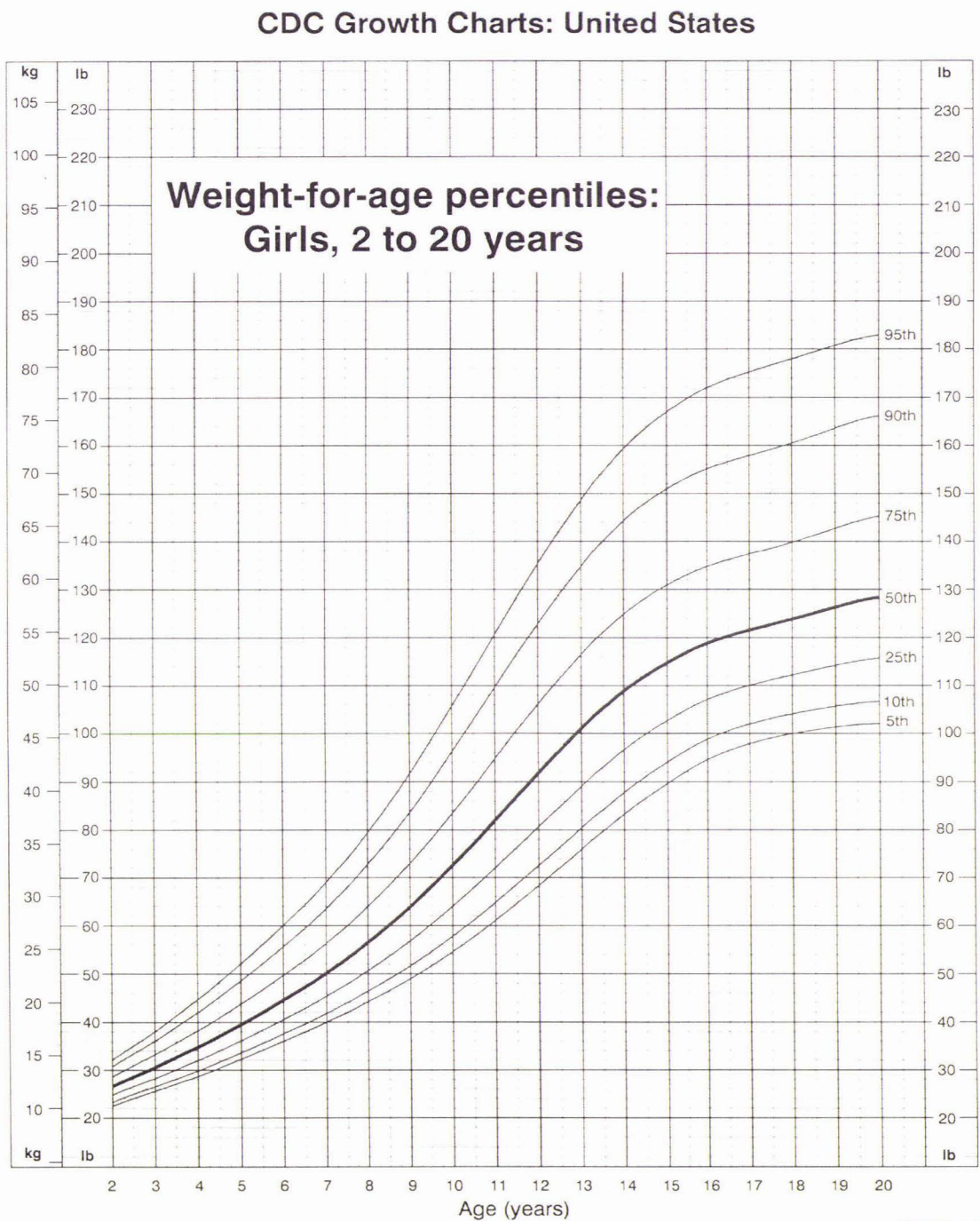


Figure 6: Height for age percentiles for boys aged 2-20 years



Published May 30, 2000.
SOURCE: Developed by the National Center for Health Statistics in collaboration with
the National Center for Chronic Disease Prevention and Health Promotion (2000)

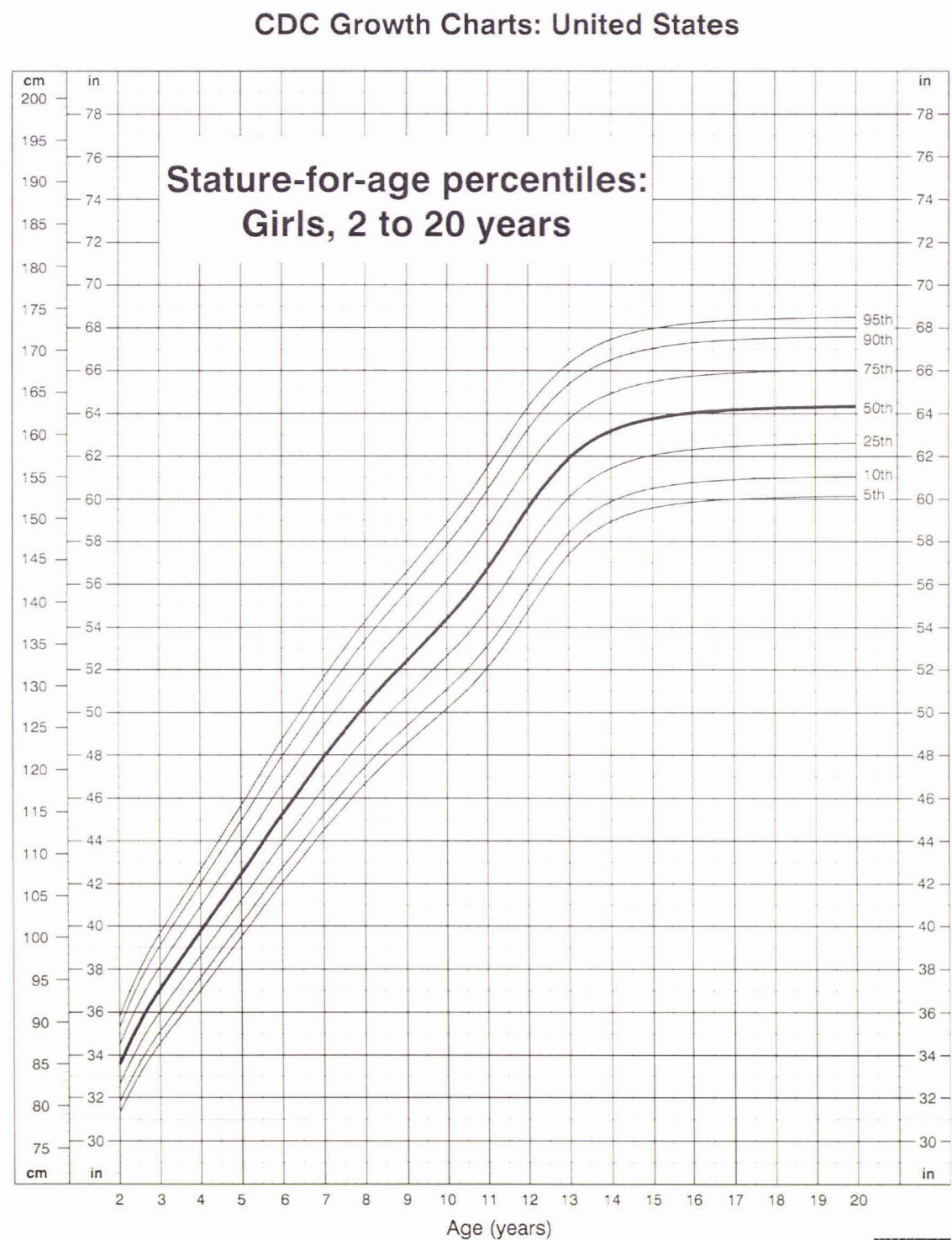
Figure 7: Weight for age percentiles for girls aged 2-20 years



Published May 30, 2000.
SOURCE: Developed by the National Center for Health Statistics in collaboration with
the National Center for Chronic Disease Prevention and Health Promotion (2000).



Figure 8: Height for age percentiles for girls aged 2-20 years



Published May 30, 2000.
SOURCE: Developed by the National Center for Health Statistics in collaboration with
the National Center for Chronic Disease Prevention and Health Promotion (2000)



Dietary changes

Fruit and vegetable intake

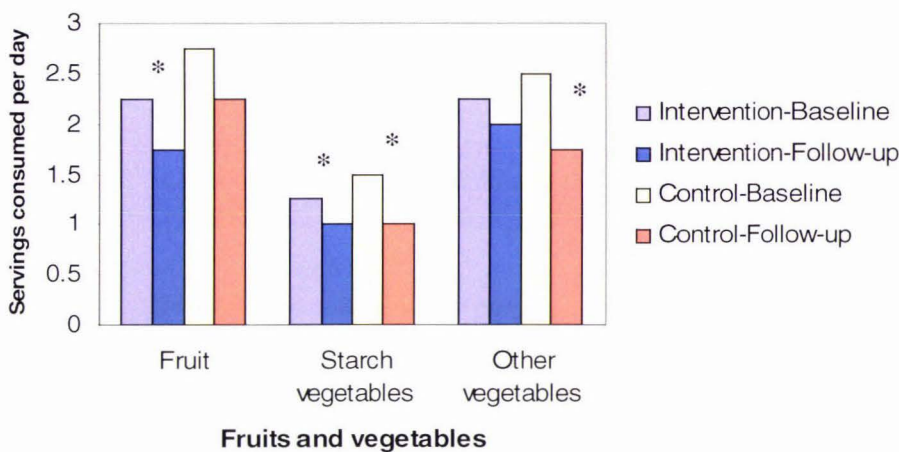
In both study groups children were found to consume higher intakes of fruit and other vegetables than starch vegetables at both baseline and follow-up. Among control subjects, fruit was the most frequently consumed followed by other vegetables and starch vegetables. Intervention subjects showed similar intakes of fruit and other vegetables followed by lower intakes of starch vegetables.

Median fruit intake showed a significant decrease ($*p \leq 0.000$) among the intervention group subjects between baseline and follow-up. The intervention group showed median fruit intake reduced from 2.25 (1.25, 3.50) serves/day at baseline to 1.75 (1.00, 2.63) serves/day at follow-up. The control school showed a small decrease in median fruit intake but results were not significant.

Median starch vegetable intake showed a significant decrease in both the intervention ($*p \leq 0.000$) and control ($*p \leq 0.000$) groups during baseline and follow-up. Intake in the intervention group showed a decrease from 1.25 (0.75, 2.0) serves/day to 1.00 (0.5, 1.5) serves/day at follow-up. The control group had a slightly higher baseline intake of starch vegetables with 1.5 (1, 3.25) serves/day but intakes decreased to a similar value at follow-up of 1.00 (0.5, 1.75) serves/day.

Median intake of other vegetables showed a decrease among both groups but only the control group showed a significant difference ($*p = 0.007$). In this group, daily intake decreased from 2.5 (1.25, 3.5) serves/day to 1.75 (0.75, 3.0) serves/day with a larger median intake at baseline than the intervention group (see figure 9).

Figure 9: Median servings per day of fruit and vegetables in the intervention and control group³



Fruit and vegetable servings/day were compared to the CNS results. A greater proportion of children at baseline and follow-up in both study groups consumed two or more servings/day of fruits than the CNS results. Only 47% of children in the CNS consumed 2 or more servings of fruit, where the intervention and control groups showed a higher proportion between 46-71%.

Apples and pears were the most frequently consumed fruits in both study groups, followed by citrus fruits such as mandarins and oranges. This was similar to the CNS data where apples or pears were consumed more than 1/week by 83% of New Zealand children followed by citrus fruits (67%) and bananas (63%). A variety of other fruits were consumed by children in the current study including watermelon, feijoas, mangos, pineapple, grapes and passionfruit with more servings at baseline than follow-up.

Only 32% of children in the CNS consumed 1 or more servings of starch vegetables where the combined study groups showed between 53-79% of children to consume 1 or more

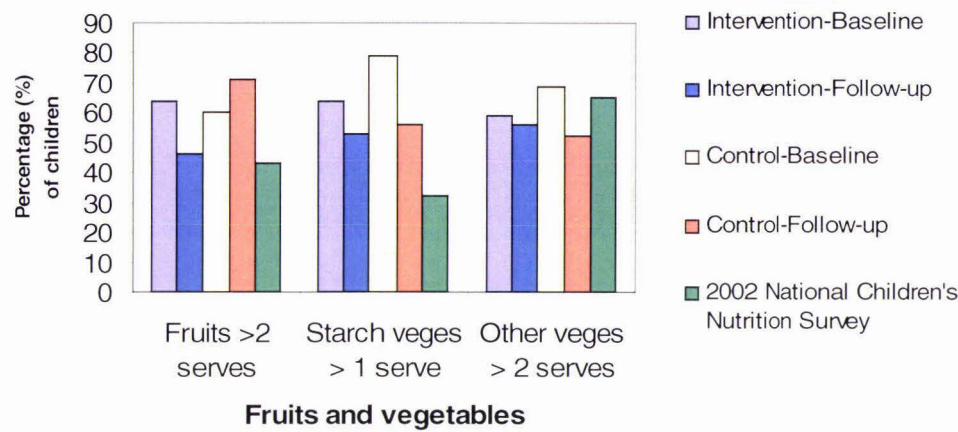
³ The * sign refers to the level of significance ($p<0.05$) for the median food intake

serves/day. The control group at baseline showed the highest proportion of children (79%) to consume 1 or more serves of starch vegetables than all other groups.

The most frequently consumed starch vegetables in the two study groups were potatoes followed closely by fried potatoes, taro and kumara. This was similar to the CNS results which showed potatoes to be most frequently consumed (87% consumed at least 1/week) item each week which included boiled, mashed, baked or roasted potatoes. Fried potato consumption (65%) was also high among survey participants and included foods such as hot chips, kumara chips, french fries, wedges or hash browns. The less frequently consumed starch vegetables in the study were roast vegetables, cassava and cooked green bananas which were similar to the CNS survey results.

Similar proportions of children consumed 2 or more serves of other vegetables in all study groups with proportions ranging from 52-69%. The most frequently consumed other vegetables by both studies groups were mixed vegetables, followed by lettuce/salad, carrots and tomatoes. This differed to the CNS results which showed carrots (79% consumed at least 1/week) to be most popular followed by broccoli (60%), peas (59%) and mixed vegetables (58%). All groups found capsicum and other seasonal vegetables to be consumed the least. For comparisons to the CNS of fruit and vegetable proportions refer to figure 10.

Figure 10: Servings per day of fruit and vegetables in the intervention and control groups compared to the 2002 National Children’s Nutrition Survey



Meat dishes, red meats, chicken & fish intake

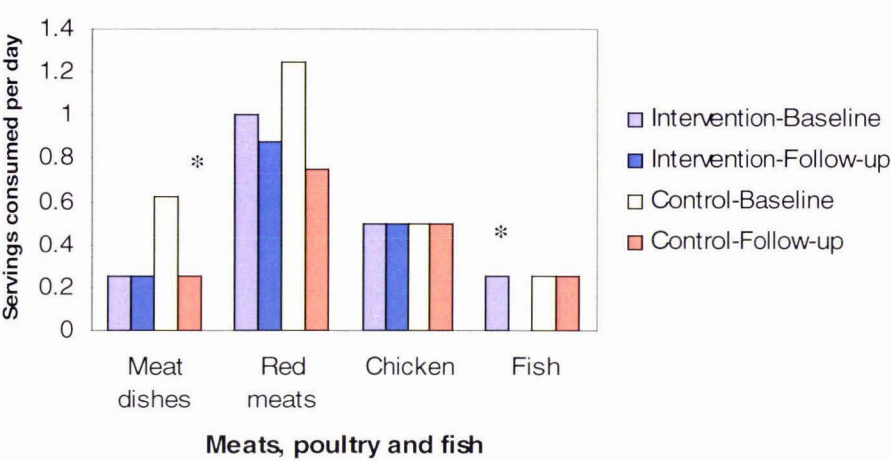
Red meat was the most frequently consumed meat type among both study groups followed by chicken, meat dishes and fish. Overall the control group showed a higher median intake in both red meats and meat dishes than the intervention group with a similar median intake in chicken. Significant differences were seen in median consumption of meat dishes for the control group (*p=0.035) and median intake of fish in the intervention group (*p=0.019). Fish intake reduced from 0.25 (0, 0.75) serves/day to 0 (0, 0.5) serves/day for intervention subjects and in the control group meat dishes reduced from 0.63 (0.25, 1.0) to 0.25 (0, 1.0) serves/day.

Median intake of red meats showed a decrease in both study groups from baseline to follow-up, however results were not significant.

Median intakes of chicken were similar for both groups at baseline and follow-up with 0.5 (0.25, 1.25) serves/day. However, no significant differences were seen in either group (see figure 11).

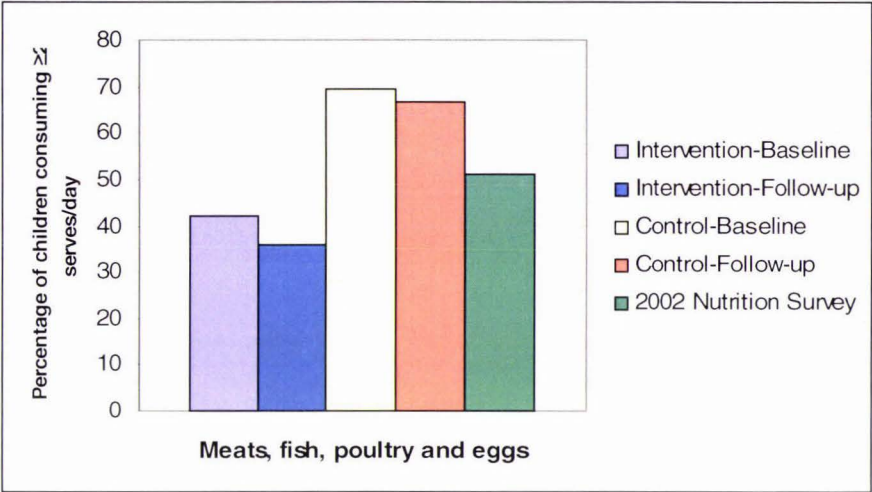
The most frequently consumed meat dishes were Chinese type, meat and vegetable 'boil-ups' and meat stew or casserole dishes. In the red meat group, bacon and ham were consumed the most followed by roast beef, lamb or pork meat, steak and mince. Liver and corned beef were consumed the least.

Figure 11: Median servings per day of meat dishes, red meats, poultry and fish in the intervention and control group



Servings of meats, fish and poultry were combined with egg servings per day in order to see the proportion of children who ate more than 2 servings/day. This was then compared with the CNS results. The intervention group showed the lowest proportion of children to consume >2 servings/day at baseline (42.2%) and follow-up (36%) with a decrease seen between the two periods. The control group showed the largest proportion of children to consume more than 2 servings/day at baseline (69.3%) and follow-up (66.7%). Both groups showed a decrease in total servings per day between baseline and follow-up, which may have been reflected by the change in median intake among individual meat groups. In comparison to the CNS, the proportion of children to consume >2 serves/day was in between (51%) both study groups. However, age groups differed slightly between the current study and the CNS results where survey results looked at a wider age group (5-14 years). Refer to figure 12.

Figure 12: Proportion of children consuming ≥ 2 servings/day of meats, poultry, fish and eggs in comparison to the 2002 National Children’s Nutrition Survey results

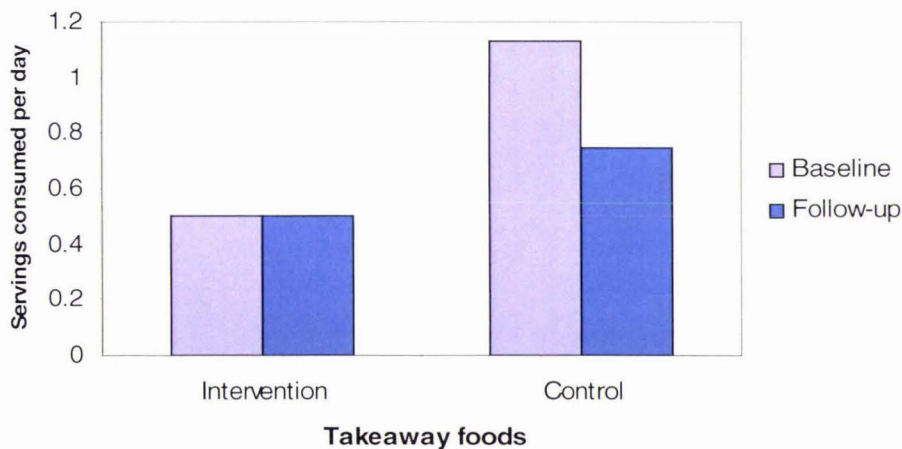


Takeaway food intake

Median intake of takeaway foods among the control group subjects showed a reduction between baseline and follow-up, however results were not significant ($p>0.05$). Median servings per day were higher in the control group with 1.13 serves/day (0.25, 2.50) at baseline and 0.75 serves/day (0.25, 2.0) at follow-up. The intervention group showed a median intake of 0.50 serves/day (0.25, 1.25) with no change at follow-up.

The most frequently consumed takeaway item was pizza followed by burgers, meat pies and sausage rolls (see figure 13).

Figure 13: Median servings per day of takeaway foods in the intervention and control group

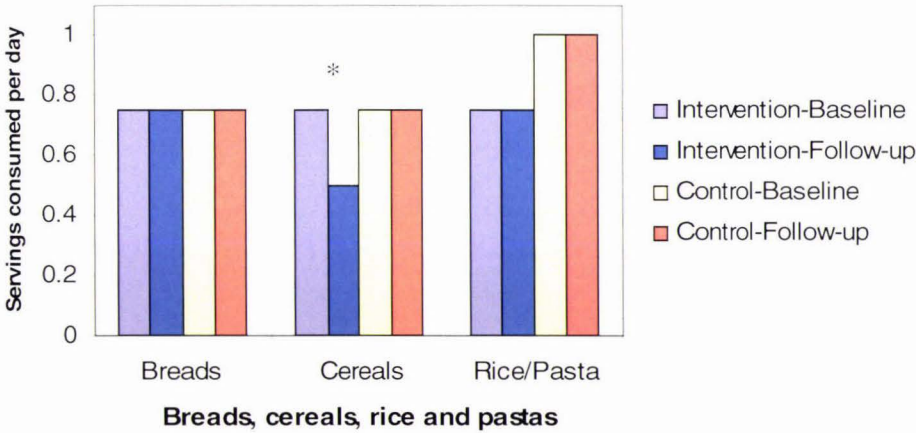


Breads, cereal, rice and pasta intake

Median intake of breads remained the same for all groups with 0.75 (0.25, 1.00) serves/day. A significant decrease (*p=0.035) in median cereal intake was seen in the intervention group where intakes decreased from 0.75 (0.25, 1.00) serves/day to 0.50 (0, 1.00) serves/day. The most frequently consumed breakfast cereal was weetbix followed by cornflakes, cocopops and rice bubbles. The same results were seen in the 2002 National Nutrition Survey. Porridge, multi-grain type cereals and muesli were eaten less frequently.

No differences in rice and pasta intake were seen between baseline and follow-up in either study groups. An overall higher intake was consumed in the control group for rice/pasta at baseline and follow-up with 1.00 (0.50, 2.00) serves/day compared with only 0.75 (0.25, 1.75) serves/day in the intervention group. However, results were not significant (p>0.05). Refer to figure 14.

Figure 14: Median daily consumption of breads, cereals, rice and pastas in the intervention and control group

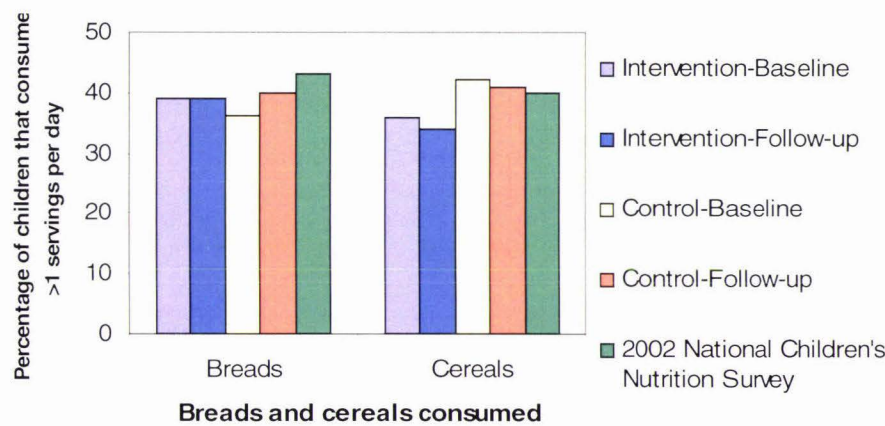


Bread and cereal intake were compared with the results from the CNS, looking at the proportion of children who consumed 1 or more servings of breads and cereals per day. CNS results showed the largest proportion of children to consume one or more servings of breads (43%) in comparison to the intervention (39%) and control groups (36-40%). A

small increase was seen in the control group from baseline (36%) to follow-up (40%), but results were not significant ($p \geq 0.05$).

Proportion of children consuming 1 or more servings/day of cereals differed in all groups with the largest percentage seen in the control group (42%). Results from the CNS were similar to this value (40%). However, the intervention group showed a lower proportion of children to consume 1 or more servings/day of cereal with values ranging from 34-36% (see figure 15).

Figure 15: Proportion of children who consume one or more servings of breads and cereals per day in comparison to the National Children’s Nutrition Survey results

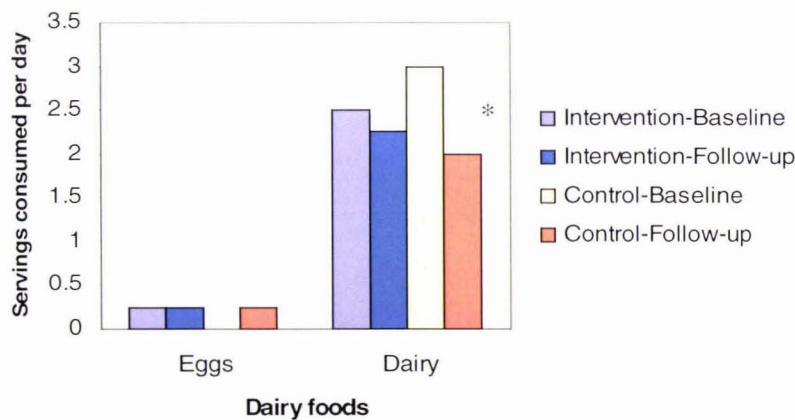


Dairy food & egg intake

Dairy food intake showed a slight decrease in median serves/day at follow-up for both groups, however only the control group showed a significant difference (* $p \leq 0.000$). Control group subjects had a median intake of 3.00 serves/day (2.25, 3.75) at baseline and 2.00 serves/day (0.75, 3.50) at follow-up. A larger portion of dairy food servings (2-3 serves/day) were consumed among these subjects compared to the intervention group (2.25-2.50).

A similar median intake of egg servings per day was seen between the intervention group with 0.25 serves/day (0, 0.75) at baseline and follow-up. The control group showed an increase from 0 serves/day (0, 0.25) at baseline to 0.25 (0, 0.75) serves/day at follow-up, however results were not significant ($p > 0.05$) (see figure 16).

Figure 16: Median servings per day of eggs and dairy foods in the intervention and control group



The most frequently consumed dairy foods in both groups were milk, ice-cream and yoghurt followed by eggs and cheese. Milk shakes, flavoured milk and cream were consumed less frequently. The main kind of milk consumed by children was standard milk (60%) followed by low fat (26%) and trim (8%). Soy and extra calcium (3%) were consumed the least. In comparison, the CNS showed similar results in milk types with

standard milk being consumed by 74% of children (aged 5-14 years) followed by low fat (13%) and trim (7%). Survey results also showed the most frequent dairy item (excluding milk) to be cheese followed by ice-cream and yoghurt/dairy food. Cream and custard were the less frequently consumed dairy foods

Sweet food intake

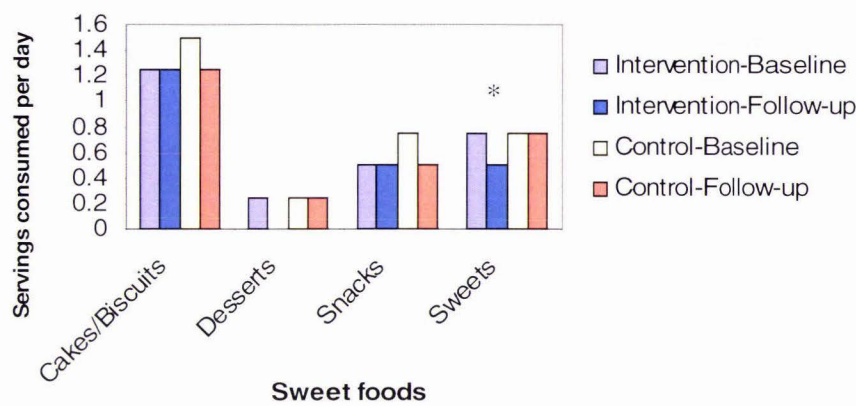
Cakes and biscuits were the highest consumed sweet foods among both groups followed by sweets, snacks and desserts. The control school showed an overall higher median intake of cakes and biscuits at baseline with 1.50 (0.50, 2.75) serves/day while all other groups remained constant at both baseline and follow-up. Only the control group showed a decrease in the number of servings in cakes/biscuits during the follow-up testing but no significant differences were seen ($p>0.05$). Plain biscuits and chocolate biscuits had the largest number of servings for both schools, with doughnuts and scones having the least. This was similar to the CNS results which showed chocolate biscuits and plain biscuits to be most frequently consumed followed by crackers, cakes/slice and doughnuts.

Dessert intake was similar for the control group from baseline to follow-up with a median intake of 0.25 (0, 1.00) serves/day. The intervention group showed a small change in the median serves/day with a decrease from 0.25 (0, 0.75) to 0 serves/day (0, 0.56) from baseline to follow-up. Puddings, fruit pies and pancakes were the main contributors to these intakes.

Sweets intake remained similar in the control group at baseline and follow-up with 0.75 (0.25, 1.75) serves/day. Only the intervention group experienced a significant decrease ($*p=0.016$) in the median intake of sweet foods with 0.75 (0.25, 1.50) serves/day reducing to 0.50 (0, 1.00) serves/day at follow-up. This was mostly seen by high consumptions of chocolate, candy coated other confectionary.

The opposite effect was seen in snack foods where only the control group experienced a decrease in median consumption at follow-up, however results were not significant ($p>0.05$). Median snack foods decreased from 0.75 (0.25, 1.00) serves/day to 0.50 (0.25, 1.00) serves/day where all other groups remained constant at 0.50 (0, 1.00) serves/day. The most frequently consumed snack food was potato chips followed by popcorn which was similar to CNS results. Refer to figure 17.

Figure 17: Median daily sweet food consumption among the intervention and control groups



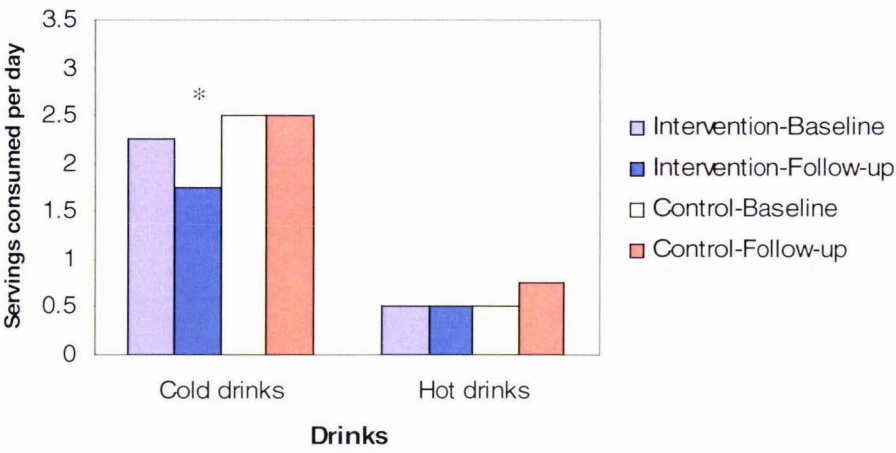
Hot and cold drink intake

The control group showed the highest median intake of cold drinks with 2.50 (1.25, 4.19) serves/day. The intervention group showed a significant difference ($*p \leq 0.000$) in the consumption of cold drinks with median intakes decreasing from 2.25 (1.00, 3.75) to 1.75 (0.75, 3.00) serves/day at follow-up. Refer to figure 18.

The most frequently consumed cold drinks among the intervention groups were juice, powdered fruit drinks and coke. In the control group juice, coke and soft drinks were consumed the most. Results were similar to the CNS where the most frequently consumed non-milk drinks were powdered fruit drink and fruit drinks followed by soft drinks and coca cola.

No differences were seen in the hot drink consumption for the intervention school where the median intake remained at 0.50 (0.25, 1.00) serves/day. The control group showed a small increase in the consumption of hot drinks at follow-up where consumption increased from 0.5 (0.25, 1.25) to 0.75 (0.25, 1.25) serves/day. However, none of these results were significant ($p > 0.05$). The most frequently consumed hot drink among children in all groups was milo, followed by tea and coffee. A higher proportion of children drank tea rather than coffee which was similar to the CNS results.

Figure 18: Median daily consumption of hot and cold drinks in the intervention and control group



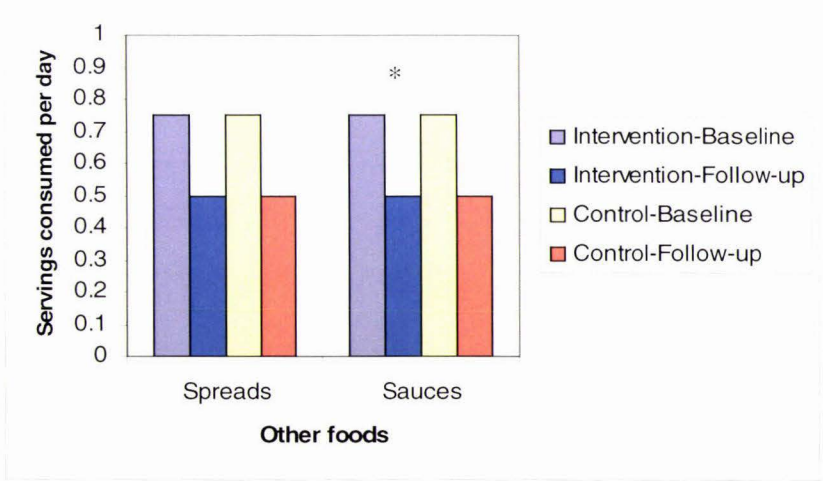
Other food intake

Other food groups included spreads, sauces and soups. Similar results were seen for spreads and sauces with consumption reducing from baseline to follow-up for each group. For spreads, both groups had a baseline median intake of 0.75 (0.25, 1.50) serves/day and a follow-up median intake of 0.5 (0.25, 1.50) serves/day but no significant results were found. The most frequently consumed spread for both groups was nutella followed by peanut butter, marmite/vegemite and jam/honey. This was different to the CNS results which showed jam and honey to be the most popular spreads consumed per week.

Median sauce intake also decreased from baseline to follow-up in both groups with 0.75 (0.25, 1.50) at baseline and 0.5 (0.25, 1.50) serves/day at follow-up. However, results were only significant (*p=0.020) in the intervention group. Children’s sauce intake among the study groups showed tomato sauce or ketchup to be most frequently consumed followed by mayonnaise and gravy in both groups. Results were similar to the CNS, except gravy intake was consumed more than mayonnaise among these subjects.

Median soup intake for each study group remained at zero at baseline and follow-up with no significant results seen (see figure 19).

Figure 19: Median daily consumption of other foods including soups, spreads and sauces among the intervention and control group



Summary of results

- 1) Anthropometric values including height, body weight and body mass index all increased between baseline and follow-up among both groups with the control group showing higher median values. In comparison to the 2002 National Children's Nutrition Survey results, the intervention group showed a larger proportion of children to have a healthy body mass index value of $<25\text{kg/m}^2$ with less children categorised as overweight or obese.
- 2) Children's body weight values ranged from 27-122kg and from 133-180cm in height values in both schools. In comparison to the United States growth charts, between 17-31% of girls and 10-25% of boys had weight and height values above the 95th percentile for both schools. The intervention school showed a larger number of children to be above the 95th percentile for both weight and height values than the control group.
- 3) The main differences in children's fruit and vegetable intakes showed significant decreases among both groups. In the intervention group, significant differences were seen in the median serves/day of fruit ($p\leq 0.000$) and starch vegetable intake ($p\leq 0.000$) from baseline and follow-up. The control group showed significant decreases in median serves/day of starch ($p\leq 0.000$) and other vegetable ($p=0.007$) intake between baseline and follow-up. No other significant results were seen.
- 4) Intake of red meat was consumed the most in both schools followed by chicken, meat dishes and fish. Median chicken intakes remained constant at 0.5 (0.25, 1.25) serves/day while meat, fish and meat dishes intake showed decreases from baseline to follow-up. Significant differences were seen in meat dish consumption ($p=0.035$) in the control group and fish intake ($p=0.019$) among the intervention group. Both groups showed a decrease in median servings/day between baseline and follow-up.

- 5) Dairy food consumption showed a decrease in median servings/day among the intervention and control groups between baseline and follow-up. However results were only significant in the control group ($p \leq 0.000$). No significant differences were seen in egg consumption from baseline to follow-up ($p > 0.05$).
- 6) Cold drink consumption showed a significant difference ($p \leq 0.000$) between baseline and follow-up among the intervention subjects with a decrease from 2.25 (1, 3.750) to 1.75 (1, 3.00) servings/day. Cold drink intake among the control group showed no significant changes between baseline and follow-up where servings/day remained at 2.5 (1.25, 4.19).

Median hot drink consumption remained constant in the intervention group at 0.50 (0, 1.00) serves/day but an increase was seen among the control group at follow-up. However, results were not significant ($p > 0.05$).

- 7) In the other food items median sauce intake showed a significant decrease ($p = 0.020$) from baseline to follow-up in the intervention group. No significant differences were seen in spreads or soups intake among either groups ($p > 0.05$).

CHAPTER SIX

DISCUSSION

The main aim of this investigation was to determine whether a 12-week nutrition and health education programme could influence the dietary patterns and body composition measures of 10-12 year old New Zealand children. This was assessed using a food frequency questionnaire (FFQ) that gathered information on daily food intake over a 4-week period. Body composition measurements included height, weight and body mass index (BMI) values and monitored children's growth and body fat levels.

The study showed some significant changes in dietary intakes among both subject groups. Changes among consumption patterns were seen in fruit, starch vegetables, fish, cereals, sauces, sweets and cold drink intake among intervention subjects. The control group only showed changes in starch vegetables, other vegetables, meat dishes and dairy foods consumption patterns. Significant results among intervention subjects could not solely be attributed to the education programme due to other factors influencing results as well as changes seen in the control group. However, the intervention group did show a larger number of dietary changes.

No significant differences in body composition measures were seen between baseline and follow-up in either group. Both groups showed increases in median height, weight and body mass index values, but this could only be explained by pubertal growth and development.

Subject characteristics

Subjects involved in the study were chosen from West Auckland, New Zealand. They were from a lower socioeconomic area. Both intermediate schools were not chosen at random, therefore results cannot be generalised to the New Zealand population. Children aged 10-12 years were chosen because previous studies (138), (41) have shown the need for dietary

improvement within this age group as well as the increased nutritional demands during puberty.

Ethnic groups

Most of the children within the study were classified as New Zealand European/Other (NZEO) decent, followed by Maori and Pacific Island. Other New Zealand studies (37), (97), (94), (88), (93) have shown Maori and Pacific Island children to have larger body weight and body mass index (BMI) measurements than other ethnic groups. A higher prevalence of overweight and obesity has been seen within these groups. Children from Maori and Pacific Island families have also been associated with a lower socioeconomic status (SES) which has led to a poorer quality in diet (88), (37).

Anthropometric Indicators

Changes in anthropometric values included increases in median height, weight and body mass index (BMI) values between baseline and follow-up among all subjects. These differences in body composition cannot be linked to the school intervention programme because differences were seen in both study groups. Puberty plays a large part in the changes of body composition in children where it initiates between the ages of 8-15 years. The body undergoes a series of changes with expected increases in both height and weight values (41). Previous literature on growth and development (42), (41) has shown changes in BMI and body fat percentage during childhood and adolescence that occur in accordance to normal physiological development.

In comparison to other New Zealand studies (93), (37) median BMI values and percentage of healthy weight children were larger among the current study groups. Children that were classified as having a healthy body type (20-25kg/m²) were greater among intervention subjects at both baseline and follow-up. A larger proportion of children from the control group were classified as overweight (25-30kg/m²) and obese (>30kg/m²) which was similar to other New Zealand studies conducted on young children (37), (93). The percentage of children classified as overweight and obese was 21% and 10% respectively.

Higher BMI values were seen among the current study groups in comparison to other New Zealand studies but this may be attributed to a number of other factors including, method of body composition, ethnicity, socioeconomic status and other lifestyle factors. Due to the scope of the study, other lifestyle factors including ethnicity and socioeconomic status could not be investigated.

Growth curves

In comparison to the United States growth charts, children from both study groups had higher median body weight and height values than the 50% percentile. Studies from around the world show that children have different types of body composition measures within each country as well as different forms of measurements used. Various methods can be used for measuring children's body weight where the level of accuracy differs for each method. Among New Zealand children, body mass index (BMI) has predominantly been used whereby measuring height and weight values (88), (93), (139), (128). However, because BMI does not take into account a child's pubertal stage and development, the level of accuracy is therefore lowered. Other methods of body composition measurement include dual energy X-ray absorptiometry (DEXA), bioelectrical impedance (BIA), anthropometry and fat free mass equations where these vary between countries. The use of different body composition methods may have been one of the reasons for the variance in values between studies. A standard anthropometric method should be specifically used within each country so comparisons can be made more easily. Growth charts should be designed for New Zealand children due to the large variety of differences seen between the current results and USA charts. Previous studies (43), (140), (141) have shown differences in children's body composition values between developing and developed countries. Variances are seen in children's pubertal status between the lower and middle class countries.

Dietary changes

Fruit and vegetables

High levels of fruit and vegetable consumption are known to be beneficial to health as well as provide protection against a variety of disease's such as cancer, stroke and cardiovascular disease (4), (3), (142), (143). Many studies (49), (144), (145) have shown that children are not consuming enough fruit and vegetables within their diet and these have been replaced these with the more high fat and palatable foods.

The Dietary Guidelines for America (5) and New Zealand children (65) recommends that children consume at least 2 servings of fruit per day in order to receive the essential vitamins and minerals provided for good health. Both study groups showed an intake over the recommended 2 servings per day at baseline, however only the control groups fruit intake remained above 2 serves/day at follow-up. A significant decrease ($p \leq 0.000$) in median fruit consumption was seen in the intervention group between baseline and follow-up. The reduction in fruit consumption may have been due to the seasonal availability of many fruits which was highlighted by the variety of fruits consumed at baseline, e.g. feijoas, watermelons. This may have accounted for the slight decrease in the control group however, results were not significant. A possible explanation for this decrease may have been due to differences in price range of certain fruits between seasons, where feijoas and watermelons are often cheaper or free during the summer months. This dietary change was different to what was expected where subject's fruit intake should have increased with the use of an intervention programme. Other studies aimed at improving dietary intakes (112), (27) have shown intervention programmes to increase fruit intake between baseline and follow-up. Studies (23), (109) that focussed solely on improving fruit and vegetable intake showed improvements of fruit intake between 0.2-0.6 servings per day.

In comparison to the CNS results (37), a greater proportion of children consumed ≥ 2 servings of fruit per day in the intervention and control group. These results may be due to differences in age, socioeconomic status and ethnicity within each study group. Nutrient intake has been associated with income status where poverty has been linked to lower fruit

and vegetable consumption and lower quality diets (39), (146). Children from different ethnic groups within New Zealand have shown variances in fruit consumption patterns, with Pacific Island children consuming the largest portion of fruits followed by Maori and New Zealand European/Other (NZEO) children (37). This was similar among US children (aged 8-20 years) who showed Non-Hispanic Whites and European/American's to have significantly lower intakes of fruit compared to Hispanic Whites, African-American and Asian children (146), (52).

The most frequently consumed fruits by children within the current study were apples and pears followed by citrus fruits including mandarins and oranges. Similar results were found in the CNS results, where 83% of children consumed apples or pears more than 1/week. The high availability of these fruits throughout the year and lower costs may have contributed to these results where other fruits often vary between seasons and are found at a higher price.

Starch vegetable consumption showed a significant decrease among the intervention ($p \leq 0.000$) and control group ($p \leq 0.000$) subjects between baseline and follow-up. The Dietary Guidelines for America (5) and New Zealand children (65) recommends that at least 3 servings of vegetables are consumed per day with at least 1 serving from starch vegetables (5). Although consumption of starch vegetables decreased from baseline to follow-up in both groups, median intakes still remained above the recommended 1/serving per day. Decreases in consumption patterns may have been due to the high frequencies of hot chips, wedges and kumara chips consumed by all children at baseline. The CNS showed that fried potato consumption (65%) was the second highest types of starch vegetables consumed each week. Because both groups showed a significant decrease between testing periods, the intervention programme cannot be solely attributed to these results. Higher consumption patterns of starch vegetables compared to the CNS may have been due to the differences in ethnicities between children as well as larger intake of other vegetables which is seen in the CNS.

Median intake of other vegetables showed a significant decrease ($p=0.007$) among control group subjects at follow-up. This was in conjunction with starch vegetables where an overall decrease was seen among all vegetables. Both groups at baseline showed a median intake of other vegetables to be over the recommended daily intake (RDI) of ≥ 2 servings/day, however only the intervention group remained above the RDI at follow-up (5). Reasons for this result may have been due to the intervention programme encouraging ≥ 2 servings/day of vegetables in the diet, however conclusions cannot be definite.

In comparison to the CNS, the intervention group showed a lower proportion of children to consume at least 2 servings of other vegetables per day. This may due to the differences in nationalities between study groups where Pacific children have been found to consume a larger proportion of vegetables than Maori and NZEO children (37). However when ethnic groups were compared, a higher proportion of NZEO children was seen in the control group than percentage of Maori and Pacific children. Therefore results may not have been reflected by ethnic differences among groups.

Lower consumption of vegetable intake is associated with a higher consumption of total energy and sugar intake (32). Reductions in vegetable intake within the current study may have been due to this dietary change. High intakes of sugar-sweetened beverages, sweets and sweetened grains in children have been associated with a large reduction (0.5-1 serves/day) in servings of fruit and vegetables (7). This was also highlighted by Cullen et al (147) who found that children who consume high intakes of soft drink and sweetened beverages reduce fruit and vegetable consumption by approximately 33% and 42% in children aged 9-11 years. Interventions that specifically aim to modify children's fruit and vegetable consumption have looked at a range of ways at increasing daily intakes. The '5 + a day' programme in the USA introduced a series of interventions in order to encourage larger intakes of fruits and vegetables in both adults and children (148), (5). One of the main predictors of children's vegetables intake is taste preference where interventions have focussed on modifying children's food preference by the use of rewards and peer modelling programmes. Studies (109), (2) have shown positive effects on fruit and vegetable consumption with the combined use of video-based peer modelling and rewards strategies.

These types of intervention strategies may be beneficial to New Zealand schools for increasing fruit and vegetable consumption.

Meat dishes, red meats, chicken and fish

No significant changes were seen among either group in the consumption of red meats and chicken. Intervention subjects showed a significant decrease ($p=0.019$) in fish consumption and in meat dish consumption ($p=0.035$) for control subjects at follow-up. The reduction in fish consumption may have been due to a decrease in fried fish from takeaway foods which is in line with the reduced takeaway intake for intervention subjects. A large proportion of children reported having their fish fried which is often purchased from a fast food outlet instead of a healthier method such as grilling. Other possible reasons for this decrease may be due to increased price and seasonal availability during the later part of the study.

Daily consumption patterns of fish and chicken were similar between study groups at with the only variations seen between red meats and meat dishes. Results from the CNS showed that a higher proportion of Pacific children ate foods from the meat, fish and poultry group compared to Maori and NZEO children (37). Therefore differences in consumption patterns may have been due to variation of nationalities between study groups.

A larger proportion of children in the control group age ≥ 2 servings per day compared with the intervention and CNS results. The Dietary Guidelines for New Zealand Children (aged 2-12 years) (65) state that children should be consuming at least one serving of lean meats, chicken, seafood, eggs, beans and lentils per day in order to meet the recommended intake for protein, iron and zinc. Young children especially require higher levels of iron in order to meet the high demands during the growth phase. This is especially important for adolescent girls who require higher levels for menstruation (65). When median intake of meats, poultry and fish are combined, both groups show an adequate intake over the recommend ≥ 1 serves/day with over 35% of children consuming ≥ 2 serves/day. However, this does not include the consumption of eggs, peas, beans and lentils like the Dietary Guidelines do.

Meats, poultry and fish contain high levels of many essential micronutrients including iron, zinc, potassium and magnesium. Studies (40), (7) have shown that higher levels of dietary fat, sugar and sodium have resulted in lower levels of important micronutrients with a larger amount of children having inadequate levels of iron. Frary et al (7) showed that children's dietary iron levels consistently decreased as the consumption of sugar-sweetened beverages, sugars and sweetened cereals increased. Socioeconomic status has also been associated with lower levels of micronutrients which has been evident in the dietary differences among most studies. Poorer quality diets are usually seen in families who are receiving the benefit compared with those who are not (40), (88), (37).

Takeaway foods

No significant differences were seen among consumption of takeaway foods within each study group. This was different to what was expected as the school intervention module was partly aimed at improving consumption patterns of unhealthy foods between baseline and follow-up. Other worldwide studies (21), (24), (22), (25), (27) have shown a significant reduction in dietary fat and cholesterol levels with the use of school intervention programmes. By educating children on appropriate dietary patterns and healthful food choices, this can help reduce the consumption of high fat foods such as these.

Consumption of takeaway foods is one of the real concerns within children's diets around the world. The United States of America has one of the highest rates of takeaway consumption in children with over 75% eating at a fast-food restaurant during the week. While there is currently no definite recommendation for takeaway consumption for children, percentage of dietary fat is therefore compared. The World Health Organisation (WHO) (38) and American Dietary Guidelines (5) recommends a dietary fat intake of <30% of total energy for the population over 5 years of age. This recommendation is set in order to make sure that children are receiving adequate nutrients and energy to support growth and development while making sure that one doesn't consume too much (149). However, in more recent years, children's dietary fat intakes have been well above 30%. The Dietary Guidelines for New Zealand Children (65) recommend that children limit fried

foods such as hot chips, fried fish or chicken to very occasional treats and choose lower fat foods when eating at fast food restaurants.

From looking at the current recommendations of dietary fat in comparison to takeaway intake, daily consumption levels are considered to be higher than the recommended allowance, where only a moderate intake should be consumed. The most frequently consumed takeaway foods within both study groups was pizza, burgers and meat pies. High intakes of meat pies was consumed in the CNS where similar weekly consumption patterns were seen between meat pies (36%), fish (37%) and roast lamb or beef (36%). Pies are one of the top selling food items in New Zealand schools with over 55,000 (70%) sold each week (98). In addition other top selling food items include juice (57%) and sausage rolls (54.5%) with fruit being the least frequent food item offered for sale. The New Zealand Heart Foundation is currently launching a national nutrition programme for children called the School Food Programme which aims at promoting healthy food choices within schools (113). However, this has only been set-up in a number of New Zealand schools and involvement is optional. The programme should aim to target a broader range of school children whereby making the inclusion compulsory. School food policy's and health organisations should also look at reducing the amount of fast-food availability in schools by replacing these items with higher nutrient and healthier alternatives foods.

Breads, cereals, rice and pasta

No significant changes were seen in daily bread consumption among all children. When compared with the CNS results, both study groups had a lower proportion of children to consume one or more servings of breads. Daily cereal intake showed a significant decrease ($p=0.035$) among intervention subjects and showed a lower proportion of children to consume one or more servings than the CNS and control subjects. The Dietary Guidelines for New Zealand Children (65) states that school children should be consuming at least five servings of breads and cereals per day. When breads and cereal intake (including rice and pasta) were combined in the current study, children's intake only reached 2.25-2.75 serves/day. This was considerably lower than the recommended intake, especially among

intervention subjects who showed a significant decrease in cereal consumption at follow-up.

Worldwide studies (16), (40), (49) have also shown the low consumption patterns of breads and cereal products within children where these have been replaced with higher intakes of dietary fat and sugary products. In relation to the Dietary guidelines for American and World Health Organisation, intakes are also below the recommended daily intake (5), (38).

Breads and cereals contain high levels of dietary fibre as well as many other essential micronutrients (65). Previous studies (7), (40), (16) have shown an association between the intake of fibre and consumption patterns of sugar-sweetened beverages, sugars, sweets and sweetened grains. Children who consume high intakes of sugary foods, show low intakes of dietary fibre, while the opposite is seen when there is a decrease in sugary food (7). Findings from the current study showed different results to what was expected where cereal consumption decreased at follow-up while cold drink consumption decreased as well. However, bread consumption remained the same. This finding may have been associated with the overall decrease in sugar-sweetened cereal consumption where research (7) has shown the intake of sweetened grains and cereals to be associated with high soft drink and sugar intake. A large proportion of children's cereals contain high levels of sugar as well as the addition of added sugar, honey or syrups. The breakfast cereals most frequently consumed was weetbix, followed by cornflakes, cocopops and rice bubbles which was in line with the CNS results. These results help confirm the association between sugar-sweetened cereals and other sugary foods and beverages, therefore showing an effective change at follow-up for intervention subjects.

Dairy foods and eggs

Dairy food consumption showed a significant decrease ($p \leq 0.000$) from baseline to follow-up among control group subjects. These changes may have been associated with higher intakes of sweet foods and sugar-sweetened beverages where studies (32), (40) have shown low consumption of dairy foods and calcium levels to be linked with high intakes of dietary fat, sugar and soft drinks. It has been suggested that soft drinks may be replacing the

consumption of fruit juice and milk in the diet with links to a lower intake of calcium, riboflavin and vitamin A and phosphorus (milk nutrients) (150), (151), (32). Among US adolescent girls, the increase in soft drink consumption has shown a reduction in daily milk intake from 72% to 57%. This is of particular concern for girls where low levels of calcium can cause unwanted effects on bone health (46), (151).

Consumption among both study groups remained above the recommended 2-3 servings per day in accordance to the Dietary Guidelines for New Zealand (65) and America (5). In order to meet requirements for growth males and female children (aged 8-11 years) should be consuming 800mg and 900mg of calcium per day (65). Children over the age of 2 years are recommended to gradually introduce the use of reduced and low fat milk and dairy products into the diet. This is to ensure that a child's full growth potentials are reached before taking away the essential dietary fats needed for development. The main type of milk consumed within the study was standard milk followed by low fat and trim which was similar to the CNS results. Due to the demands of growth for children at this age group, the use of lower fat milks with extra calcium is usually recommended.

No significant differences were seen in daily egg consumption in the intervention group. The recommended daily intake by the Dietary guidelines for America stated that 2-3 servings per day should be consumed from the meat, poultry, fish, beans, eggs and nuts group (5). This is slightly higher than the New Zealand Dietary Guidelines who recommend that children consume at least one serving per day (65). Results from the meats, poultry and fish group together with eggs consumption show adequate intakes of this group. Eggs consumption was recommended in moderation because of the higher cholesterol content found in the yolk (5). Method of cooking the eggs was not investigated so total amount of dietary fat and cholesterol cannot be determined.

Sweet foods

The intervention program used in the current study did not show any significant changes to the consumption patterns of cakes/biscuits, desserts or snack foods. This was of surprise, due to impact of intervention programs on dietary fat and sugary foods from the previous

studies (24), (22), (25), (152), (153). Intervention group subjects however did show a significant difference ($p=0.016$) among sweets consumption patterns with an expected decrease between baseline and follow-up. This finding is consistent with intervention studies where a decrease in sweets/confectionary intake is often associated with a decrease in other sweet foods/beverages such as soft drink consumption (24), (22), (25), (152), (153).

There are currently no dietary guidelines for New Zealand children for sweet food consumption. The Dietary Guidelines (65) recommend that treat and snack foods be eaten in moderation during special times or parties. Similar recommendations have been made in the Australian (154) and American (5) Dietary Guidelines for adults and children. When looking at sweet consumption patterns of children in the current study groups and acknowledging the dietary recommendations for fat and sugar children's consumption patterns are considered high. In comparison to the CNS results biscuits, potato crisps, chocolate and confectionary were consumed most frequently each week with larger intakes seen among Pacific Island children. Consumption of sweet foods per day could not be compared but the high percentage sweet foods per week were similar to the current study. This is in line with other studies (155), (46), (147), (7), (16), (40), (32), (35) who found young children to be consuming large intakes of sweet foods compared to the moderate recommendation. Research has shown that this is mainly attributed to the high level of schools containing tuckshops, vending machines and a la carte programs. Snack foods including non-chip snacks and savoury chips are the main types of sweet foods consumed within overseas studies followed by biscuits, chocolate confectionary and cakes. This is different to results found within the CNS and the current investigation where cakes and biscuits were the main sweet foods consumed followed by sweets, snacks and dessert foods. The use of school lunch intervention programs have found to be successful at reducing the total fat, saturated fat and sodium content in children's school lunches where by introducing eat smart guidelines, meal planning, food recipe modifications and meals to fit a low fat criteria (24), (22).

Hot and cold drinks

Previous studies (46), (7) have shown that beverage consumption contributes to 20-24% of children's daily energy intake with 8% coming from soft drinks. The high intake of sugar sweetened beverages among children has been known to impact the consumption of other key nutrients such as fruit, vegetable and dairy food consumption. As children grow up the frequency and prevalence of milk and fruit juice intake decreases whereas soft drink intakes more than triple (156). Mealtimes now consist of greater amounts of soft drinks, fruit drinks and fruit juice rather than milk (7).

In the current study, it is difficult to estimate whether the subject's consumption patterns were higher than other children, as most studies look at the total contribution of cold drinks within the diet. A significant decrease ($p \leq 0.000$) was seen among intervention subject's intake between baseline and follow-up. This mostly consisted of high intakes of juice, powdered fruit drinks and soft drinks. The nutrition and health education programme may be attributed for these reductions in cold drink consumption but no definite conclusions can be made. It has been proposed that the inclusion of a school based educational programme can help reduce the consumption of carbonated drinks as well as prevent excessive weight gain in young children (157). James et al (157) investigated the use of a one-year nutrition education programme on children aged 7-11 years in the United Kingdom. Subjects in the intervention group experienced a decrease in carbonated soft drink consumption by 0.6 glasses while the control group consumption increased by 0.2 glasses. Percentage of children classified as overweight and obese also decreased in the intervention group by 0.2% with an increase seen among control group subjects of 7.5%. Other studies (8) have also found an association between high amounts of soft drink consumption and an increase in child's BMI values with a 60% increase in the risk of obesity. In comparison to this study, no significant changes were seen among body composition measures in either group which suggests that the intervention module may not have affected body weight values or the time frame between baseline and follow-up was not long enough.

High amounts of carbonated beverages have also been associated with higher levels of fast foods including fried potatoes, hamburgers and pizza which have led to lower intakes of

fruit and vegetables (49). Frary et al (7) found that children who consume high amounts of sugar-sweetened beverages experienced a decrease in the number of fruit servings per day by more than half a serving as well as a decrease in dairy food consumption by a full serving (7). These results may be linked to the reduced intakes of fruit, vegetables and dairy foods within the current study where significant decreases were seen between baseline and follow-up. Other studies (158), (159), (151) have also found excessive sweetened drink consumption to be associated with lower intakes of milk, higher daily energy intakes and greater weight gain in children.

No significant changes were seen among hot drink consumption in either group. Milo was the most frequently consumed hot drink which is line with results from the CNS. Food drinks (e.g. Milo, Nesquik) consumption among children in the CNS results showed that 59% of New Zealand children consumed a food drink at least once a week (37). This popularity in both studies may be due to the large amount of advertising for this product seen within New Zealand as well as recommendations by many nutritionists and Food Guidelines in order to increase calcium intakes among young children.

Tea was the second most frequent consumed hot drink where a large portion of ethnic families feed their children tea as part of their culture, for example in Pacific cultures. Therefore this may reflect the frequency and higher consumption of tea within young children.

Other foods

No significant differences were seen among children's consumption patterns of spreads and soups. Intervention subjects experienced a significant decrease ($p=0.020$) in sauce intake from baseline to follow-up with the main contributors being tomato sauce and ketchup followed by mayonnaise and gravy. There are currently no dietary guidelines for sauces, soups or spreads for children or adults. However, due to many sauces and spreads containing extra amounts of sugar and salt (sodium) moderate consumption is therefore recommended. Possible decreases in sauce intake among intervention subjects may be partly due to the decrease in sugar consumption in line with the reduction in sweets and

cold drink consumption. Again the intervention programme may be attributed to these results but influences from other factors cannot be ruled out.

Limitations

The current investigation showed a number of limitations that may have affected the overall results of the study. These include both methodological and experimental procedures.

One of the major limitations of the study was the type of dietary assessment method used. The food frequency questionnaire (FFQ) was chosen for this study due to a number of advantages in collecting dietary information from a large group of children. The main benefits of the method are; the low cost of assessment, short time period to administer and ease of administration within larger subject numbers (118). However, food frequency questionnaires (FFQ) have shown a number of limitations when used among young children (117). These include overestimation of energy intake (117), (160), underestimation of energy intake (116) and difficulties in recalling and remembering total daily food intake (117). Overestimation of energy and nutrient intake may have been attributed to the use of adult portion sizes in children's questionnaires where this tends to drive nutrient estimations upward (117), (161), (162), (163). Another limitation associated with the dietary assessment methods was that the food frequency questionnaire (FFQ) was the only method used for collecting dietary information, where other studies have shown the use of two or more methods increases accuracy and validity (164), (115). This method of dietary assessment also led to problems in the reporting of dietary intake among the children. Results from the food frequency questionnaire showed that a large amount of children misunderstood what was required and confusion was seen in portion sizes, food items and brand names. This often led to food items being missed or being included more than once throughout the questionnaire. Children from different ethnic groups also had problems filling out the questions due to the limited number of food items from their nationality. This may have led to a misrepresentation of the child's true daily intake.

Recruitment of subjects within the study was a limitation because children were only drawn from a lower socioeconomic area. Schools were chosen because of close proximity to each

other, larger student numbers and of similar decile ratings. With the recruitment of subjects from a larger socioeconomic representation this would have given a distribution of results from New Zealand children, rather than just the lower socioeconomic areas. Results will therefore only represent the lower socioeconomic areas and schools instead of the full representation of New Zealand school children.

The education intervention programme used was developed by Nestle Foods Ltd in Australia and modified for New Zealand children. The programme has previously been used on Australian school children for the past 5 years but has not been evaluated. It has not yet been used among schools within New Zealand. Of importance was the length of the intervention programme, where schools only received the education modules for 3-months. Previous studies (21), (24), (22), (108), (25), (27) have shown that the use of intervention programmes for over a year can produce a larger number of dietary improvements and behavioural changes. Lack of validation of the education programme modules within New Zealand schools including total length of the programme was therefore a limitation in the study.

Very few studies have also shown significant changes in body composition from an intervention programme where problems have been attributed to the length of the intervention. The relatively short-time period of the intervention allows little time for any changes to occur (112). Therefore this may have been one of the reasons for no changes seen in body composition measures within the current study. However, the short-term dietary changes seen within the study encourages and indicates great potential for initiating a longer and more beneficial intervention study.

A further limitation in the intervention programme was the compliance of the teachers in the health education modules where they often differed in the delivery technique and pace of the modules taught. It was not feasible for a trained educator to come into the school and teach the education modules therefore the programme was designed to fit into the school curriculum and be taught by the class teacher. Bringing an unknown individual into

the school may have also caused problems within compliance and uncertainty in the children where they may have felt uncomfortable asking questions to a stranger.

The final limitation within the study was the use of body mass index (BMI) values in determining children's body fat levels. Limitations have been seen (127), (128) in the use of BMI values in children due to factors such as age, ethnicity and pubertal status affecting results. Although the low cost of equipment, short measurement period and ease of administration on larger populations made it the best technique to use, results still did not show an accurate measure of body fat. Problems with this method also show differences within developing and the less developed countries where more mature children have higher BMI values than their peers. With the use of BMI measurements, this can lead to the more mature children being wrongly classified as overweight and obese for their age group. Other more accurate and reliable measures of body fat percentages include methods such as dual energy X-ray absorptiometry (DEXA), bioelectrical impedance (BIA) and skinfold-thickness measures (anthropometry). The study did however show the changes of growth and development that occurred during puberty where height and weight were both valid measures of this.

CHAPTER SEVEN

SUMMARY AND CONCLUSIONS

Children's dietary patterns are formed at a very young age and are influenced by a number of factors including the school environment. Schools are where children spend a large proportion of their time and are seen as ideal settings for influencing health and behaviour patterns (98). The use of school education intervention programmes has been well documented (21), (108), (24), (22), (25), (27) and shown a large number of benefits in the dietary and physical activity patterns of young children around the world. There are currently a lack New Zealand nutrition education intervention programmes that have been evaluated for children aged 8-15 years. The inclusion of these programmes into New Zealand schools is greatly warranted and should be specifically target areas of greater need.

Findings

The current investigation has shown that the use of a school education intervention programme may help improvement the dietary habits of 10-12 year old children in New Zealand. Dietary changes were seen among children from both intervention and control groups with decreases in median intake from baseline to follow-up. Positive changes were mainly documented among intervention subjects who showed significant differences in fruit, starch vegetables, fish, cereals, sauces, sweets and cold drinks. Control subjects only showed positive changes in starch vegetables, other vegetables, meat dishes and dairy foods. Although results were encouraging and more evident in the intervention group, they could not be solely attributed to the school education intervention programme.

No significant changes were seen among children's body composition values except for the expected changes that occur during puberty including increases in height and weight values.

Future directions

As with most investigations there are a number of methodological issues within the study that can most likely be improved and ultimately lead to an increase in the accuracy of results. It is encouraging to see some significant changes among dietary intakes however a number of improvements can be made for future investigations.

- Measurement of dietary intake was conducted using a food frequency questionnaire where a large number of issues arose with the accuracy of results within young children. Although another method should be incorporated to improve overall results, efficiency, low cost and ease of administration within large populations still shows this to be an ideal method for children. Future improvements made to the questionnaire should look at ways of increasing the precision of dietary assessment by offering secondary questions about details of foods usually consumed e.g. special characteristics of foods and the incorporation of new food items such as low-fat and healthy alternative foods. A more accurate method of assessment would have been the use of a food frequency questionnaire in conjunction with a 3-day food diary or 24-hour recall. Validation of the FFQ can then be evaluated by the other dietary method used giving a more accurate and reliable result. This has been demonstrated previously and shown dietary correlation coefficients to be 0.54 which is similar to adult studies and is considered reliable (160). Correlations coefficients for the validity of nutrient intake appear to be between 0.5-0.7, while this may seem low they are similar to other epidemiologic measurements in population studies (165). Future research should look towards validating the use of the questionnaire for a larger variety of ethnic groups worldwide and in New Zealand including different education levels and socioeconomic status (166).
- The school education modules were delivered to the children by their class teachers during health and physical activity class time. Future recommendations should therefore look at proper education and training sessions for the school teachers therefore enhancing the effectiveness of the education intervention programme.

- School education modules looked specifically at physical activity, overall health and nutrition and aimed to improve the children's knowledge with the inclusion of class activities and participation exercises. However, more emphasis should be placed on specific dietary and exercise behaviours with areas such as increasing fruit and vegetable intake, limiting high fat foods and exercising at least 30 minutes a day. Education on physical activity was included into the school modules but only covered a small portion of what was needed with limited time spent on practical sessions. An intervention study based in the USA (21) found that the inclusion of a fitness programme should teach children the benefits and guidelines of exercise, components of fitness programmes, learning the relationship between exercise and heart disease, prevention of fitness-related injuries and basic anatomy and physiology. By including a larger amount of exercise knowledge and practical sessions into the programme, specific health benefits can be seen as well as an effective behavioural change. Future studies should also monitor the health benefits of the exercise programme with exercise performance tests, anthropometric measurements and blood pressure changes.
- Other mediums such as tuckshops and vending machines, parental influences and family environments should be incorporated into achieving a more beneficial result. Tuckshops and vending machines are situated in a large proportion of New Zealand primary/intermediate schools with only 17% have a food policy for promoting healthier foods and nutrition education (98). With the large amounts of high fat foods sold within school tuckshops and vending machines, this has a large influence on children's dietary intakes during the day. Results from a New Zealand study (167) have shown the positive impact of the National Heart Foundation School Food Programme on foods sales and children's eating patterns. By including school food sales into the intervention programme, schools can introduce a healthier range of foods and beverages into the tuckshop with the help of the National Heart Foundations Food Programme. Ideally other influences such as parents and family members should also be involved into future studies due to the large impact and control they have on children's eating patterns. Perez-Rodrigo and Aranceta (1)

looked at school-based nutrition education programmes for children and summarised the main characteristics that should be included to produce an effective behavioural change. These included:

- Behavioural focus
 - Theory-driven strategies
 - Adequate time and intensity
 - Family involvement
 - Multicomponent strategies
 - Developmentally appropriate
 - Considers needs of students, teachers and school
 - Self-assessment elements (older children)
 - Self-efficacy. Strengthen skills, influence attitudes, behavioural capability
 - Adequate teaching methods
 - Modify school environment: access to healthy food; school food policies; school meals
 - Teacher training opportunities
 - Cultural relevance
 - Evaluation
-
- The length of the intervention programme was taught within a period of 3-months and included a total of 9 class modules with one hour per week. Other intervention studies (21), (24), (22), (108), (25), (27) have shown a larger number of results and a higher level of accuracy and reliability with the inclusion of a longer education programme. Future studies should include an education programme of sufficient duration to enable changes in both anthropometry and dietary patterns. Programmes should monitor these changes after the completion of the intervention programme with a follow-up session. This can reveal whether or not the programme made a behavioural change on the children or if it was just short term.
 - Body composition measurements were collected using body mass index (BMI) values. Future recommendations within the body composition measurements

would be to include the use of a more accurate method including DEXA, BIA or skinfold measurements. Other studies (96), (88) have found bioelectrical impedance (BIA) to be a more accurate measure of body composition in children because it differentiates between fat and lean tissue whereas BMI does not. This is a non-invasive technique used for measuring body composition within larger population-based studies. Dual energy X-ray absorptiometry (DEXA) is a validated measure of percentage body fat in children (168) and has been shown to accurately measure a child's body mass than that of BMI (45). The method involves a high-tech scanner system which determines total fat mass, bone-free lean tissue mass, bone mineral content and bone mineral density (128). By combining the body composition methods BIA with DEXA, this would provide a more accurate and reliable method in determining children's body mass values. However, more research is needed in obtaining body fat measures from children of different ethnic backgrounds.

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APPENDICES

APPENDIX A

Consent forms

Participant information sheets



Sovereign Sports Supercentre
17 Antares Place
North Shore City 1331
Private Bag 302145
North Harbour 1330
New Zealand
Telephone +64 477 2060
Facsimile + 64 477 2061
www.Institutesporthealth.org.nz

Dear Parents,

This year Te Atatu Intermediate have agreed to be part of a health and well-being study conducted by the Millennium Institute of sport and health (MISH) and helped run by Massey University.

The study focuses on nutrition, fitness, lifestyle and self esteem and determines whether the teaching of these topics and will be included into a number of intermediate schools curriculum next year.

Initial school testing will be conducted this year during physical education lessons by staff from Millennium Institute of Sport (MISH) and Massey University. This will include completion of a series health and nutrition surveys and measurements of height and weight values. The results of this survey will be utilised by the Millennium Institute and for a students Masters project at Massey University as well as for normal school records. Results used by the Institute and University will remain confidential and will not include children's names.

The school health education programme will run for 3 months before re-testing occurs.

The children's participation is part of the schools normal health and physical education module. However, if you do not wish the results from your child to be used as part of the health projects, please sign and return the slip below.

Regards,

Chelsea Downey
Manager – Health Promotion
School and Community Programmes
Millennium Institute of Sport and Health (MISH)

Chrissy Denton
Human nutrition
Masters student
Massey University

I do not wish for my child's physical education and health programme results to be part of the healthy lifestyles projects.

Childs name..... Class.....

Parents name.....

Signature.....



Sovereign Sports Supercentre
17 Antares Place
North Shore City 1331
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North Harbour 1330
New Zealand
Telephone +64 477 2060
Facsimile + 64 477 2061
www.Institutesporthhealth.org.nz

Dear Parents,

This year Bruce McClaren Intermediate have agreed to be part of a health and well-being study conducted by the Millennium Institute of sport and health (MISH) and helped run by Massey University.

The study focuses on a wide range of health topics and lifestyle choices where Classes will receive a 12-week health and education programme involving 9 modules on nutrition, fitness, lifestyle and self-esteem. The results of the study will determine whether the teaching of this health programme can help improve children's health and lifestyle choices.

Initial school testing will be conducted this year during physical education lessons by staff from Millennium Institute of Sport (MISH) and Massey University. This will include completion of a series health and nutrition surveys and measurements of height and weight values. The results of this survey will be utilised by the Millennium Institute and for a students Masters project at Massey University as well as for normal school records. Results used by the Institute and University will remain confidential and will not include children's names.

The school health education programme will run for 3 months before re-testing occurs.

The children's participation is part of the schools normal health and physical education module. However, if you do not wish the results from your child to be used as part of the health projects, please sign and return the slip below.

Regards,

Chelsea Downey
Manager – Health Promotion
School and Community Programmes
Millennium Institute of Sport and Health (MISH)

Chrissy Denton
Human nutrition
Masters student
Massey University

I do not wish for my child's physical education and health programme results to be part of the healthy lifestyles projects.

Childs name..... Class.....

Parents name.....

Signature.....

29th January, 2003

PARENT/LEGAL GUARDIAN'S INFORMATION SHEET
FOR THE HEALTH AND WELL-BEING STUDY,
TE ATATU INTERMEDIATE.

Hello and thank-you for taking the time to read this information. This year, your child's intermediate school has agreed to take part in a health and well-being study. The aims of this study are to determine the health status of intermediate pupils. It is hoped that all parents and children in the school will consent to taking part. The study is funded by and used as a health project for the Millennium Institute of Sport (MISH) as well as for a Masters project in Nutrition conducted by Chrissy Denton from Massey University.

All children who consent to participate, and have the consent of their parents, will be involved in some initial measuring of height and weight (conducted in a private room), and will fill in some questionnaires about their knowledge of food, what they eat, what exercise they do, and what their lifestyle is like. The information gathered will be confidential, and will not include your child's name, apart from an individual confidential report given to them at the end of the study. Your child does not have to participate. This is not an exam, and is designed to help your child to feel as healthy and happy as possible. The measurements and questionnaires will be repeated at the end of the three months in order to monitor the progress of the whole school.

The study is conducted by trained individuals and there are no foreseeable risks to your child. There will be no cost to you or your child in taking part. The study will run for three months initially, and if successful, will run for the rest of the year. If the trial shows that there are positive results, your child's school will be offered more intensive health and well-being programmes the following year. The measurements obtained from Te Atatu this year are vital in assessing the success of the study.

The Principal Investigator is Dr Paul Hofman, Paediatric Endocrinologist at Starship Children's Hospital, and the project is being run by the Millennium Institute of Sport and Health assisted by Massey University. Your child's teacher should be able to answer any questions you may have about the study.

Please feel free to contact your child's teacher, Chelsea Downey or Chrissy Denton if you have any questions about this study.

Please complete the consent form and return it to your child's teacher as soon as possible.

Best wishes, and thanks once again for your time,

The Research Team:

Chelsea Downey (ph 4772082), Chrissy Denton (ph 5285678),
Dr Yvonne Anderson, Dr Paul Hofman



29th January, 2003

**INFORMATION SHEET FOR THE HEALTH AND
WELL-BEING STUDY,
TE ATATU INTERMEDIATE.**

This term, your school had agreed to participate in a study to improve health and well-being of you and your classmates.

During the next few weeks, those of you who agree to take part will be involved in answering some questionnaires, and having some measurements done. It is designed to be fun, and hopefully if the initial trial is successful, your school will get a chance to do some fun class modules and fitness sessions once the trial is complete!

At the beginning of the study, some simple measurements (height and weight, completed in a private room) and questionnaires will be done, in order to get some information. This will happen again at the end of the study. All the information will be private, so no-one will know the results but you (if you want). This is not a test or an exam, and is meant to be a fun challenge for you.

Your involvement is really important to us, and the other people involved, because the more of you who take part, the more fun it is, and the more information we get about people your age and their general health.

Thank-you for taking the time to read this. Your teacher will answer any questions you may have.

All the best, and have a great year!

From,

The Research Team
Chelsea
Chrissy
Yvonne
Paul



29th January, 2003

PARENT/LEGAL GUARDIAN'S INFORMATION SHEET
FOR HEALTH AND WELL-BEING STUDY,
BRUCE MCLAREN INTERMEDIATE.

Hello and thank-you for taking the time to read this information. This year, your child's intermediate school has agreed to take part in a health and well-being study. This means that there will be a focus on nutrition, fitness, lifestyle, and self-esteem in the first three months of the year. The aims of this study are to determine whether teaching a whole school of children about healthy lifestyles can improve their health. It is hoped that all parents and children in the school will consent to take part. The study is funded by and used as a health project for the Millennium Institute of Sport (MISH) as well as for a Masters project in Nutrition conducted by Chrissy Denton from Massey University.

All children who consent to participate, and have the consent of their parents, will be involved in some initial measuring of height and weight (in a private room), and will fill in some questionnaires about their knowledge of food, what they eat, what exercise they do, and what their lifestyle is like. The information gathered will be confidential, and not include your child's names, apart from an individual confidential report given to them at the end of the study. Your child does not have to participate. This is not an exam, and is designed to help your child to feel as healthy and happy as possible. The body measurements and questionnaires will be repeated at the end of three months in order to monitor the progress of the whole school.

To participate, your child will need to speak fluent English, as for all classroom activities. The study is conducted by trained individuals and there are no foreseeable risks to your child, only benefits will be gained. There will be no cost to you or your child in taking part. The study will run for three months initially, and if successful, will run for the rest of the year. Those children who do not have consent to take part will still receive classroom teaching on healthy lifestyles, but will not be measured, fill out the questionnaires, and therefore will not have any feedback from the research team as to their progress with these topics.

The Principal Investigator is Dr Paul Hofman, Paediatric Endocrinologist at Starship Children's Hospital, and the project is being run by the Millennium Institute of Sport and Health and assisted by Massey University. Your child's teacher should be able to answer any questions you may have about the study.

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29th January, 2003

**INFORMATION SHEET FOR THE HEALTH AND
WELL-BEING STUDY,
BRUCE MCLAREN INTERMEDIATE.**

This term, your school had agreed to participate in a study to improve health and well-being of you and your classmates.

During the next few weeks, those of you who agree to take part will be involved with teaching sessions and physical education sessions about food, lifestyle, and keeping fit. It is designed to be fun, and hopefully will make you feel better!

At the beginning of the study, some simple measurements and questionnaires will be done, to get some information. These will happen again at the end of the study. All this information will be kept, and is secret, so no-one will know the results but you. This is not a test or an exam, and is meant to be a fun challenge.

All the teaching sessions will be during class time, so you will hardly notice any difference to your day.

Your involvement is really important to us, and the other people involved, because the more of you who take part, the more fun it is, and the more information we get about people your age and their general health.

Thank-you for taking the time to read this. Your teacher will answer any questions you may have.

All the best, and have a great year!

From,

The Research Team
Chelsea
Yvonne
Paul
Chrissy



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The Principal Investigator is Dr Paul Hofman, Paediatric Endocrinologist at Starship Children's Hospital, and the project is being run by the Millennium Institute of Sport and Health and assisted by Massey University. Your child's teacher should be able to answer any questions you may have about the study.

Please feel free to contact your child's teacher, Chelsea Downey or Chrissy Denton if you have any questions about this study.

Please complete the consent form and return it to your child's teacher as soon as possible.

Best wishes, and thanks once again for your time,

The Research Team:

Chelsea Downey (ph 4772082), Chrissy Denton (ph 5285678),
Dr Yvonne Anderson, Dr Paul Hofman

APPENDIX B

Food frequency questionnaire (FFQ)

year

If you never or rarely eat a food, tick in the box 'never or less than once a month' and go to the next question.

It may be helpful to ask the person who does the cooking and shopping in your household to help you fill in the questions.

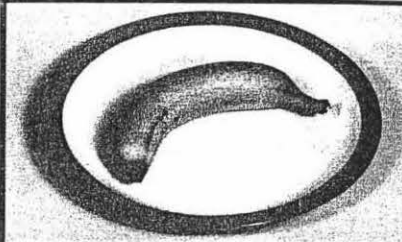
PLEASE DO NOT SKIP ANY FOODS

Put a tick ☒ in the box which best tells HOW OFTEN you eat the food.

Fruit

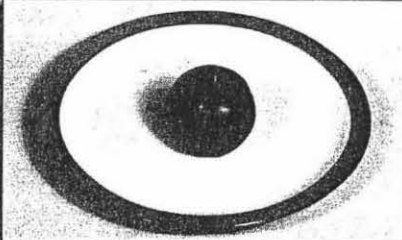
1. Banana, raw

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



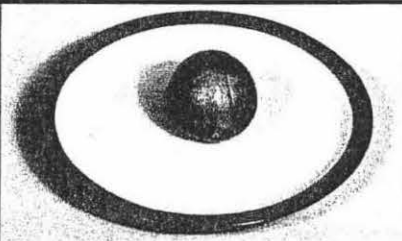
2. Apples or pears

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



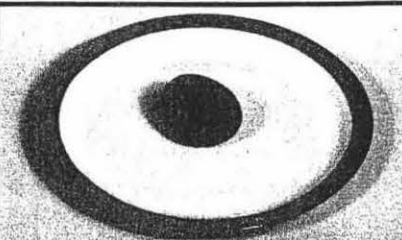
3. Oranges or mandarins

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



4. Kiwifruit

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



5. Nectarines, peaches, plums or apricots

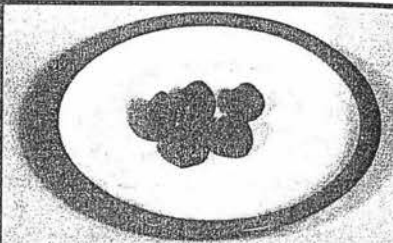
Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Put a tick ☒ in the box which best tells HOW OFTEN you eat the food.

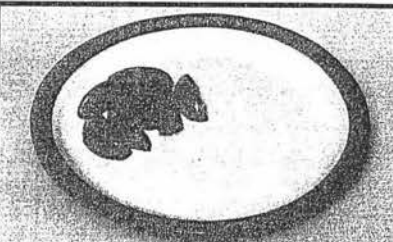
6. Strawberries or other berries

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



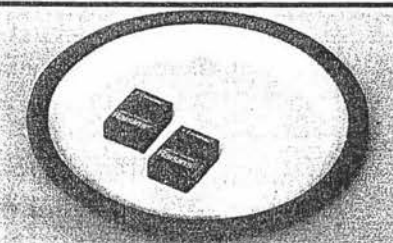
**7. Tinned or cooked fruit,
eg. tinned peaches**

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



8. Dried fruit, eg. raisins

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



9. Other Fruit (1) If you often have another fruit, not listed - give the name and tick a box to show how often you eat it

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

10. Other Fruit (2) If you often have another fruit, not listed - give the name and tick a box to show how often you eat it

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Put a tick ☒ in the box which best tells HOW OFTEN you eat the food.

Vegetables

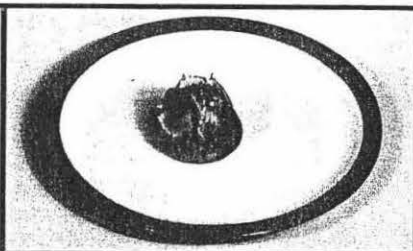
- 11. Fried potatoes, eg. hot potato chips, kumara chips, french fries, wedges or hash browns**

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



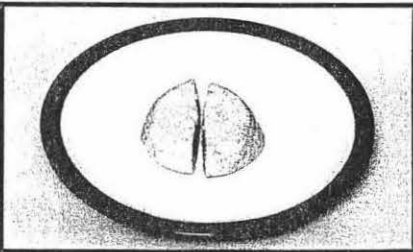
- 12. Other potatoes, eg. boiled, mashed, baked or roasted**

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



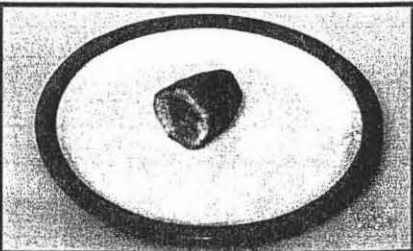
- 13. Taro**

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



- 14. Kumara**

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



- 15. Carrots (raw or cooked)**

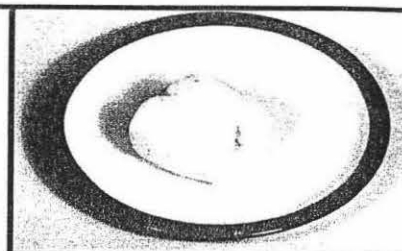
Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Put a tick ☒ in the box which best tells HOW OFTEN you eat the food.

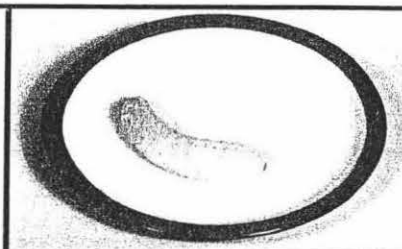
16. Cassava

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



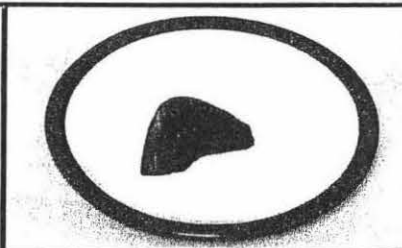
17. Cooked green banana

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



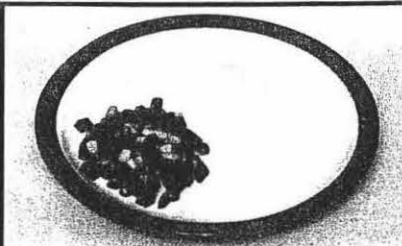
18. Pumpkin

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



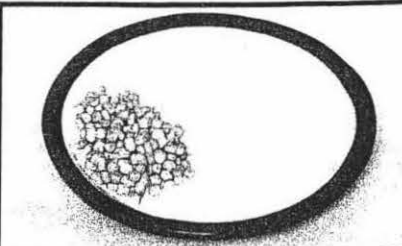
19. Mixed vegetables

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



20. Corn

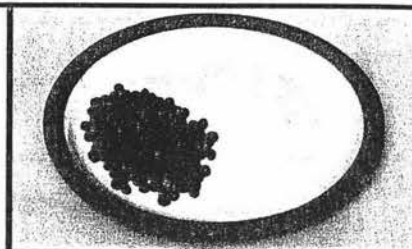
Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Put a tick ☒ in the box which best tells HOW OFTEN you eat the food.

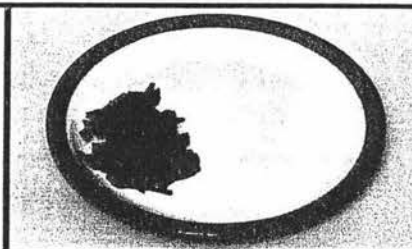
21. Peas

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



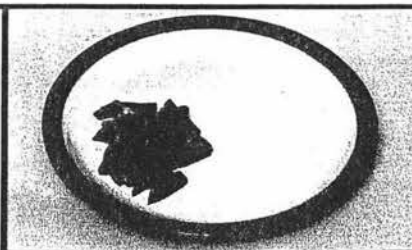
22. Silverbeet, spinach, puha or watercress

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



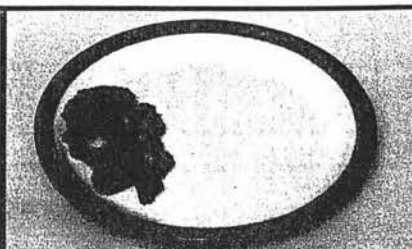
23. Green beans

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



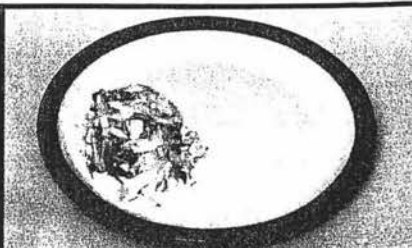
24. Broccoli

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



25. Cauliflower or cabbage

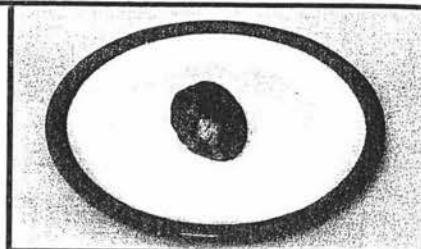
Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Put a tick ☒ in the box which best tells **HOW OFTEN** you eat the food.

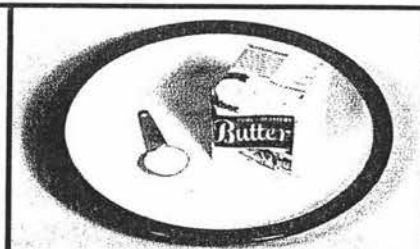
26a. Thinking about **cooked vegetables**, how often would you have **roast vegetables**?

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



26b. Thinking about **cooked vegetables** again, how often would you have **butter or margarine** on them?

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



26c. Which of these do you usually have on vegetables? (*tick one box*)

☐ butter

☐ blend (margarine and butter)

☐ low-fat spread

☐ Don't have either

☐ margarine

Name of margarine or blend _____

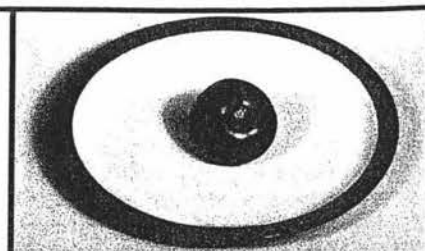
27. **Lettuce or green salad**

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



28. **Tomatoes (raw or cooked)**

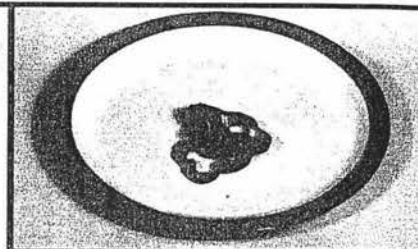
Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Put a tick ☒ in the box which best tells HOW OFTEN you eat the food.

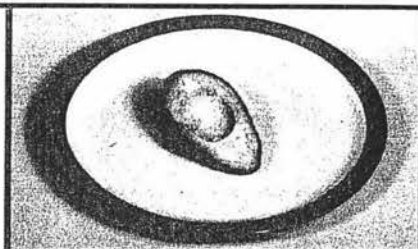
29. Capsicum (green, red or yellow peppers)

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



30. Avocado

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



31. Other Vegetable (1) If you often have another vegetable, not listed - give the name and tick a box to show how often you eat it

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

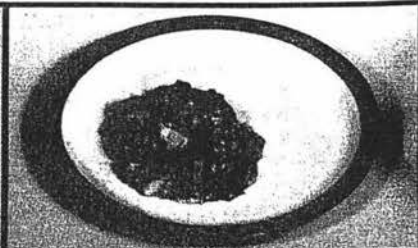
32. Other Vegetable (2) If you often have another vegetable, not listed - give the name and tick a box to show how often you eat it

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Mixed dishes

33. Meat and vegetable 'boil-up', eg. puha, povi masima, brisket, mutton flaps, pork bones

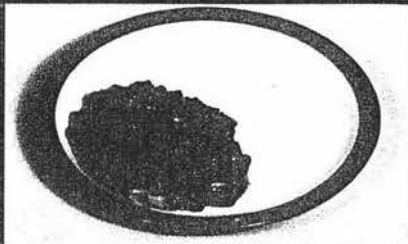
Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Put a tick ☒ in the box which best tells HOW OFTEN you eat the food.

34. Meat stew or casserole with vegetables

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



35. Pasta with meat and tomato sauce, eg. lasagne, spaghetti bolognese

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



36. Pasta with cream, white sauce or cheese sauce

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



37. Chinese type dishes, stir-fry meat or chicken and vegetables

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



38. Other Mixed Dish If you often have another mixed dish, not listed - give the name and tick a box to show how often you eat it

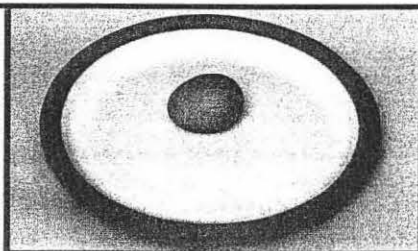
Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Put a tick ☒ in the box which best tells HOW OFTEN you eat the food.

Eggs, meat, poultry and fish

39. Eggs, boiled, poached, fried or scrambled, etc

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



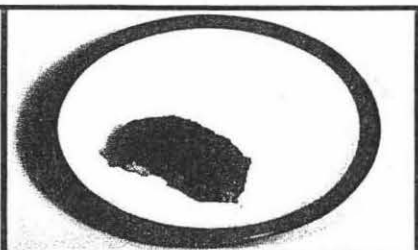
40. Roast beef, lamb or pork

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



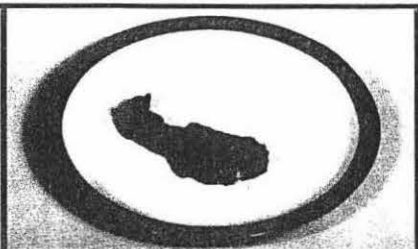
41. Steak

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



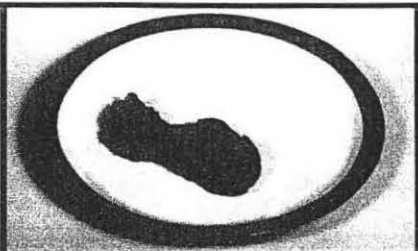
42. Lamb or mutton chops

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



43. Pork chop (or other pork small cuts)

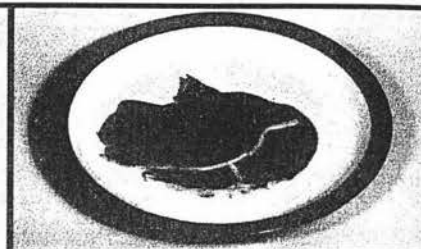
Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Put a tick ☒ in the box which best tells HOW OFTEN you eat the food.

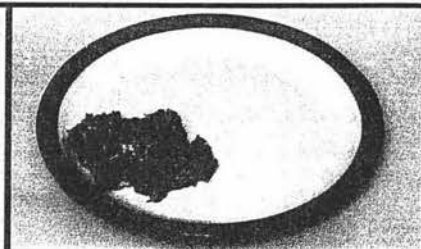
44. Boiled corned beef/silverside

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



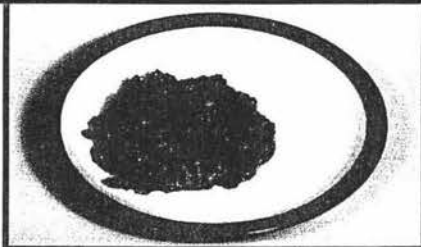
45. Tinned corned beef

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



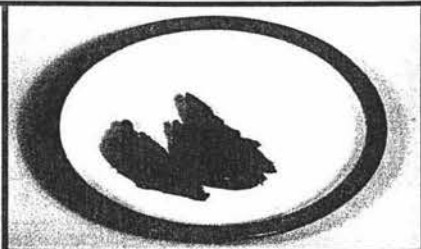
46. Mince, including rissoles, patties, Shepherd's Pie, etc

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



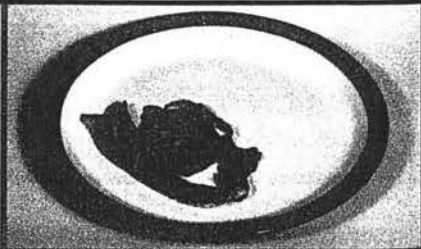
47. Liver or liver paté

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



48. Bacon or ham

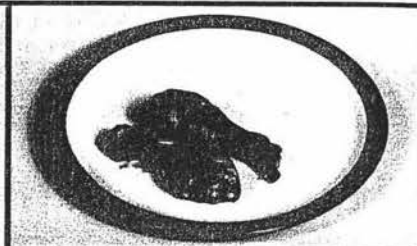
Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Put a tick ☒ in the box which best tells HOW OFTEN you eat the food.

49. Chicken

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

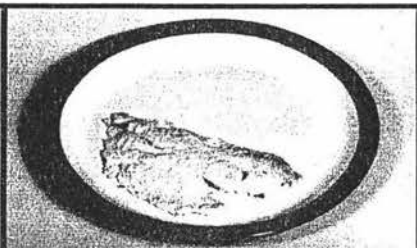


49a. How often was the **chicken** you ate **fried chicken or chicken nuggets**? (tick one box)

- ☐ almost never or never
 ☐ ¾ of the time
☐ ¼ of the time
 ☐ almost always or always
☐ ½ of the time

50. Fish

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

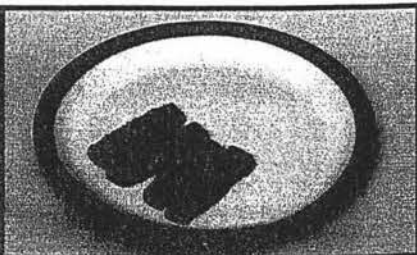


50a. How often was the **fish** you ate **fried fish or takeaway fish**? (tick one box)

- ☐ almost never or never
 ☐ ¾ of the time
☐ ¼ of the time
 ☐ almost always or always
☐ ½ of the time

51. Fish cake, fish fingers or fish pie

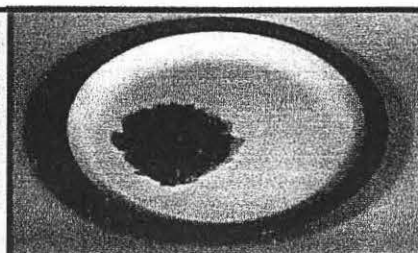
Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Put a tick ☒ in the box which best tells HOW OFTEN you eat the food.

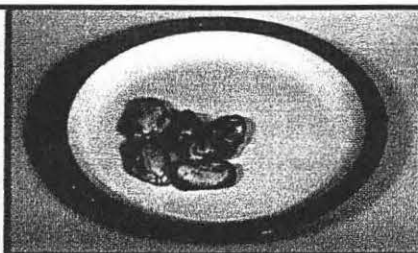
52. Tinned fish, eg. tuna or salmon

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



53. Shell fish, eg. mussel, paua or crabmeat

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



54. Other item of the 'Eggs, meat, poultry and fish' group If you often have another item from this group, not listed - give the name and tick a box to show how often you eat it

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

55. Which of the following fats were regularly used to cook your meat, poultry or fish? (mark all that are used)

- ☐ Don't know
- ☐ Margarine
- ☐ Butter
- ☐ Lard, dripping

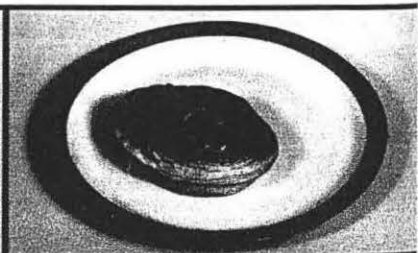
- ☐ Kremelta type fat
- ☐ Canola oil
- ☐ Corn oil
- ☐ Olive oil

- ☐ Safflower oil
- ☐ Sunflower oil
- ☐ Other vegetable oil

Pies, fastfoods, sausages

56. Meat pie

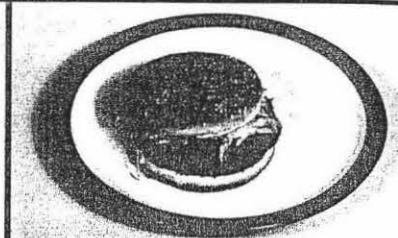
Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Put a tick ☒ in the box which best tells HOW OFTEN you eat the food.

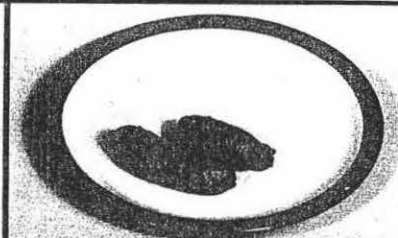
57. Burgers

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



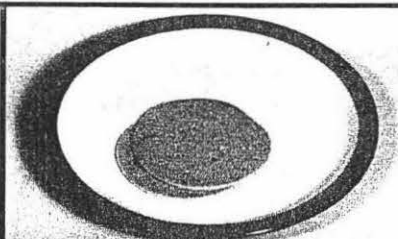
58. Sausages (all types)

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



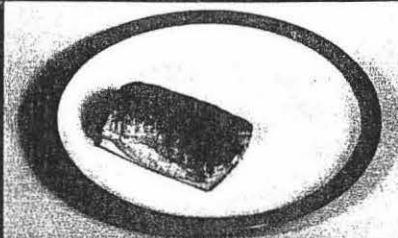
59. Luncheon, ham and chicken

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



60. Sausage rolls

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



61. Other item of the 'Pies, fast foods, sausages' group If you often have another item from this group, not listed - give the name and tick a box to show how often you eat it

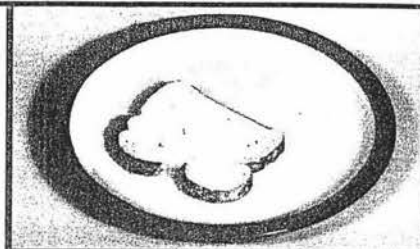
Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Put a tick ☒ in the box which best tells HOW OFTEN you eat the food.

Bread and Cereals

62. Bread, including toast and bread rolls

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

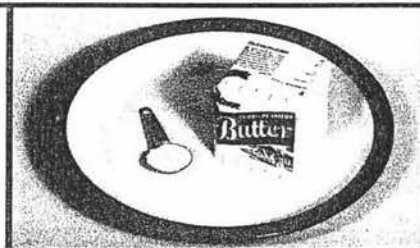


62a. What type of bread do you usually eat? (tick one box)

- ☐ white
☐ wholemeal
☐ mixed grain

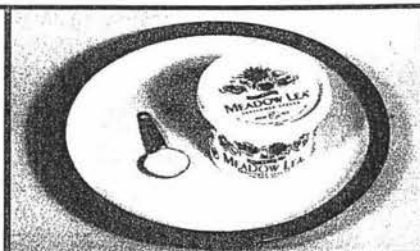
62b. How often do you have butter on your bread?

- ☐ rarely or never
☐ ¼ of the time
☐ ½ of the time
☐ most of the time



62c. How often do you have margarine or margarine blend on your bread?

- ☐ rarely or never
☐ ¼ of the time
☐ ½ of the time
☐ most of the time



62d. Which type of margarines do you usually have?

- ☐ Polyunsaturated margarine, eg. Miracle, Meadowlea, Flora, Sunrise
☐ Canola margarine, eg. Gold'n Canola, Vraise Canola, Canola Harvest, Country Crock
☐ Olive oil, margarine, eg. Olivio, Olivani, Oliveta
☐ Blend of butter and margarine, eg. Countrysoft, Dairysmooth
☐ Don't know

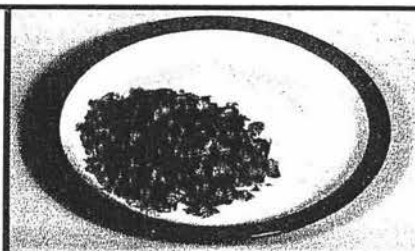
Put a tick ☒ in the box which best tells HOW OFTEN you eat the food.

62e. Is the margarine you usually have reduced fat or lite?

- ☐ Yes
- ☐ No
- ☐ Don't know

63. Breakfast cereal

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



63a. What type of cereal do you usually have? (tick one box)

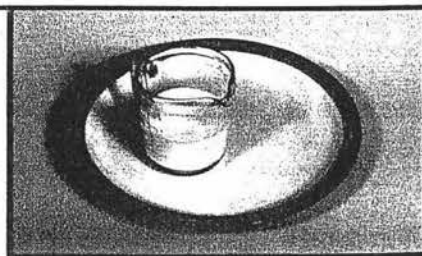
- | | | |
|--|--|---|
| <input type="checkbox"/> Weetbix type | <input type="checkbox"/> Cocopops | <input type="checkbox"/> Porridge |
| <input type="checkbox"/> Cornflakes type | <input type="checkbox"/> Muesli | <input type="checkbox"/> Other (Please give name) |
| <input type="checkbox"/> Rice bubbles | <input type="checkbox"/> Multi-grain typ | _____ |

63b. Was milk added to your cereal?

- ☐ Yes ☐ No

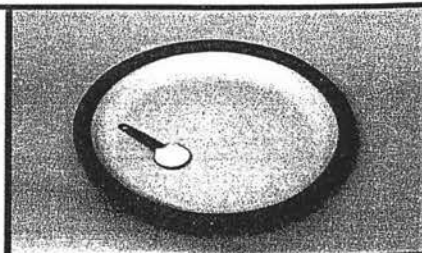
What kind of milk was usually added?

- | | | |
|--|--|-----------------------------------|
| <input type="checkbox"/> Standard milk/dark blue | <input type="checkbox"/> Trim (green) | <input type="checkbox"/> Soy milk |
| <input type="checkbox"/> Light blue | <input type="checkbox"/> Extra calcium | |



63c. Was sugar, honey or syrup added to your cereal?

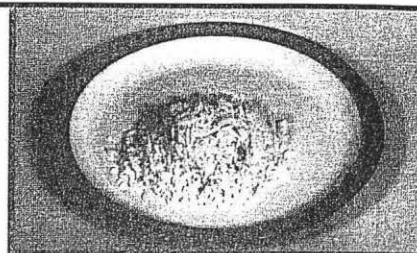
- ☐ Yes ☐ No



Put a tick ☒ in the box which best tells HOW OFTEN you eat the food.

64. Rice

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



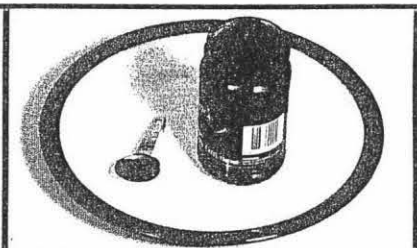
65. Other Bread and Cereals If you often have another item from this group, not listed - give the name and tick a box to show how often you eat it

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Spreads, sauces

66. Jam or honey

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



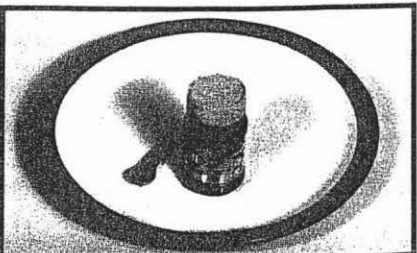
67. Nutella

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



68. Marmite or Vegemite

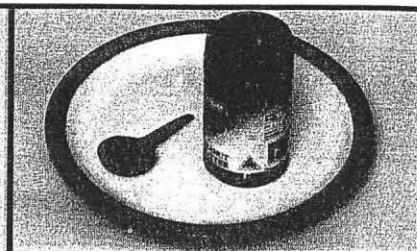
Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Put a tick ☒ in the box which best tells HOW OFTEN you eat the food.

69. Peanut butter

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



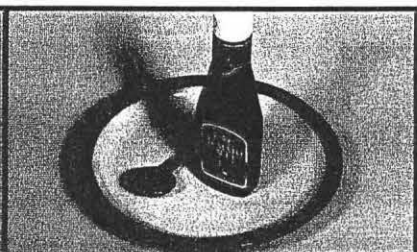
70. Mayonnaise or salad dressing

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



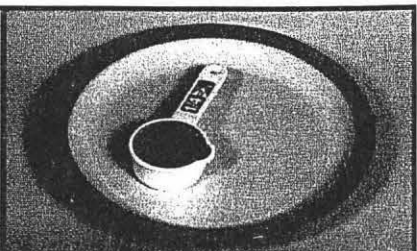
71. Tomato sauce or ketchup

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



72. Gravy

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



73. Other item of the 'Spreads, sauces' group If you often have another item from this group, not listed - give the name and tick a box to show how often you eat it

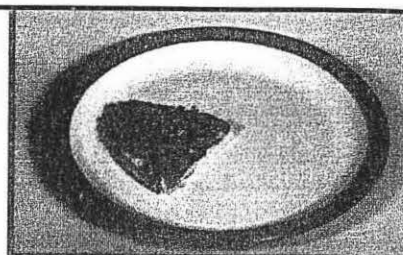
Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Put a tick ☒ in the box which best tells HOW OFTEN you eat the food.

Convenience meals/snacks

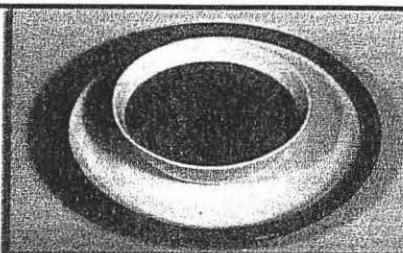
74. Pizza

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



75. Soup

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

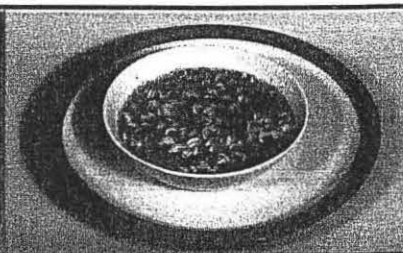


75a. What **type** of soup do you usually have? (tick one box)

- | | |
|---|---|
| <input type="checkbox"/> Tomato soup | <input type="checkbox"/> Ham and pea soup |
| <input type="checkbox"/> Vegetable soup | <input type="checkbox"/> Other soup |
| <input type="checkbox"/> Cream soup | |

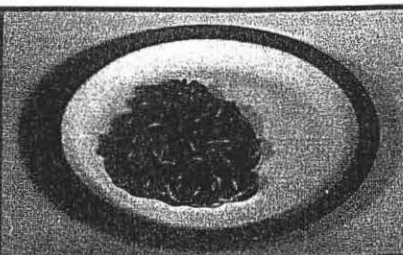
76. Noodles

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



77. Tinned spaghetti with tomato sauce

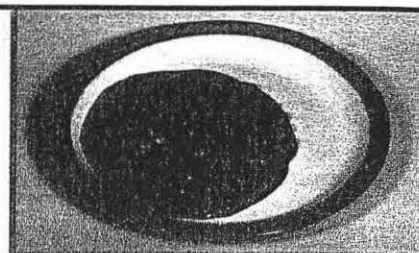
Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Put a tick ☒ in the box which best tells HOW OFTEN you eat the food.

78. Baked beans

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



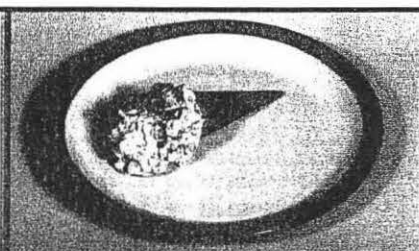
79. Other item of the 'Convenience meals/snacks' group If you often have another item from this group, not listed - give the name and tick a box to show how often you eat it

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Dairy

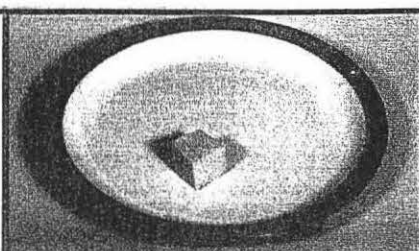
80. Ice cream

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



81. Cheese, eg. cheddar, colby, etc.

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



82. Yoghurt or Dairy food (all types)

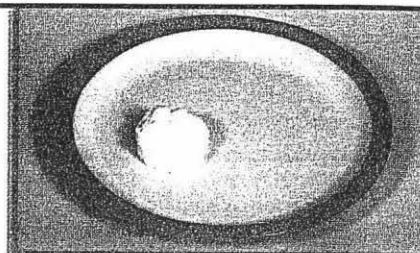
Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Put a tick ☒ in the box which best tells HOW OFTEN you eat the food.

83. Cream

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



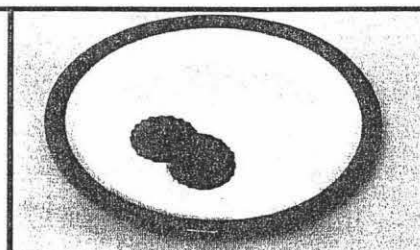
84. Other item of the 'Dairy' group (not milk drinks) If you often have another item from this group, not listed - give the name and tick a box to show how often you eat it

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Biscuits/cakes

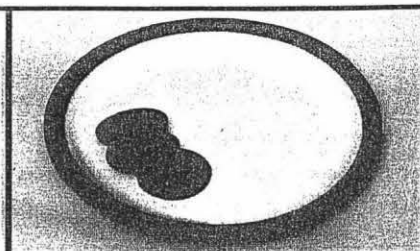
85. Chocolate coated or cream filled biscuits

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



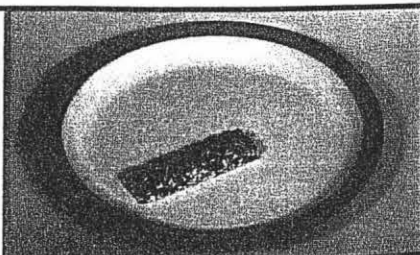
86. Biscuits, eg. plain, chocolate chip, semi-sweet, ginger nut, shortbread

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



87. Muesli bars

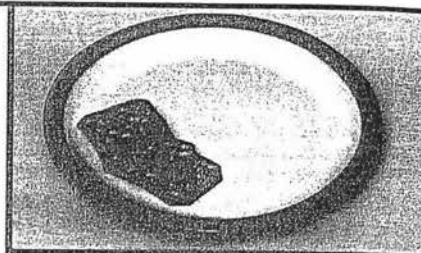
Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Put a tick ☒ in the box which best tells HOW OFTEN you eat the food.

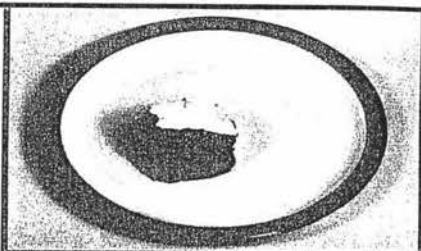
88. Crackers or crispbreads

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



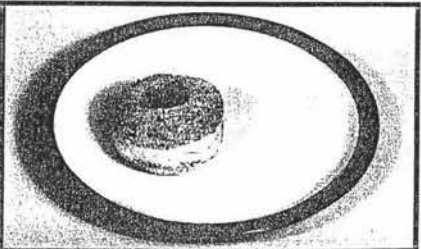
89. Cake

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



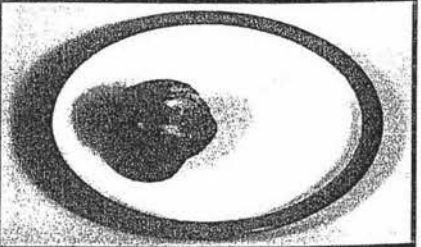
90. Doughnuts or croissants

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



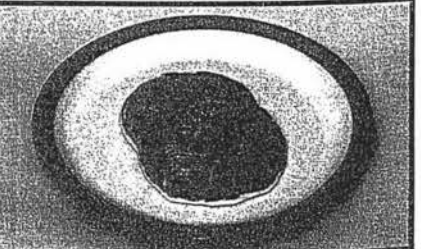
91. Scones, muffins or sweet buns

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



92. Pancake or pikelets

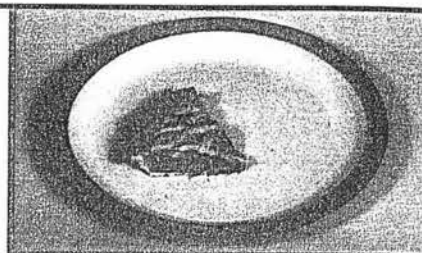
Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Put a tick ☒ in the box which best tells HOW OFTEN you eat the food.

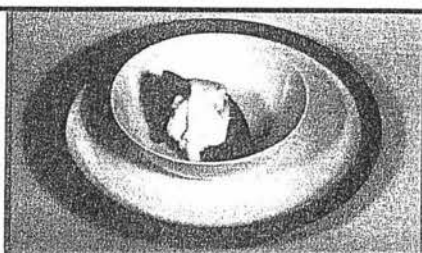
93. Fruit pie, fruit crumble or tart

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



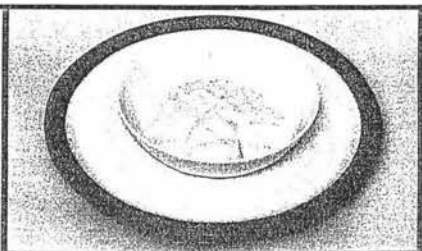
94. Pudding, eg. sponge pudding or steamed pudding

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



95. Custard or custard puddings

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



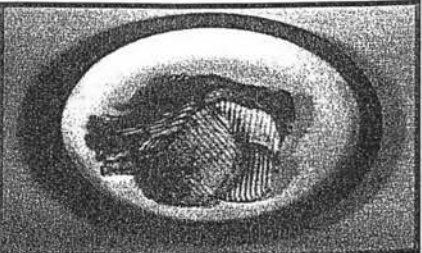
96. Other item of the 'Biscuits/cake' group If you often have another item from this group, not listed - give the name and tick a box to show how often you eat it

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Snacks and sweets

97. Potato crisps, corn snacks or chips, eg. burger rings, rashuns, etc

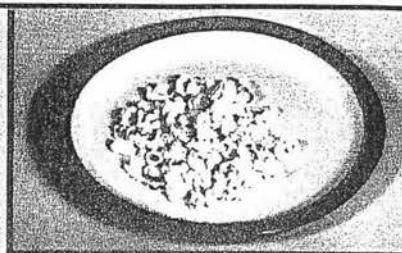
Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Put a tick ☒ in the box which best tells HOW OFTEN you eat the food.

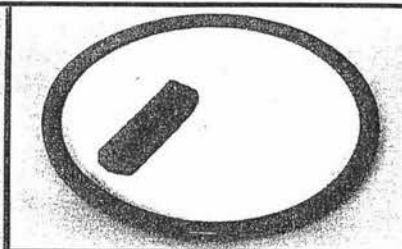
98. Popcorn

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



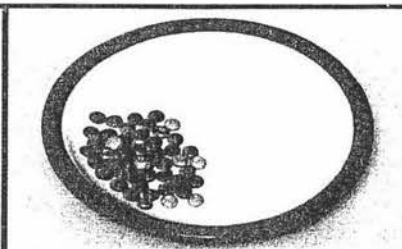
99. Chocolate, eg. Moro bar

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



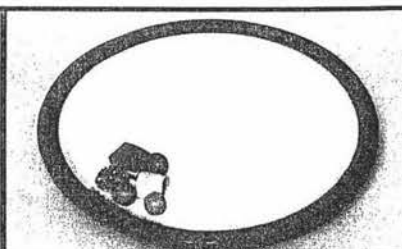
100. Candy coated chocolate, eg. pebbles

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



101. Other sweets

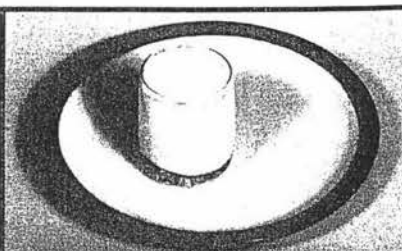
Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Milks

102. Milk (not flavoured)

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Put a tick ☒ in the box which best tells HOW OFTEN you eat the food.

102a. What kind of milk do you usually drink?

☐ Standard milk (dark blue)

☐ Trim (green)

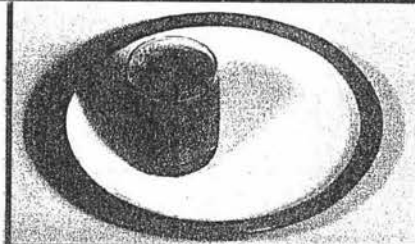
☐ Soy milk

☐ Low fat (light blue)

☐ Extra calcium

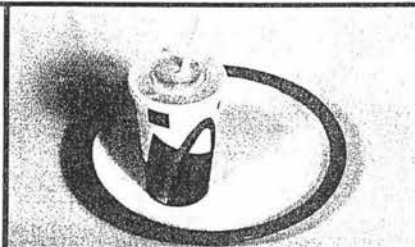
103. Flavoured milk

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



104. Milk shake

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



105. Milo powder, Quik or Drinking chocolate

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



105a. With this drink did you use?

☐ All milk

☐ 1/2 milk

☐ 1/4 or less milk

Was sugar added?

☐ Yes

☐ No

Put a tick ☒ in the box which best tells **HOW OFTEN** you eat the food.

Infant milks

106. Was your child fed **breast milk** daily in the last 4 weeks?

☐ Yes

☐ No

107. Was your child fed **Infant formula** daily in the last 4 weeks?

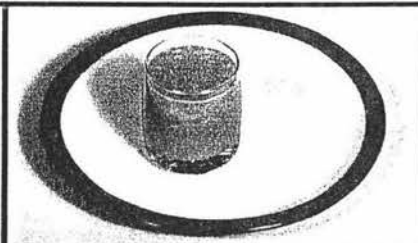
☐ Yes

☐ No

Other drinks

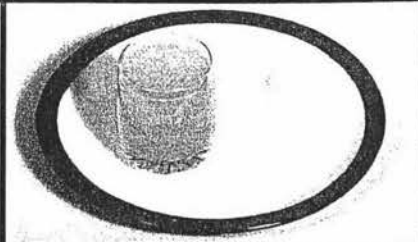
108. **Juice**, eg. fresh orange juice, Just Juice, Freshup, Pams, Ribena diluted

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



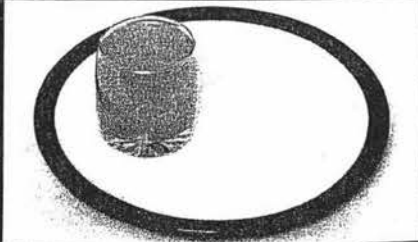
109. **Powdered fruit drink**, eg. Refresh, Raro

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



110. **Fruit drink concentrate, cordial**

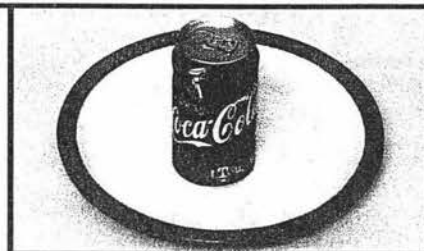
Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Put a tick ☒ in the box which best tells HOW OFTEN you eat the food.

111. Coca cola or other cola drinks

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



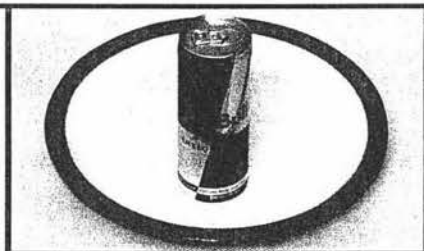
112. Mountain Dew

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



113. 'Energy' drinks, eg. V, E₂, Red Bull

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



113a. If you have 'energy' drinks, which type do you usually have? (tick one box)

☐ V

☐ Red Bull

☐ Bullrush

☐ E2

☐ Liquid B

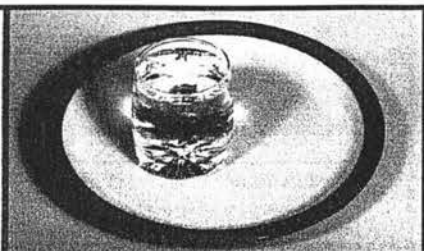
☐ Other (Please name)

☐ Lift

☐ Ikon

114. Soft drinks, eg. lemonade, orange

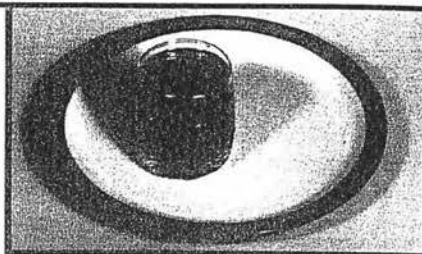
Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Put a tick ☒ in the box which best tells HOW OFTEN you eat the food.

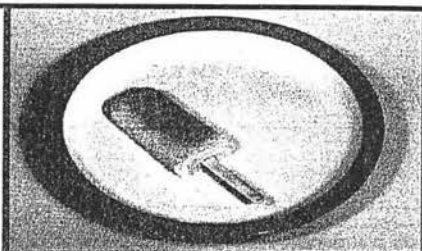
115. Sports drinks, eg. Gatorade, Powerade

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



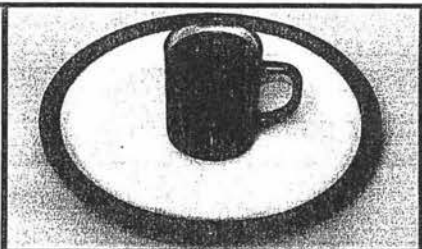
116. Ice blocks

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



117. Tea

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



117a. Was milk added to your tea?

☐ Yes ☐ No

Was sugar added?

☐ Yes ☐ No

118. Other item of the 'Other drinks' group If you often have another item from this group, not listed - give the name and tick a box to show how often you eat it

Never or less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 or more times a day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Dietary supplements

1. During the past month have you taken any vitamins or minerals?

☐ Yes

☐ No

2. If **YES**, what do you take fairly regularly? (Choose from the list of dietary supplement types below).

Supplement type	Number of tablets							
	None	1-3 per week	4-6 per week	1 per day	2 per day	3 per day	4 per day	5+ per day
Multivitamin mineral	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Supplement name: <input type="text"/>								

Supplement type	Number of tablets							
	None	1-3 per week	4-6 per week	1 per day	2 per day	3 per day	4 per day	5+ per day
Vitamin C	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Supplement name: <input type="text"/>								

Supplement type	Number of tablets							
	None	1-3 per week	4-6 per week	1 per day	2 per day	3 per day	4 per day	5+ per day
Haliborange	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Supplement name: <input type="text"/>								

Supplement type	Number of tablets							
	None	1-3 per week	4-6 per week	1 per day	2 per day	3 per day	4 per day	5+ per day
Vitamin A	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Supplement name: <input type="text"/>								

Supplement type	Number of tablets							
	None	1-3 per week	4-6 per week	1 per day	2 per day	3 per day	4 per day	5+ per day
Iron	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Supplement name: <input type="text"/>								

Supplement type	Number of tablets							
	None	1-3 per week	4-6 per week	1 per day	2 per day	3 per day	4 per day	5+ per day
Zinc	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Supplement name: <input type="text"/>								

Supplement type	Number of tablets							
	None	1-3 per week	4-6 per week	1 per day	2 per day	3 per day	4 per day	5+ per day
Calcium	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Supplement name: <input type="text"/>								

Supplement type	Number of tablets							
	None	1-3 per week	4-6 per week	1 per day	2 per day	3 per day	4 per day	5+ per day
Omega 3 fatty acids	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Supplement name: <input type="text"/>								

Supplement type	Number of tablets							
	None	1-3 per week	4-6 per week	1 per day	2 per day	3 per day	4 per day	5+ per day
Herbal/Homeopathic	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Supplement name: <input type="text"/>								

	Number of tablets							
<i>Supplement type</i>	None	1-3 per week	4-6 per week	1 per day	2 per day	3 per day	4 per day	5+ per day
Other (1)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Name: <input type="text"/>								

	Number of tablets							
<i>Supplement type</i>	None	1-3 per week	4-6 per week	1 per day	2 per day	3 per day	4 per day	5+ per day
Other (2)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Name: <input type="text"/>								

	Number of tablets							
<i>Supplement type</i>	None	1-3 per week	4-6 per week	1 per day	2 per day	3 per day	4 per day	5+ per day
Other (3)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Name: <input type="text"/>								

Thank you very much for filling out this questionnaire.

Please take a moment to fill in any questions you have skipped.

APPENDIX C

Intervention education programme

Class modules



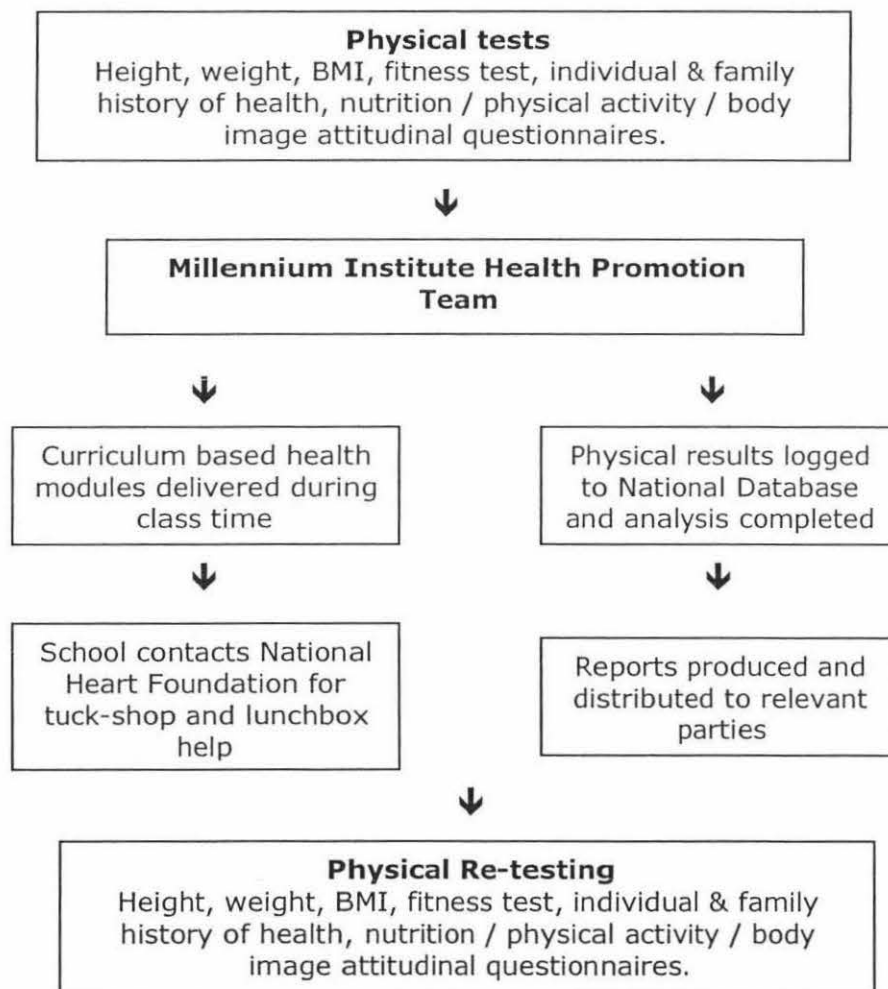
Health Promotion Programme

Programme Model

After initial physical tests, psychological questionnaires and personal / family history of health, sport and exercise records are completed, results are analysed and collated. Reports including results and recommendations are then distributed to relevant people (i.e. Principal gets whole school report, teacher gets class report and each child gets their own report).

After reports are distributed, curriculum compatible modules are allocated to each child. In the initial stages there will be three core modules covered (*) and then more optional modules added over time. Each module will run for a period of 12 weeks, after which time, retesting may occur.

Programme Overview



SCHOOL BASED HEALTH PROMOTION

Childhood wellness is an important health concern as it enhances the learning experiences of children and can assist prediction of health status in adult life. There are no current interventions in New Zealand that target childhood wellness in the holistic sense and have either single issue focus or are targeted specifically at Pacific Islanders. Therefore, a population-wide school-based intervention is proposed, with a multi-disciplinary approach. It is hypothesized that a school-based intervention programme is an effective and cost-efficient way of enhancing childhood wellness in New Zealand.

The importance of this health promotion in schools intervention is best summed up by Mr Jack Jones, of the World Health Organisation (WHO). He says,

"While we expect our schools to be places of learning, the role we expect them to play in health is not as clearly defined. If our schools could promote health as they do learning, holistically and with the measures available, the benefits both today and to future generations would be very significant – both in terms of health and education. To achieve education and health goals, our schools must be able to promote health as they do learning.

We know that healthy children learn well. If they are healthy, young people can take full advantage of every opportunity to learn. Also, we know that schools can not achieve their full potential as places of learning if children who attend school are not capable of learning well. Additionally, we know that, for better or worse, schools influence health. This, in turn, either now or in the future affects the school's potential to educate and the potential impact of investments in education."

Needs Assessment

An example of the need for health education during childhood is the ever increasing prevalence of childhood obesity. Childhood obesity is becoming a pressing concern, with approximately 1 in 5 children in the UK and USA now overweight (Lissauer and Clayden, 2001:165-167). Research indicates the prevalence of childhood obesity is increasing, both in Australasia (Lynch, Wang and Wilcken, 2000) and the World (Summberbell, Waters, Edmunds, O'Meara and Campbell, 2002), with the World Health Organisation describing obesity as a global epidemic (Edmunds and Waters, 2000).

A study conducted by Hitchcock, Maller, Sobol, Paterson, Colditz, and Dietz (1986) found that there are different representative figures amongst various social groups. In a New Zealand study, Auckland children aged 5 – 10.9 years 14.3% of children were found to be obese, with higher rates in Pacific Islanders

(24.1% and Maori (15.8%) (Tyrrell, Richards, Hofman and Gillies, 2001). These differences pose an important factor when determining the different strategies to combat the problem.

As a result of these findings, this programme will take a multidisciplinary approach to enhancing childhood wellness and reducing childhood obesity. The specific nature of the programme will be focussed on the production of enjoyable educational modules on the importance of physical activity, nutrition and body image.

Setting Issues

The setting for this project is in Intermediate Schools (Form 1 and 2) throughout New Zealand. There are numerous things to consider when trying to implement projects on a large scale throughout such large demographic area and these may include such issues as: ethnic and gender mix in the school group, decile ratings of the school, socio-economic status of the local community, general activity levels of the older population in the area, access to wider community resources for parks, sporting clubs and 'safe-play' areas. Any number of these factors can and will impact on the success or failure of a project and they need to be carefully assessed when introducing change to a community.

Of all factors that influence the success of a behavioural change intervention in the school community, one of the most important factors is the individual school and teaching staff's openness or willingness to execute such a programme. Should they have any doubts regarding the significance and importance of the programme, or opposition to the programme, then success rates will be somewhat compromised. There is a need then, to develop good lines of communication between the school, teacher and Millennium Institute of Sport and Health programme team to ensure that any doubts or queries are satisfactorily covered and participation maximised.

Children of primary school age are duly influenced by parents and peers (Mayall, 1994). It is necessary then, to encourage participation of all students and parents alike, to ensure that maximum benefits are gained. An air of 'fun' should be created around activity sessions and where possible, positive talk about the programme sustained when discussing issues to parents and during 'class talks'.

Organisational Structure

The Millennium Institute of Sport and Health is a non profit organisation formed to develop high performance in sports throughout New Zealand. It is a privately owned organisation with numerous different sources of revenue streams including: privately donated funds, regional trust donations, corporate sponsorship, health and fitness club open to paying members of the public,

gambling taxes, and a multiple sports club. Income from each of the different streams is channeled back into the high performance unit and is utilised in assisting athletes to 'be the best'.

Programme Structure

Children will participate in a variety of physical measurements including and after initial tests are complete, results are analysed and collated. Reports including results and recommendations are then distributed to relevant people (i.e. Principal gets whole school report, teacher gets class report and each child gets their own report).

At this stage of the programme, the school will then be put into contact with the National Heart Foundation, who will assist the school with supportive environmental changes within the school community. The National Heart Foundation will assess and make recommendations to the school to optimize the nutritional value of foods sold at tuck-shops, as well as implement their "Healthy Lunchbox" campaign.

After reports are distributed to the relevant parties, curriculum compatible learning modules are allocated to each child. In the initial stages there will be three modules covered (Nutrition, Physical Activity and Body Image) and then more modules added over time. Each module will run for a period of twelve weeks, after which time, physical testing will reoccur and updated recommendations made. Progressive modules will be allocated at the end of each twelve weeks.

Planning Process

The overall planning processes are complex and ever-changing. It was important to set down an overall programme plan during the initial stages of any project so as to ensure adequate coverage of all areas. A basic planning model was created initially and then processes added as needed.

There are significant differences between theory based interventions and programmes put into practice (Hochbaum, Sorenson and Lorig, p302-304). Due to the complex nature of health promotion in practice, no one model can be deemed adequate to meet the various needs of the target population. In this case, the programme has used the Transtheoretical Theory to guide the intervention but also incorporates several key components of the Social Cognitive Theory.

Transtheoretical Theory (otherwise known as the Stages of Change Model)

Wearne (1992) states that educators and health promotion programmes in schools should allow for different developmental, emotional and social stages

that students go through during their schooling years. Because each person's progress in addressing a particular health concern is different, the Transtheoretical model seeks to describe the steps people go through in order to make and sustain change (Cassidy, 1997). Below is a description of the Transtheoretical model in each of its five stages:

1. Pre-Contemplation

During this stage of the programme, an individual may or may not be aware their behaviour is unhealthy and are unwilling to modify their behaviour (Cassidy, 1997). An example of how this state of mind is assessed during this programme is a programme description is sent home and students are asked to discuss with family and get parental permission to participate. In this stage, children will either want to participate or not – if not, then they are given an information package regarding the programme and its objectives and re-invited to participate the following year. Any child that does not wish to participate, or is not allowed to participate, will still get the same modules taught to them but they will not be included into the physical testing.

2. Contemplation

The contemplation stage is where the individual is aware of a threat to their health through unhealthy behaviours and they are thinking about changing their ways within the following six months (Cassidy, 1997). The programme seeks to create interest with the initial programme information package and get the children thinking about how 'healthy' they are. It is then their decision to find out more information about the programme and possibly make a commitment to involvement.

3. Preparation

During this stage the individual has made a commitment to change their current behaviour (Cassidy, 1997). Upon commitment to the programme, each child will receive an additional information pack regarding the testing process and any required preparation will be detailed. Once this has gone out, the programme will be scheduled to start within the month.

4. Action

The action stage of this model is where the unhealthy behaviour is in the process of being changed (Cassidy, 1997). In the school setting there is a likely possibility that children will be at different knowledge levels and as such, modules are written for various stages. For example, if a certain class of children is all at a sound knowledge level, then the module will address practical physical exercise and address more in depth content than earlier units. This ties in with the reasons behind coordinating the programme with the New Zealand curriculum – teachers should know where the kids are at knowledge-wise, so should be able to assist in implementing the correct module for each class.

5. Maintenance

During the maintenance stage of this model, the previous unhealthy behaviour has been modified and the healthy behaviour has been sustained for over six months (Cassidy, 1997). This phase of the programme will be where retesting of the physical parameters is carried out, teacher education sessions are held and distribution of updated results occurs. The aim of this stage is to maintain current interest in the healthy behaviour and encourage participation of previously 'missed' children.

Social Cognitive Theory

The Social Cognitive Theory is based on the theory that human behaviour is shaped by the environment, personal factors and significant relationships (Kaplan, Sallis and Patterson, 1993).

Self control and Behavioural capability are two key components of the Social Cognitive Theory that are incorporated into this programme. It is hoped that by giving the children an opportunity to learn and develop skills associated with healthy behaviours, they will be well equipped for a healthy future.

This programme also uses the "value expectancy" component of the social cognitive theory in to encourage children to modify their current unhealthy behaviour or continue with their healthy behaviour. This will be encouraged by tangible rewards such as healthy gift packs (containing fruit bars, healthy snacks etc) and changing the children's perception that good health may potentially help them succeed in their chosen sport. The body image / confidence module incorporated into the programme will address the issues surrounding kids perception about whether they want to be healthy or not!! They need to have the belief that they 'can' do it and it 'is' worthwhile.

Additionally, there will be incentives built into the programme where the healthiest school (biannually assessed via a school based project submitted to the Millennium Institute of Sport and Health for judgment) gets a visit from a prominent sports star or similar.

Programme Goals

Short Term Goals

Pilot programme in local intermediate schools to assess flow of curriculum based module content and programme outcomes. Refine programme and implement into all local schools to obtain feedback and behaviour change with regards to physical activity levels, nutrition choices and body image in our local community.

Long Term Goals

Implement programme on a national level and effect behaviour change in the Intermediate school population. Outcome goals include an increase in the immediate and future health of New Zealand children.

It is important to mention at this time, that although one of the sub-objectives of the programme is to reduce the total number of children with obesity in New Zealand, the programme seeks to do so not by weight loss in the children involved, rather the maintenance of current weight throughout their early pubescent growth spurt.

Programme Strategies

In order to motivate children of all abilities and ages to participate, physical educators need to use innovative approaches that will help their students enjoy themselves (Booth, 2001). The Millennium Institute of Sport and Health's health promotion programme utilises several different underlying strategies to ensure the success of the programme.

Periodical Physical / Behavioural Assessment

The production of a periodical report of physical and behavioural analysis will enable each child to monitor and direct their personal wellbeing. This is an important component of the Social Cognitive Theory and to enhance the results of this strategy, there will be health 'contracts' set down and signed by each child.

School Curriculum Alignment

In order to successfully gain the support and interest of New Zealand teachers and schools, it is imperative to tie the programme in with the New Zealand Curriculum. There are four main strands identified within the Physical Education curriculum and each of these can be effectively met by modules developed by the Millennium Institute of Sport and Health. The four strands to cover for Health and Physical Education are:

1. Personal Health and Physical Development
2. Movement Concepts and Motor Skills
3. Relationships with Other People
4. Healthy Communities and Environments (NZ Ministry of Education, 2002)

To fit the programme within the Transtheoretical model, each of these four strands can be further broken down into levels specific to intermediate school aged children. From these levels we will produce modules of course work that students will work through as part of their involvement with the programme.

Module Overview and details (Weeks 3-12)

- Wk 3 Healthy Lifestyles: the many dimensions of health**
Students will identify the various components of health
Students will identify their needs in terms of health and develop skills for self awareness / reflection
Students will identify how the mind, health, nutrition and physical activity contribute to a balanced life
- Wk 4 Eating for Health**
Students will identify the role of food and nutrition has in supporting better health
Students will critically analyse and identify their nutritional needs for health
Students will develop action plans to meet their nutritional needs
- Wk 5 Activity for Health**
Students will identify the effects of physical activity on the body and how leisure contributes to a healthy lifestyle
Students will learn about the different types of exercise
Students will develop the skills to design an exercise programme to suit them and include their parents
Students will work together to meet class goals in terms of activity levels
- Wk 6 Mind Power for Health**
Students will learn about what influences their development as individuals & the importance of positive thinking
Students will learn about the concept of self identity and how to control the outside influences on self esteem
- Wk 7 My Food Choices**
Students will identify the influences such as economy, culture and media have on food choice
Students will develop an understanding of the consequences of their food choices
Students will develop goal setting skills to address their food choices
Students will analyse their environment for influences on food choice
- Wk 8 Getting into Exercise**
Students will learn how lifestyle decisions influence participation in physical activity
Students will enhance previously learnt goal setting skills to address their physical activity levels
- Wk 9 Role Modelling**
Students will learn the importance of role modelling and how they affect self esteem, motivation, behaviours
Students will develop an understanding of how other people deal with situations, roles and relationships
Students will learn to look to their peers for role models and identify good qualities in each other
- Wk 10 Inactivity and Energy**
Students will develop an understanding of the relationship between nutrition & physical activity & their contribution to health
Students will learn about the effects of inactivity and sedentary behaviour
Students will learn about the relationship between food and energy levels
- Wk 11 My Great Country**
Students will discover how the role of sport has contributed to the development of national pride
Students will identify how immigration has changed physical activities in the local community
Students will identify the role and growth of the Maori / Pacific Island sportsmen and women in New Zealand
- Wk 12 Healthy Lifestyles: health dimensions revisited**
Students will revise the many dimensions of health and how it relates to their well being
Students will revisit their action plans for nutrition, lifestyle and physical activity

Establishing Partnerships

To enable the community to participate and contribute to the success of this programme, the programme will invite several key organisations to become involved. It is hoped that by setting up these strategic partnerships, there will be a greater awareness of the project and greater success as a result of alternative feedback and input. Partnerships to be established include: Millennium Institute of Sport & Health for programme delivery and development; Ministry of Education, Heart Foundation, Cancer Society, Active NZ and Health Promoting Schools Association of New Zealand for endorsement; Local Intermediate Schools for participation; and Community Trust and corporate sponsor for funding.

Health Promoting Schools Association of NZ

The importance of aligning with this organization is best summed up by Mr Jack Jones, a key figure for the WHO. He says,

"The health promoting school is a global concept relevant to achieving health and education as expressed in the United Nation's goals of 'Health for All' and 'Education for All'. Because these goals are inseparably linked, they can and must be achieved together. This will require concerted action, enhanced cooperation and new partnerships between health and education agencies, non-governmental organizations and the private sector...

... We can improve the yield of educational investments if we can help schools to become health-promoting schools. I believe that the concepts of the health-promoting school can help provide vision and direction for creating a framework for policy and actions that can strengthen both education and health..."

Why has this strategy been utilised?

Previous attempts at enhancing childhood wellness have focused on numerous methods, including family based and school based intervention programmes, with varying success. The over-riding conclusion however, is that population based interventions are likely to be more effective than targeting children individually.

Resources

Fiscal costs involved in the programme include a fixed set up cost for programme and web site development. Cost efficiency was calculated for a variety of programme scenarios and it was deemed that using the web is best for programme delivery on a national level and regional contractors will be employed to educate all involved schools in group sessions on a periodical basis.

Conclusion about Health Promotion

Deteriorating health and obesity is a worsening public health issue that needs to be addressed in order to reduce its future impact on already strained health resources. Previous research suggests that a multifaceted intervention is required to adequately obtain sustainable healthy behaviour change. This programme utilised the Transtheoretical Theory and Social Cognitive Theory on a planning basis to develop specific strategies. Via assessment and education, this programme seeks to teach intermediate school aged children about positive health behaviours they can participate in, in order to live healthy and happy lives.

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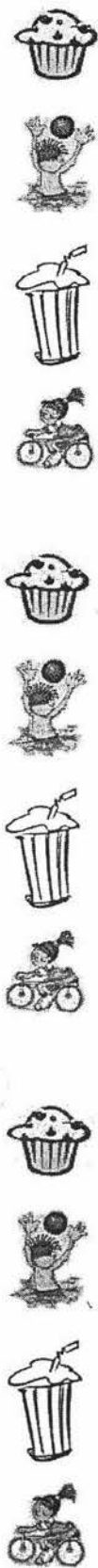


Units

One

-

Nine



Health Promotion Programme Resources

The classroom is an ideal place for students to explore lifestyle choices and develop self-reliance in an ever changing world. This classroom resource has been developed to empower students with the knowledge, understanding, attitudes and skills that will enable them to lead a healthy and balanced life.

Active children are not only healthier, they are more confident and are likely to concentrate better in class. Regular exercise and a balanced diet contribute to their overall well-being and set up long-lasting healthy habits into adulthood.

Children today are faced with a multitude of choices. Unfortunately some aspects of their lifestyle (including poor food choice and inactivity) may place them at increased risk of developing diseases such as obesity, cardiovascular disease and diabetes.

Programme Overview

This resource has been designed for students in intermediate schools to complement the Health & Physical Education Curriculum. The resource aims to encourage students to consider their own attitudes and behaviours towards a healthy and balanced lifestyle. Throughout each activity, students translate their understandings into real-life situations beyond the classroom. By involving their own life experiences, students are empowered to make healthy lifestyle decisions now and in the future.

Module outline:

Module 1	Good Life
Module 2	Good Health
Module 3	Food and You
Module 4	Fit Body
Module 5	Mind Power
Module 6	Get Active
Module 7	Fuelling Your Body
Module 8	Role Modelling
Module 9	You Are Part of a Great Sporting Nation

How to use this resource

This resource should be taught in modules and may be integrated into existing lessons or units of work. It is envisaged that each module will be taught over a one week period. Teachers should read through the entire resource and activities prior to commencement as some preparation may be required. The activities also may need modification according to the needs and interests of students and the school community. If possible, please keep records on any changes made so we can maximize the quality of future resources.

Unit 1: Good Life!

Students will be able to:

- Understand how mind power, health/nutrition and physical fitness contribute to a 'balanced life'
- Understand what balance means in life

Achievement Objectives:

- Students will be able to identify the various components of health and balance (Strand A1 & A2)
- Students will be able to identify their need for balance in terms of nutrition, physical activity, emotional, social and mental health (Strand A1 & A2)
- Encourages students to develop skills of self awareness and self reflection and develop understanding of dimensions of health (Strand D1)

Resources:

- Worksheet 1 - Food and Activity Diary

The Millennium Institute of Sport and Health (MISH) is the most prestigious training ground for athletes in New Zealand. And while MISH students are very talented athletes, sport is only one part of their studies.

While every athlete at the MISH must stick to very strict training and dietary regimes, some athletes train for up to eight hours a day - they also need to:

- Attend school, Polytech or university - and achieve good grades
- Be well behaved and follow the rules for the training facility
- And most importantly they need to want to "be the best that they can be."

Taken together, this means that the athlete will not only excel at his or her chosen sport, but will also be able to apply these learnings to all parts of life. So, whether they become a world champion or move on to other things - they will be a success in making a Good Life for themselves.

Who has a healthy lifestyle?

Read the following scenarios, adapting them if necessary to make them appropriate for your students, their families, whanau, or communities. After listening to the scenarios, students can consider the questions that follow.

Scenarios

Keri and Pat both go to Rangi Intermediate School.

Keri is an active student who delivers newspapers every morning before school. Breakfast is always on the run, but Keri manages to eat cereal and also eats a banana while biking to school. Often Keri is out delivering the newspapers when Mum and Dad go to work in the mornings and misses seeing them before going to school.

After a busy day at school and at sports training after school, Keri has to heat dinner in the microwave before doing homework and collapsing into bed at 9.30pm. Keri is really conscientious and mows Granny's lawns every weekend before going to sport.

Pat leads an inactive lifestyle and hates physical education at school. Pat often has fried eggs and hash browns for breakfast and can sleep in until 8am every morning because Mum drives Pat to school in the car.

Pat's mum can't believe how much food Pat can eat. After school, when Pat's friends and Pat walk home past the dairy, they usually take turns to buy ice creams and lollies.

After arriving home, Pat has to look after a younger brother and sister. Dinner is always at a good time at Pat's house as there is always plenty of food, including vegetables, and family conversation, followed by everyone watching television. Pat usually goes to bed at about 10pm.

Questions

Using the following questions, ask students if it is possible to decide whether Keri or Pat has the healthier lifestyle.

- How might the various aspects of Keri's and Pat's lifestyles influence their health?
- What does the term healthy food choices mean to you?
- What is good about Pat's lifestyle? What may be missing?
- What is good about Keri's lifestyle? What may be missing?

Scenarios taken from page 10 of "Food Choice", a New Zealand Health and Physical Education Curriculum resource.

Unit 1

Good Life!

Worksheet 1 Food and Activity Diary

Write down everything you eat and drink including how much (for example, 1 cup of whole Milk with 2 teaspoons of Milo, 1 packet of Maggi 2 minute noodles) over the next two days. Record your mood and feelings (for example, hungry or bored) when you eat.

At the same time record all the activities that you do (including sleeping, doing your homework, as well as activities like playing sport, walking to school etc) over the next two days. Don't forget to include how long each activity took.

Keep your diary and a pencil with you all the time so you remember to write down all activities regularly throughout the day.

Your diary may look like this:

Time	When	Food and Drinks	My mood & feelings	Activity & time spent
8:00am	Before school	Two slices white toast with Marmite, 1 banana, ½ cup orange juice	A bit sleepy still!	Rode bicycle to school (10 minutes)

Time	When	Food and Drinks	My mood & feelings	Activity & time spent
6:00am 7:00am 8:00am	Before school			
9:00am 10:00am	Before recess			
10:00am 10:30am	Recess			
10:30am 11:00am 12:00pm	Before Lunch			
12:00pm 1:00pm	Lunch			
2:00pm 3:00pm	After lunch			
4:00pm 5:00pm	After school			
6:00pm 7:00pm	Dinner			
8:00pm 9:00pm	Before bed			
10:00pm – 6:00am	Bedtime			

Unit 2: Good Health

Students will be able to:

- Create their own definition of health
- Explain the function of nutrients in relation to health
- Describe the food groups
- Understand the concept of Eating for healthy teenagers
- Identify the influences on snack and general food choice
- Communicate the effects of good food choice and health
- Describe how food choice is influenced by social needs
- Set goals to make healthier food choices

Achievement Objectives:

- Students will be able to identify their nutritional needs for health (Strand A1)
- Students will be empowered to take a critical look at their own nutrition and food choices (Strand A1)
- Students will develop an understanding of why they eat and the external influences on their food choices (Strand D1)
- Students will develop an action plan for changes to food choices so their nutritional needs are met (Strand A1)
- Students will develop interpersonal skills and work together on a group activity and support team decisions (Strand C1)

Resources:

- Worksheet 2A - Food Groups and Nutrients
- "Food Fantastic"
- Worksheet 1 - Food and Activity Diary
- Worksheet 2B - Healthy Diet Check-List

Athletes bodies are often referred to as 'well-oiled machines' and this is quite a good analogy.

If you think of your body as a machine, a car for example, it is easy to understand why being healthy is so important. If you don't take care of your car - by regularly filling it up with petrol, driving it and getting it serviced, it can stop working altogether.

Similarly, you need to regularly refuel with good food, get exercise and take care of yourself to keep yourself at your best and feeling good.

Activities

Class Structure	Activities	Teaching Points
Individuals	Students write their own definition of what it means to be 'healthy'	Copy the definition of 'healthy' from the dictionary on the board to stimulate discussion Macquarie Dictionary definition: <u>Health</u> - soundness of body <u>Healthy</u> - possessing or enjoying health
Whole Class	Class discussion on what it means to be 'healthy'. Students brainstorm concepts of health including physical, emotional, mental, spiritual and social aspects affecting their well-being	
Whole Class	Finalise a class definition of 'health'	
Group Work	Group discussions of the role of food and 'health'. How does food affect well-being? Groups report back to the class with their definitions and roles. How do these fit into the class definition of 'health'?	Students to use butcher's paper and pen to transcribe ideas from their group discussions
Whole Class	Discuss the 'Food Groups' and function of nutrients using handout 2A 'Food Groups, Nutrients and Functions in the Body'	The basis of a balanced diet is a variety of foods eaten each day from all the 'Food Groups'. Students are to identify how each food group has a specific role in health.
Whole Class	Introduce "Eating for healthy teenagers"	This guide provides information about the amounts and kinds of food children need to eat each day to get enough of the nutrients necessary for good health.
Individuals	Using information from their 'Food and Activity Diary' (Unit 1), students are to assess the quality of their nutrition intake.	Students are to refer to worksheet 2B - 'Healthy Diet Check-List' to analyse their food intake and make recommendations. The aim of the activity is for students to analyse their own food choices using the 'Food Groups'.
Whole Class	We eat not only because we are hungry. Students brainstorm other reasons why we eat: eg. Taste, likes, time, nutrition, boredom, social occasions. The responses are then divided into	To achieve health promoting behaviour, students need to understand how their social, emotional and spiritual needs influence their eating habits. This exercise will develop learning experiences for students to enable them to make decisions on nutritious food

	<p>'Social', Physiological', 'Emotional' and 'Spiritual' needs</p> <p>Discuss these needs encouraging students to use their own experiences with examples of their behaviour.</p>	<p>choices in the context of their social, emotional or spiritual health needs.</p>
Individuals	<p>Using their food diary students' list reasons why they eat. Once this list is made, create a continuum, from most to least, of the influences they face for food choice. E.g. Availability > Taste > Media > Culture.</p>	<p>How other needs drive eating behaviours rather than the physiological need for food. Students find reasons relating back to their food diary and reflect on how they were feeling when eating at different times / occasions of the day.</p>
Individuals	<p>Using information from their food diary and the continuum they have created, students are to suggest modifications and goals to improve their diet and reflect on the possible outcomes of the decisions.</p>	<p>This action plan involves the critical thinking and action process required to empower students to begin taking positive action towards food selection.</p> <p>The stages in an action plan are as follows:</p> <ol style="list-style-type: none"> 1. Gathering and evaluating information related to either their own diets or to societal factors that impact on food beliefs and habits. 2. Deciding whether action is necessary and, if it is, setting associated goals. 3. Identifying factors that will make the achievement of set goals either easier or more difficult. 4. Planning and acting to overcome the barriers and achieve the goals and reflecting on what happened. <p>This action plan involves critical thinking and critical action and empowers students to begin taking positive action towards food selection and preparation.</p>

Unit 2

Good Health!

Handout 2

Food Groups, Nutrients & Functions in the Body

Which Group?	What Nutrients?
Bread, cereals, rice, pasta and noodles	This food group provides protein, carbohydrates, fibre, vitamins and minerals
Vegetables, legumes (eg dried peas, beans & lentils)	This food group provides fibre, carbohydrates, vitamins (particularly A & C) and minerals
Fruit	Fruit is a good source of vitamin C and a mineral called folate. Fruit skins also provide carbohydrate and fibre
Milk, yoghurt, cheese and other dairy products	Dairy foods are the best source of calcium. They also provide protein, carbohydrates, vitamins and minerals and some fat
Meat, fish, poultry, eggs, nuts and legumes	This group provides good sources of protein, fat, vitamins and minerals, particularly iron to carry oxygen around our body
Extra foods	Extra foods are the other foods we eat and enjoy in small amounts like biscuits, ice cream, chocolate, chips etc.

To eat a healthy diet:

1. Eat enough foods from each of the five food groups
2. Choose different varieties of foods from within each of the food groups from day to day, week to week and at different times of the year
3. Eat plenty of plant foods (bread, cereal, rice, pasta, noodles, vegies, fruit and legumes)
4. Moderate amounts of animal foods (milk, yoghurt, cheese, meat, fish poultry, eggs)
5. Enjoy only small amounts of the 'extra foods' as well as oils and margarine
6. Drink plenty of water

Which Group?	Found In	Function in the Body
Protein	Meat, fish, poultry, eggs, nuts, legumes (dried beans, peas and lentils), milk yoghurt and cheese	Essential for growth and repair and maintenance of a healthy body. Makes up part of the structure of cells in the body
Carbohydrate	Bread, cereal, rice, pasta, noodles, vegetables, legumes, fruit, milk and yoghurt	Major source of fuel for energy. Allows protein to be used for growth and maintenance of body cells.
Fats Saturated Monounsaturated Polyunsaturated	Butter, lard, coconut oil, copha, cooking margarine, palm oil, ghee cream, milk, cheese and icecream Olive oil, canola oil, peanut oil and peanut butter Safflower, sunflower and other vegetable oils (including margarine produced from vegetable oils), nut oils like almond and walnut	Most concentrated source of energy. Fat is used in the structure of every cell in the body. Supplies fat-soluble vitamins (A, D, E and K) as well as essential fatty acids
Vitamins & Minerals	Found in lots of different foods. For example, vitamin C is found mostly in fruit and vegetables while the vitamin B group is found mostly in cereals as well as in fruit and vegetables	Needed in small amounts for normal growth and health everyday. Essential for the body to help carbohydrate foods to release energy. Important for other body structures.

Unit 2

Good Health!

Worksheet 2 Healthy Diet Check-list

Using the information from your Food Diary...

Fill in the chart with how many serves you have eaten from each of the food groups for Day 1 and Day 2. You will need to compare the number of serves you have eaten with the amount of recommended every day and answer the questions under the chart on how your diet rated. Check how much is a serve by using the table on the next page.

Target on eating	Bread, cereals, rice, pasta, noodles	Vegetable & legumes	Fruit	Milk, yoghurt, cheese	Meat, fish, poultry, nuts, legumes	Extra foods
Recommended number of serves each day	6	3	2	3	1-2	1-2
How many serves I had on day 1						
How many serves I had on day 2						

Are you on target?

- Did you meet your target for the number of serves in each food group?

☐ Yes ☐ No

If no, which food group(s) did you:

- not eat enough of _____
- eat too much of _____

- Now that you have looked at your targets, draw up your own menu of foods and drinks with the recommended number of serves for all your meals and snacks. Check that you are on target now.

What is a serve?

Food Group	Sample Serve Size
Breads & cereals	1 roll (50g) 1 muffin (80g) 1 medium slice of bread (26g) 1 cup cornflakes (30g) Half cup muesli (55g) or cooked cereal (130g) 1 cup cooked pasta (150g) 1 cup cooked rice (150g) 2 sweet biscuits
Vegetables & Fruit	1 medium potato or kumara (135g) Half cup cooked vegetables (50-80g) Half cup salad (60g) 1 tomato (80g) 1 apple, pear, banana or orange (130g) 2 small apricots or plums (100g) Half cup fresh fruit salad (120g) Half cup stewed fruit (135g) 1 cup fruit juice (250ml)
Lean meats, chicken, seafood, eggs, dried beans, peas & lentils	2 slices cooked meat (approx 100g) Three-quarters of a cup of mince or casserole (195g) 1 egg (50g) 1 medium fillet of fish – cooked (100g) 1 medium steak (120g) Three-quarters of a cup dried cooked beans (135g) 2 drumsticks or 1 chicken leg (110g) 1 medium puau (120g) 2 medium mussels (30g) 1 kina (100g)
Milk & Milk Products	Glass milk (250ml) 1 pottle yoghurt (150g) 2 slices cheese (40g) 2 scoops icecream (140g)

Appendix 6

Food fantastic – eating for healthy adolescents

Eat many different kinds of food each day

Life as a teenager can be fast, furious and fun – and so can your food. Include from these four groups to get the nutrients you need to stay healthy, active and alert:

- fruits and vegetables
- breads and cereals
- milks and milk products
- lean meats, chicken, seafood, eggs, dried peas, beans and lentils.

Fruit and vegetables

- Provide carbohydrates, fibre, vitamins and minerals and are low in fat.
- Choose fresh if you can.
- Have with most meals – every day.
- Enjoy raw or lightly cooked.
- Ideal snack food.

Choose at least three servings of vegetables and two servings of fruit every day.

Serving size samples:

- 1 medium potato, kumara or similar-sized root vegetable (135 g)
- half a cup cooked vegetables, for example, puha, watercress or corn (50–80 g)
- half a cup salad (60 g)
- 1 tomato (80 g)
- 1 apple, pear, banana or orange (130 g)
- 2 small apricots or plums (100 g)
- half a cup of fresh fruit salad (120 g)
- half a cup stewed fruit (135 g)
- 1 cup fruit juice (250 ml).

Breads and cereals

- More than just bread and breakfast cereals, this also includes rice and pastas.
- Provides carbohydrates, fibre and other nutrients.
- Satisfies your hunger longer than sweet biscuits, cakes or sweets.
- A great source of energy for growth, sport and fitness.
- Ideal to meet the demands of intense physical activity.
- Try some wholegrain varieties.

Fill up on breads and cereals when hungry. They are great choice for meals and snacks.

Choose at least six servings each day, including some wholegrain. Most adolescents will need more than this – especially for young men who need even more to meet their needs for extra energy (calories).

Serving size samples:

- 1 roll (50 g)
- 1 muffin (80 g)
- 1 medium slice of bread (26 g)
- 1 cup cornflakes (30 g)
- half a cup muesli (55 g)
- half a cup cooked cereal (130 g)
- 1 cup cooked pasta (150 g)
- 1 cup cooked rice (150 g)
- 2 plain sweet biscuits (14 g).

Milks and milk products

- Includes milk, cheese, yoghurt and ice cream.
- Valuable sources of calcium and protein.
- Choose low fat milk for extra calcium.
- You need high-calcium foods to build strong bones during teenage years.
- Try milk, cheese and yoghurt as snacks.
- Keep active – regular exercise keeps bones strong in later life.

Choose at least three servings each day, preferably low fat.

Serving size samples:

- milk (250 ml)

- 1 pottle yoghurt (150 g)
- 2 slices cheese (40 g)
- 2 scoops ice cream (140 g).

Lean meats, chicken, seafood, eggs, dried beans, peas and lentils

- Valuable sources of protein, iron and other nutrients.
- Your body needs lots for growth, mental and physical activity and sports.

Iron needs for women increase when periods begin.

The iron from meat, chicken and seafood is used more easily by the body. Iron from other foods is better able to be used if eaten at the same time as foods rich in vitamin C (eg, fresh fruits and vegetables, especially oranges, kiwifruit and peppers).

Choose 1–2 servings each day.

Serving size samples

- 2 slices cooked meat (approx 100 g)
- three-quarters of a cup mince or casserole (195 g)
- 1 egg (50 g)
- 1 medium fillet of fish – cooked (100 g)
- 1 medium steak (120 g)
- three-quarters of a cup dried cooked beans (135 g)
- 2 drumsticks or 1 chicken leg (110 g)
- 1 medium paua (120 g)
- 3 medium mussels (30 g)
- 1 kina (100 g)

Vegetarians

If you are a vegetarian it is important to understand your body's needs and plan your meals and snacks carefully.

By not eating meat, vegetarians need foods with lots of iron, such as wholegrain cereals, dried peas, beans and lentils, dried fruits and dark green leafy vegetables. Eat vitamin C rich foods with these meals to help absorb iron.

For vegetarians who don't eat cheese, milk or eggs, mixed meal and cereals, tofu, dried peas, beans and lentils will also give protein.

Eat enough for growth and physical activity

- You need more energy (calories) now than ever before. During rapid growth, energy and nutrient needs are high, so you must eat enough food to get all the nutrients your body needs.
- Choose from the four food groups first to meet this need for extra energy.
- Snacks are needed, but limit high-fat, high-sugar foods.
- There is no exact or ideal body weight or shape. Body shapes change naturally when you are growing as proportions of fat and muscle change. If you get little exercise and choose high-calorie foods too often you may gain unneeded weight.

Physical activity

- Everyone benefits from regular physical activity.
- Try and be physically active on most if not all days of the week.
- Activity includes biking, walking, swimming, dancing and playing sport.

If you are very active you will need more to eat than most. If you are involved in heavy physical training and endurance sports events you will have special food needs. It's best to get ideas and advice from a dietitian or a sports medicine specialist.

Choose foods low in fat, sugar and salt

Establish good eating habits while young and promote good health in your adult life.

Achieve this by:

- eating foods low in fat, sugar and salt
- keeping fit by exercising often
- watching your weight
- choosing not to smoke.

Many fast foods, takeaways and snacks are high in fat, salt and/or sugar. For example, chocolate bars, muesli bars, potato chips, French fries, doughnuts, pies, sweets, fruit leathers and soft drinks.

Instead of eating these high-calorie foods every day, eat them only now and then. If you eat them too often, you may gain weight.

- Eat more bread, cereals, fruits and vegetables.
- Choose low fat varieties of milk, cheese and yoghurt.

- Spread margarine and butter thinly.
- Eat less saturated fat, eg, butter, meat fats, dripping, sausage and cream.
- Choose lean meats, trim off the fat, skim fat off stews, remove skin from chicken and eat more frilled or steamed fish.
- Keep sugary foods and drinks to mealtimes to protect your teeth from decay.
- Grill, steam, microwave, boil or bake meals without adding fat.
- Eat meals without adding extra salt.
- When shopping, read labels and look for pre-prepared foods that are lower in fat, salt and sugar.

Choose snacks well

Active teenagers need snacks. Snacks help provide the extra calories you need for growth and physical activity and will satisfy large appetites. Snacks should be low in fat, salt and sugar, for example, fruit, bread, yoghurt and low fat milk. They should provide plenty of energy as well as nutrients.

Snack ideas

- Bread, bread rolls, bagels, Māori and pita bread, French sticks. Try some wholegrain varieties.
- Muffins, crackers, fruit buns, scones, fruit bread, pancakes, popcorn – pop your own.
- Pasta and rice.
- Snack filling ideas: egg, lean meat, seafood, cheese, lots of salad, peanut butter, jam, spaghetti, baked beans, vegemite, banana or cottage cheese.
- Breakfast cereals low in fat and sugar served with low fat milk.
- Yoghurt, plain or flavoured milk and ice cream.
- Fresh fruit eaten whole or served with yoghurt, blended into a milkshake or served with a slice of cheese.
- Fresh vegetables, eaten raw, like carrots, tomatoes or coconut.
- Leftovers reheated, for example, stews, soups, vegetables such as potato, taro, pumpkin or kumara.

Drink plenty every day

- Drink at least six to eight glasses every day.

You need to drink plenty of fluid every day. Even more during hot weather and when you are very active (especially before, during and after sports events).

Great Drinks

- Water is best. It is cool, refreshing, easy to get and FREE. Keep a jug of cold water in the fridge.
- Milk is a cool drink, it's rich in calcium and makes a good snack. Low fat milks are recommended.
- Dilute fruit juice with plenty of water. Add lots of ice. Limit to meal times only because the natural sugar present can cause tooth decay.

Soft drinks are popular, but don't drink too much. They can be a source of unneeded calories.

Coffee and tea should be limited. Tea should not be drunk with meals because the tannins in tea mean you will not absorb the iron as well as you could.

Alcohol is not recommended

Alcohol is not recommended because it is a drug that affects every part of your body. If you decide to drink, limit your intake – keep it to a minimum. Alcohol supplies unnecessary calories and almost no other nutrients, so can contribute towards obesity.

If you do decide to drink alcohol:

- *be responsible*
- eat some food when you drink alcohol
- dilute alcoholic drinks with plenty of water or mixers and lots of ice
- do not binge drink
- do not drive
- if you are having a party, make sure you provide plenty of fruit juice, soft drinks and water, low alcohol drinks and plenty of food throughout.

Smoking

- Being smokefree is recommended.
- Smoking shortens your lifespan, makes you broke and doesn't help to make friends.
- Some people think smoking is an easy way to lose weight. This is not true.

For more information contact:

Dietitian at your local hospital.

Local dietitian – try the *Yellow Pages*.

Registered nutritionist.

School counsellor or health education co-ordinator.

Community health centre.

National Heart Foundation.

Doctor, doctor's nurse (practice nurse).

Nutrition Foundation, PO Box 33-1409, Takapuna, Auckland.

Cancer Society, PO Box 12 145, Wellington

Unit 3: Food and You

Students will be able to:

- Describe nutrients and foods important for growth
- Understand the reasons for eating and food choice
- Understand the consequences of their food choices
- Describe the components of food and their nutrient value
- Explain the importance of snacks
- Identify the influences on snack and general food choice
- Communicate the effects of good food choice and health
- Describe how food choice is influenced by social needs
- Set goals to make healthier food choices

Learning Outcomes:

- Students will be able to identify pressures that can influence food choices and demonstrate basic assertiveness skills to manage these (Strand C3)
- Students will investigate and describe lifestyle and media influences that impact on food choices and contribute to common food and nutrition health problems (Strand D1)
- Students will recognise that different cultures may have different beliefs associated with food (Strand C2)
- Students will develop skills to meet and manage food issues at a personal or societal level (Strand C3)
- Students will develop effective communication skills to interact positively with others and enhance emotional wellbeing, personal identity and self-worth (Strand C1)

Resources:

- Worksheet 3A - Ripper Recipes
- Worksheet 3B - Snack Analysis
- Worksheet 3C - Canteen Survey
- Handout 2A - Food Groups and Nutrients
- Food Fantastic

We are often told - 'we are what we eat'.

WHY?

It is important to know how foods help you grow and why balance is important in terms of what and how much you eat every day. Everyone needs to understand that the foods we choose affect our daily life. We need to understand what factors affect our food choice. Athletes understand this - it helps them choose foods that boost their total performance.

Activities

Class Structure	Activities	Teaching Points
Group Work	Working in small groups, students are to give examples of how members of their own family eat differently.	<p>The primary years are a time when children are exposed to a whole range of new foods from outside their own home.</p> <p>School friends, teachers, the school tuck-shop and images in the media all introduce new food experiences.</p> <p>A multitude of foods from different cultures contributes to our food choice and understanding of our multicultural society.</p>
Pairs	'My favourite food' - one student is to write down their favourite food on a piece of paper and conceal it. The other student asks questions to try and guess the name of the food. Questions on why they like the food should be explored.	
Whole Class	'Food Heads' - a food version of the 'Celebrity Heads' - students are given hats with well known foods written on them so they cannot see (however, the rest of the class can) - they have to guess what sort of food they are by asking questions. The class answers 'yes' or 'no'.	Foods may be categorized according to their origin, (ie plant or animal), food group, meal type etc. This activity explores a multitude of reasons on how students may categorise food.

Pairs	Students look at Handout 3A - 'Ripper Recipes'. Look at why home prepared dishes are often nutritionally better than take-away ones. Students work in pairs and nominate their favourite dish and make up their own recipe for it.	It is important that students are empowered to develop a sense of understanding and control over food choices. This happens at two levels: 1. Students as individuals have a sense of control over what they eat. 2. Students develop skills and the understanding required to work collectively with others to overcome problems or barriers that have a negative impact on their food choices.
Whole Class	Suggested discussion points: How would these food choices assist energy needs for activity	Students will begin to understand how they can make food choices and how food choices can determine energy levels.
Whole Class	Discuss the 'Snacks' section of 'Food Fantastic'. Suggested discussion points: What are these foods part of this category? What are snacks? What happens if we eat too much fat, sugar, salt? How do snack affect performance e.g. sport and study? Encourage students to talk about their own snack choices and sporting activities etc. Write a class definition of 'Snacks' on the board.	Snacks are an important part of children's diets because they are growing rapidly and have high energy and nutrient needs. Snacks are also important for physical activity and sporting performance. Unfortunately many snacks are high in fat and low in fibre.
Group Work	Working in groups, students are to complete worksheet 3B 'Snack Analysis'. Students are to analyse their food diary from lesson 1 and list their snack choice under the headings 'Where', 'When' and 'Why' they ate snacks. Students report their findings back to class and draw conclusions. Students could also graph the class results of their snack choices and draw conclusions from the food diaries.	This activity examines the role of snacks in the diet and enables students to identify issues related to their snack choices (ie. Peer / advertising influence / physiological need / access to healthier food choices etc). This is particularly relevant to this age group as it allows students to change their personal diets by exploring the reasons for their snack choice and implement health-promoting strategies to improve their diet.
Group Work	Working in groups and using Worksheet 2A - Food Groups and Nutrients (from Unit 2). Groups are to categorise snacks under the food groups. What snacks should be encouraged every day? Give reasons for their answers and snack examples.	

Whole Class	Class discussion on the influence of advertising, convenience and peer pressure on food choice. Display a number of magazine advertisements for snacks around the room to prompt discussion.	This activity enables students to understand the values, attitudes and behaviours related to their food choices.
Whole Class	Introduction of food choice issues and their social context. Relate their food choices in a variety of settings - the take-away food store, milk bar, the school tuck-shop etc. Discuss how food choices are made (look back on Unit 2 a the food continuum)	Food habits are influenced by social needs.
Pairs	'School Tuck-shop Survey' - worksheet 3C. Students survey the school tuck-shop menu and categorise the types and varieties of foods sold. Compare with Food Fantastic recommendations. Students to draw conclusions on their findings (ie What recommendations you would make? Why?) Students could also consider how price affects their food choice and discuss implications. (could use a take away food store as an alternative to the tuck-shop)	<p>This activity encourages students to set goals to bring about change in their personal eating behaviours and explore societal issues.</p> <p>The school tuck-shop manager could also be invited to talk to the students about issues relating to health and tuck-shop management. (Could also be informative in relation to budget implications for tuck-shop management).</p>
Whole Class	Report back to the class with their conclusions	
Whole Class	Conduct a survey of class purchases from the school tuck-shop. Graph findings and discuss reasons for purchases. This could be presented on spreadsheets.	

Unit 3:

Food & You!

Handout 3A Ripper Recipes



Milo Banana Smoothie

- 2 cups reduced fat milk
- 1 banana, roughly chopped
- 2 tablespoons reduced fat natural yoghurt
- 2 tablespoons Nestle Milo
- Ice cubes

Combine all ingredients in blender until thick and creamy, pour into serving glasses. Serves 2.

Create your own recipe

Using these recipes as an example, create your favourite dish.

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Breakfast Health Bars



- 2 cups Rice Bubbles cereal
- 1 cup rolled oats
- ½ cup flaked almonds
- ½ cup coconut
- ½ cup dried apricots
- 1 cup sultanas
- ½ cup Nestle Milo
- 60g Butter
- ½ cup honey

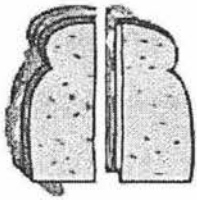
Combine first 7 ingredients in a bowl. Place butter and honey in pan, stir over low heat until butter has melted, pour over dry ingredients and mix well. Press mixture into foil lined tin (18cm x 28cm). Refrigerate until firm and cut into bars.

Food & You!

[illegible]

Unit 3

Food & You!



Worksheet 3C Tuckshop Survey



What is at our school tuckshop?

Prepared food

(e.g. pies, lasagne,
noodles, salad rolls,
sandwiches etc.)

Drinks

(e.g. milk drinks, juices,
bottled water etc.)

Snacks

(e.g. fruit, ice cream,
yoghurts, popcorn,
crackers etc.)

Unit 4: Fit Body

Students will be able to:

- Understand the effects of physical activity on the body
- Understand the role of activity in maintaining long term health
- Consider options available for recreational activities and implement a plan to participate
- Identify in simple terms the fitness requirements for taking part in selected activities / sports

Learning Outcomes

- Students will be able to work cooperatively in a team (Strand C1 & C3)
- Students will be able to identify the different components of fitness and the benefits exercise has on improving health and sporting performance (Strand A1 & A2)
- Students will understand the differences between the different types of exercise (Strand B3)
- Students will be able to design an exercise programme with a focus on an identified class goal or target (Strand A2 & D4)
- Students will support each other to reach class targets (Strand C1)

Resources:

- Handout 4A - Different Activities and the Body
- Handout 4B - Muscle Groups and Different Sports
- Worksheet 4C - Muscle Groups and Different Sports

Having a fit body means being well prepared to cope with the challenges of everyday life. It also makes us feel good and strong.

Athletes at the MISH have one thing in common - they are very fit. While we think of fitness in physical terms, the word 'fitness' really means being in good shape, being well-suited or well-adapted to the task at hand.

Did you know that MISH athletes have different levels of fitness? They have different levels of fitness for the different sports they choose to do. For example, a weightlifter can lift many kilos but might not be able to run very far. Similarly, a marathon runner can run for many kilometres but might not be able to lift anything very heavy.

Activities

Class Structure	Activities	Teaching Points
Group Work	Groups brainstorm the effects of physical activity. Place effects under the following headings: Physical, Social, Emotional and Mental.	SPARC recommends that children and teenagers should be physically active every day in as many ways as possible. A minimum of 30 minutes of moderate to vigorous intensity physical activity per day is recommended to provide health benefits (60 minutes per day will deliver optimal health benefits). A further benefit is achieved if children engage in three relatively vigorous sessions of activity per week, of at least 20 minutes. For further information on physical activity guidelines, visit the SPARC website: www.sparc.org.nz
Whole Class	Discuss the effects of physical activity on the body referring to handout 4A	Students are to investigate the different effects of exercise on the body. Look at aerobic exercise that works the heart and lungs compared to static exercise that does not promote cardiovascular health, but may promote flexibility.
Individuals	Students take their pulse by placing two fingers near the edge of their wrist for one minute and count. Students are then to do some star jumps for approximately 30 seconds. Have students count their pulse again.	There are over 650 muscles in the body. One of the most powerful muscles is the heart, which is responsible for pumping blood around the body. By taking their pulse before and after exercise, students will understand the effect of exercise on their body, E.g. Their heart beating faster and harder to transport more oxygen to their muscles as they work.

Individuals	<p>Students collect pictures of people playing different sports. Complete worksheet 3C. Discuss the major muscles used in these sports, how they develop and grow stronger. Discuss how other attributes that are important to performance - strength, speed, balance, skill level and so on.</p> <p>Students could compare different athletes, E.g. A swimmer and a weight lifter. This activity explores the major attributes to health related fitness: body composition, muscular strength, muscular endurance, flexibility and cardiovascular endurance as well as skill-related fitness: speed, power, coordination, balance and reaction time.</p>	<p>This activity explores the major attributes to health and skill related fitness.</p> <p>Answers to worksheet 3C:</p> <ul style="list-style-type: none"> * Marathon running - legs * Sprinting - shoulders and trunk * Weight-lifting - shoulders and back * Gymnastics - all muscles * Archery - legs, trunk and arms
Whole Class	<p>Students discuss the meaning of 'leisure'. Brainstorm specific leisure activities in which students and their families take part. Write the results on the class board.</p>	<p>This activity promotes the understanding that leisure time activities also contribute to overall fitness and well-being.</p>
Whole Class	<p>LUNCHTIME ACTIVITY</p> <p>Students are instructed to make a list of everything they did at lunchtime. Discussion - what types of activity can we do in the playground?</p> <p>What sporting, leisure or physical activities can we do?</p> <p>Class could look at what activities could be easily arranged to encourage more students to become active.</p> <ul style="list-style-type: none"> * What other activities could boys do? * What other activities could girls do? * What would be suitable for both? 	<p>There are many sports that are popular for young New Zealanders. If you would like more information about introducing these sports to your schools, to go the SPARC website: www.sparc.org.nz</p>
Individuals	<p>Using the information from the brainstorm activity above, conduct a survey of leisure activities of students in the class. Students are to present the information on a pie graph or use</p>	<p>Students need to be challenged on how to make productive use of their leisure time. What one student may consider 'leisure time', may not be the same for other students. Students can also be encouraged to explore the diversity of</p>

	percentages to represent class findings. Students are then to draw conclusion from their findings.	leisure pursuits in different cultures (eg. Maori dance, tai chi, ?? etc).
Group Work	<p>Involve groups in planning an 'interesting' walk / run circuit around the school grounds. Make it interesting by involving all the features of the school such as: adventure playground, grass, court areas, through trees, up slopes, using playground markings etc.</p> <p>Each group should draw up a map and mark out their circuit on the map. Have the groups decide which parts of their circuits should be walked, jogged, hopped, skipped, run etc. Using a different groups circuit every three days or week, get the whole class to travel around the circuit - those responsible for developing the circuit should lead the way.</p> <p>As an addition to the walk / run circuit, students may develop 'stations' around the circuit to do particular activities E.g. run and weave between some trees, 15 star jumps inside the free throw area on the basketball court.</p>	<p>Running and walking are an important part of the daily fitness and exercise programme. For long term benefits, aim for the students to walk, jog or run for 30 minutes per day. Students must feel they 'own' the programme. This means they must have a hand in planning and organization and must know the benefits of such a programme prior to starting.</p> <p>Further incentives: (taken from www.teachingonline.org/running.html)</p> <ul style="list-style-type: none"> * Have students develop a series of graduated rewards. Eg. Award 1 after 10 circuits completed, award 2 after 25 circuits etc. * Measure the distance of each circuit with trundle wheel. Have each student write down accumulated distances on personal or class charts. * Tally class differences and have them used on a 'walk' around the South Island. Mark the distances on road maps. This can be a class or group challenge. * See where we meet! Half the class starts at the North Cape and the other half at the Bluff. Follow State Highway One. Where do we meet? What towns do we pass through?
Group Work	Students to create a poster to encourage physical activity in the community	<p>This activity may take a 'whole school' approach by encouraging students to promote safe use of playground equipment in the school. Recommendations could also be made to their school council / parliament / principal on improving the use of playground space.</p>

Unit 4

Fit Body

Handout 4A

Different Activities and the Body

Measuring Different Things - Physical

Standing height – if you are 12 years only and measure 173cm or more you would be classified as tall for your age and could be good at rowing or volleyball.

Sitting height (to give trunk and leg length) – a long trunk (with short legs) is advantageous in sports such as canoeing and a short trunk (with long legs) would be suited to high jump. A rule of thumb measurement is that your sitting height should be 52-53% of your total height. Long legs are good for reach but are a disadvantage when turning.

Arm span – a large arm span is one that is 5-10cm greater than your height and would be an advantage in sports like rowing, discus and canoeing. A short arm span would be better suited to sports such as weight-lifting.

Measuring Different Things - Physiological

Explosive Power – is determined by measuring your vertical jump capacity. Explosive power is good in sports such as cycling and weight-lifting.

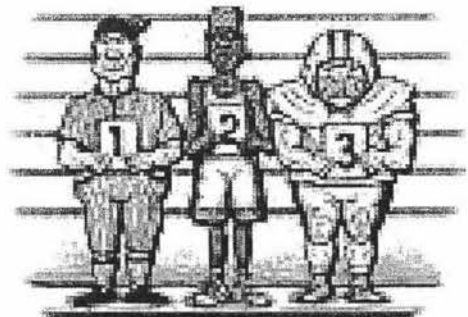
Sprint Speed – is measured over 20m and 40m and being fast is good in team sports

Endurance – is suited to sports such as marathon, cycling, swimming and triathlon.

Different Bodies!

Different sports require athletes to train in different ways. Within teams people can have different roles depending on their height and shape. For example in a netball team goal shooters and goal defenders need to be tall but mid court players can be shorter and faster.

Certain physical and physiological tests are made to match up an athlete with what sport they could be good at and to determine what sort of training they should be doing.



It takes all shapes and sizes to make a sports person!

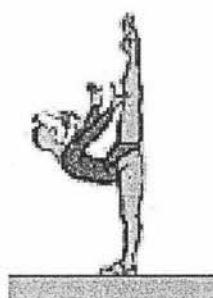
What is your favourite sport and is it more important to have explosive power, sprint, speed or endurance?

Unit 4

Fit Body

Handout 4B

Muscle Groups and Different Sports



Five S's of Training – Skill, Stamina, Suppleness, Strength, Speed

Target Sports	Endurance Sports	Flexible Sports	Power Sports	Fast Sports
Require skill	Require stamina	Require suppleness	Require strength	Require speed
Archery, darts, golf, shooting, lawn bowls	Marathon, rowing, swimming, road cycling, triathlon	Gymnastics, synchronised swimming	hammer throw, discus, weight lifting, shotput	sprinting, team sports e.g. soccer, hockey

Unit 4

Fit Body

Worksheet 4C

Muscle Groups and Different Sports

Training

In the handout 4B we looked at the 5 S's of training. List one additional sport requiring each of the following:

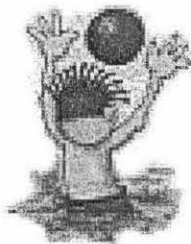
Stamina

Skill

Strength

Speed

Suppleness



Muscles

Some muscles help you perform actions by helping you move your joints. These are often the powerful muscles that can help you move fast and have a tendency to get bigger if you use them regularly e.g. arm biceps.

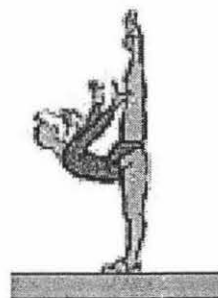
Other muscles help hold the body stable so that you can move your arms and legs, like those muscles around your shoulder blade, hips and abdomen.



Match the muscle groups that would be most important to the following sports:

1. Marathon running
2. Sprinting
3. weight-lifting
4. gymnastics
5. swimming
6. archery

All muscles
shoulders and trunk
shoulders and back
legs
all muscles
legs, trunk and arms



Unit 5: Mind Power

Students will be able to:

- Develop and maintain a positive self-concept
- Recognise the influences on self-esteem and behaviour (personal abilities, family, friends, community)
- Understand the process of goal setting
- Understand the concept of self-identity and 'uniqueness'

Students will be able to:

- Identify the importance of role models and the roles they play (Strand A1 & A4)
- Understand an alternative view on situations, events, relationships etc. (Strand A4)

In New Zealand there are many talented athletes - but what makes these athletes become sporting champions? Fitness and training are important but it is also their mental attitude that gives them the ability to move on to greatness.

A positive attitude and the ability to work towards goals are crucial to every athlete's success. Additionally they need to be able to remain focused on what they want to achieve and have the self-discipline to stick to their goals even when they are tired or would prefer to be doing something else.

While the average person probably does not need to be as disciplined or focused as an athlete training for the Olympics or Paralympics, we can learn from their experience and find ways to make our lives a great performance.

Activities

Class Structure	Activities	Teaching Points
Whole Class	<p>Develop a class ID poster:</p> <p>Teacher lists characteristics:</p> <ul style="list-style-type: none">* Appearance - physical* Interests - hobbies / sports* Responsibilities - duties at home* Strengths - sense of humour, caring	<p>Students can start to understand what makes them unique and special. What components make up people - more than what you can see and hear.</p> <p>Teacher can have extensive input as to how they see the class as a whole</p>

Individual	<p>Student writes a personal profile of him or herself describing appearance, interests, strengths, achievements and responsibilities.</p> <p>Utilising the list from the previous activity, students describe themselves.</p>	
Whole class	<p>Teacher leads a discussion on achieving. What is an achievement - when we achieve, how do we feel?</p> <p>Teacher leads a discussion on failure. When have you attempted to do something and failed? How did you feel and what did you do?</p> <p>Discuss how class thinks NZ athletes would handle success and failure.</p> <p>Are there parallels between achieving / failing and winning and losing - how are these things similar? Students discuss how they think about themselves.</p>	<p>Reactions to achieving are listed.</p> <p>Reactions to failing are listed and how to turn negative feelings into positive feelings.</p> <p>Investigate self-esteem issues. How do family, friends, peers, sporting heroes influence them?</p>
Group Work	<p>Students brainstorm positive attributes about each other working in groups. Build up a list of positive attributes and then discuss how each individual feels about the list:</p> <ul style="list-style-type: none"> * What are the similarities or differences with others in the group? * Who do they admire? 	
Whole Class	<p>Compare and discuss the various influences on their lifestyle - diet, physical activity choices, interests and values.</p> <p>How does what we see and hear affect us? Look at fads - how do we change our behaviour based on what is in or out, popular or not.</p>	<p>Identify the role of family, peers, media, culture and community in regard to our behaviour.</p>

Unit 6: Get Active

Students will be able to:

- Identify the factors that influence physical activity
- Set realistic goals to meet their physical activity requirements
- Make decisions on their own level of fitness and activity

Achievement Objectives

- Shows how to maintain and improve the quality of an active lifestyle (Strand A2, A2 & Strand B3)
- Communicates confidently in a variety of situations (Strand C1)
- Willingly participates in regular physical activity (Strand A2)
- Increasingly accepts responsibility for personal and community health (Strand D1)

Resources:

- Worksheet 6A - My Favourite Activities
- Worksheet 6B - Goal-setting

Activities

Class Structure	Activities	Teaching Points
Whole Class	Students are to transcribe the activities recorded in their Worksheet 1A - Food and Activity Diary, onto the class board.	Introduce the concept of 'accumulated activity' Explain that the accumulation of moderate exercise throughout the day will have health benefits. For further information on physical activity guidelines, visit the SPARC website: www.sparc.org.nz
Individual	Using the class results, students are to draw conclusions such as: What are the most popular activities? What are the most unusual activities? Students are to discuss and explore reasons that may have influenced the results.	

Individual	Students are to refer to their Worksheet 1A - Food and Activity Diary, and draw a pie graph of their representative activity such as sleeping, eating, time at school, sport etc. Students are to draw conclusions on what may happen if particular pieces of the 'pie' were bigger or smaller.	This activity relates back to the students concept of energy intake and energy expenditure from lesson 3 - Food and You.
Whole Class	Class discussion from students' pie graphs.	Encourage students to draw some conclusions about their own level of physical activity.
Group Work	Working in groups, students are to identify factors that influence their choice of activities. Complete worksheet 6A, students are to assess reasons why they enjoy different activities. Report back to the class.	By working in groups, students are more likely to be exposed to different reasons / barriers for activity choice by their peers.
Individuals	Goal setting exercise: Worksheet 6B. Students are to set short-term goals to increase their activity / participation levels. Include daily balance between physical activity, work, rest and relaxation.	In setting personal goals, students need to identify their own personal preferences in maintaining a life long habit. It is important for them to set realistic goals to increase their activity levels. Barriers to participating in a range of physical pursuits have been explored in Unit 4. Students are to investigate solutions to overcome these barriers as part of their goal-setting exercise.
Whole Class	Discuss how the activities they enjoy can be as beneficial as structured sporting games. Investigate what students mean by 'spare time'.	This can be related back to their goal-setting exercise on how they could be more productive with their 'spare time'. The concept of 'accumulated activity' and health benefits can be reinforced.
Whole Class	Role-play: 'Have a Go' Working in pairs, one student explains a physical activity that they currently enjoy to another student (including the rules of the game or sport if appropriate). The first student needs to explain why they enjoy the physical activity and why the other student should participate.	The aim of the activity is to persuade students to 'have a go' at a new physical activity or sport. Students could pose negative responses on why it is 'too hard' to participate. It is then up to the student explaining the activity to convince the other student. This activity will explore any perceived prejudices against involvement in physical activity or sport.

Unit 6

Get Active

Handout 6A My Favourite Activities

List your 3 favourite activities and why you enjoy them:

Activity	Activity	Activity
.....
I like this activity because: (tick the boxes)	I like this activity because: (tick the boxes)	I like this activity because: (tick the boxes)
<input type="checkbox"/> I can do it <input type="checkbox"/> My family does it <input type="checkbox"/> I saw it on TV <input type="checkbox"/> It makes me feel good <input type="checkbox"/> My friends do it <input type="checkbox"/> It's near where I live <input type="checkbox"/> It's new to me <input type="checkbox"/> It makes me healthy <input type="checkbox"/> It's cool <input type="checkbox"/> I do it on weekends <input type="checkbox"/> I do it after school <input type="checkbox"/> I want to get better at it	<input type="checkbox"/> I can do it <input type="checkbox"/> My family does it <input type="checkbox"/> I saw it on TV <input type="checkbox"/> It makes me feel good <input type="checkbox"/> My friends do it <input type="checkbox"/> It's near where I live <input type="checkbox"/> It's new to me <input type="checkbox"/> It makes me healthy <input type="checkbox"/> It's cool <input type="checkbox"/> I do it on weekends <input type="checkbox"/> I do it after school <input type="checkbox"/> I want to get better at it	<input type="checkbox"/> I can do it <input type="checkbox"/> My family does it <input type="checkbox"/> I saw it on TV <input type="checkbox"/> It makes me feel good <input type="checkbox"/> My friends do it <input type="checkbox"/> It's near where I live <input type="checkbox"/> It's new to me <input type="checkbox"/> It makes me healthy <input type="checkbox"/> It's cool <input type="checkbox"/> I do it on weekends <input type="checkbox"/> I do it after school <input type="checkbox"/> I want to get better at it
Other reasons:	Other reasons:	Other reasons:

Unit 6

Get Active

Handout 6B Time to Set Goals

Goal Setting Exercise

A 'goal' as you know, is something you aim to do in life. It's a bit like when you aim to score a goal in your sport or when you aim to get all your spelling words correct. By checking your Activity Diary, you can decide where you can set goals to increase your activity level. Remember you need a minimum of 30 minutes of moderate physical activity every day (60 minutes is even better!)

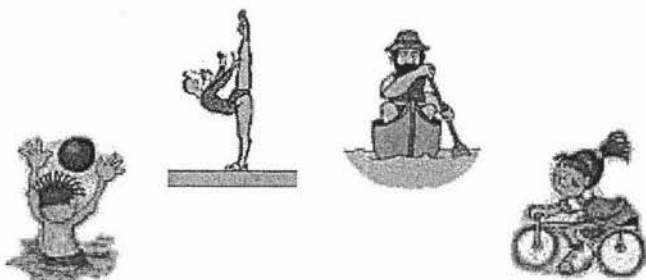
Write 5 statements that will help to motivate you to reach your goals. For example: "I am prepared to work hard to get what I want"

My goals are

Short term goals for the next 1-2 weeks
(for example, play soccer at lunch at least once at week)

Medium term goals for the next 1-2 months (for example, play soccer at lunch 3 times a week)

Long term goals for the next 1-5 years
(for example, find a sport I like and join a team)



Unit 7: Fuelling Your Body

Students will be able to:

- Understand the differences between physical activity, exercise, sport and fitness.
- Understand the effects of inactivity and sedentary behaviour
- Discuss the relationship between food and energy

Learning Outcomes

- Students will be able to work cooperatively in a team (Strand C1 & C3)
- Students will understand the differences between the different types of exercise (Strand B3)
- Students will support each other to reach class targets (Strand C1)
- Makes informed decisions and accepts responsibility for consequences (Strand C3)
- Suggests, considers and selects appropriate alternatives when resolving problems (Strand C2)
- Explains the consequences of personal lifestyle choices (Strand A1)

Resources:

- Worksheet 7A- Physical Activity / Exercise / Sport and Fitness - What does it mean?
- Handout 7B - Food for Fuel
- Worksheet 7C - Food and Energy
- Worksheet 1A - Food and Activity Diary

In Unit 2 we likened the human body to a car, so what happens if you put water in a car's tank instead of petrol?

IT DOESN'T WORK.

Your body is very similar to this - if you put in the wrong 'fuel', it may not work properly.

Given that different athletes achieve different levels of fitness - they also need very different diets to meet their training requirements. Did you know that some athletes eat a whole loaf of bread for breakfast everyday while others will eat many meals throughout the day? But they don't get fat. Why? Because they are

so active - they need to eat large amounts of good food to give them the energy they need to keep training.

Activities

Class Structure	Activities	Teaching Points
Whole Class	<p>What is the difference between the following - physical activity, exercise, sport and fitness?</p> <p>Class discussion on the terms. Students use handout 7A to give examples of each from their own activities.</p>	<p>Students will apply their knowledge about nutrition more effectively when it is relevant to them. By analyzing their own lifestyle (foods eaten and activity patterns) and how food affects their sporting performance, students will make more meaningful judgments. By discussing the terms physical activity, exercise, sport and fitness, students can begin to understand what they need to do to increase fitness.</p>
Whole Class	<p>Discuss the effects of 'inactivity'. Students brainstorm and list ideas. Discuss the effects of an imbalance between energy intake (too much food) and energy expenditure (too little exercise). Include a brainstorming session on the different types of inactivity - E.g. Gameboy, Nintendo, computers, TV.</p>	<p>Fitness / physical activity has both physical and psychological (including social) benefits. Students are encouraged to explore their own needs for fitness and how to incorporate physical activity into their lives.</p>
Individuals	<p>Students are to refer to handout 1A - 'Food and Activity Diary' (unit 1) and look at their activity level for both the days recorded. Students are to make recommendations on how to improve their level of physical activity.</p>	<p>By analysing their own lifestyle, students can determine if they are reaching the recommended target of 30mins per day of physical activity.</p>
Whole Class	<p>Class discussion of the concept of 'food as a source of energy' by referring to handout 7B - 'Food for Fuel'. Discuss the importance of nutrition and sporting performance.</p> <p>Using worksheet 7C, students are to calculate the number of kilojoules used for various activities.</p>	<p>Students should identify the importance of nutrition for elite athletes but also for everyday activities.</p> <p>Handout 7B provides a good opportunity for a comprehension exercise on key terms:</p> <ul style="list-style-type: none"> • Nutrients • Glycogen • What foods contain carbohydrates? • What foods contain fats? • What foods contain protein?

Groups	<p>Using the information from handout 7B - 'Food for Fuel' students are to give examples of their own meal / snack suggestions before playing a sport / activity and give reasons for their choice.</p> <p>Students are also to consider their need for fluids before, during and after physical activity.</p>	<p>Children have high energy and nutrient needs. Snacks are an important part of eating as they help meet energy needs for growth. By understanding how food contributes to their energy needs, students are able to make food choices suitable to their own needs. Children require approximately 1.0 - 1.5 litres of fluid per day (4-6 glasses). This requirement may increase in warm weather or during exercise. As well, a child's involuntary intake (i.e. their ability to recognise thirst) is not as well-regulated as in adults.</p> <p>Encourage children to carry an extra bottle of water during physical activities.</p>
Whole Class	<p>Class discussion from group work above. Encourage students to contribute a meal / snack idea for an activity and give reasons for their selection.</p>	<p>For an interactive computer exercise for students, go to http://www.nestle.com.au/aisgames/ This internet based activity looks at how different foods affect performance.</p>

Unit 7:

Fuelling Your Body

Handout 7A

Physical Activity / Exercise / Sport & Fitness

- What does it mean?

Physical Activity

Moving your body
Making your muscles move
Examples:
housework, chores, gardening,
walking to school

What physical activity I do:

Exercise

Physical activity with the intention
of getting or staying fit
Examples:
jogging, cycling,
rollerblading

What exercise I do:

Sport

Organised physical activity or exercise
for competition or enjoyment.
Examples:
football, netball, athletics, cricket,
swimming and skiing

What sport I do:

Fitness

All of these
can help you
exercise for
competition



Unit 7:

Fuelling Your Body

Worksheet 7B Food For Fuel

Food is made up of nutrients – protein, carbohydrate, fat, minerals and vitamins. Water and fibre are often added to this list. These nutrients provide the energy (or fuel) in food to make our bodies work. Even when you are asleep, your body needs energy to work. Your body works harder and needs more energy when you walk, run, dance or play footy. Just like a car needs fuel to run, our bodies need the energy in food everyday to work efficiently.

Energy in food is measured by kilojoules. Check the nutrition information panel on a package of food, and you will see how many kilojoules (Kj) are in the food (this will be written next to 'energy' on the label).

Carbohydrates

Carbohydrate is the nutrient that the body uses mostly as fuel for energy. It is very efficient in getting the energy to your muscles to work. That's why our bodies need carbohydrates from every meal or snack. Most of your carbohydrates should come from foods like bread, cereal, pasta, rice, fruits and veggies that give long lasting energy. They also provide lots of vitamins and minerals as well as fibre.

When you eat carbohydrates, they are stored in the muscles as glycogen (energy reserves). During exercise, the muscles release glycogen into the bloodstream so your body can work. When the muscles run out of glycogen, this usually means you have not eaten enough carbohydrates. You will often feel tired and perhaps not able to exercise as well as you could. If your car runs out of fuel, it simply doesn't work. You therefore shouldn't let your muscles run out of glycogen. Having regular snacks and meals

with lots of carbohydrates from breads, cereals, pasta, rice, fruit and veggies will help keep your muscles in top condition.

Fat

Fat supplies twice the amount of energy (or Kj) of carbohydrates. Fat provides padding around our organs such as the heart and kidneys and insulates us from the cold. Fat is found in oil, butter, margarine and nuts as well as dairy foods and meats. Fat is also used in a lot of processed foods found in the supermarket and shops.

Protein

Protein provides about the same amount of energy as carbohydrate. But our bodies would much rather use protein to build muscles and help us grow than as a source of energy. Protein is found in meats, chicken, fish, eggs, legumes, nuts and dairy products. Breads and cereals provide smaller amounts of protein. When your body runs out of carbohydrate as its source of fuel it will start using the fats and proteins in the foods you have eaten.

Fluids

Just like a car needs water to run efficiently, our bodies need fluid to work everyday. Amazingly, 60% of our bodies are made up of water, so it is not surprising that you need water and fluids while exercising. You need to drink approximately 4-6 cups of fluids a day. It's a good idea to take an extra bottle of water with you when playing sport at school or when playing with friends.

While water should make up most of your fluids everyday, drinks like milk and unsweetened fruit juice are also good choices as they provide other nutrients. It is really important that you have regular drinks before, during and after physical activity, particularly in hot weather.

Check your Food and Activity Diary – are you drinking enough fluid everyday? If not, how can you give your body a top-up?

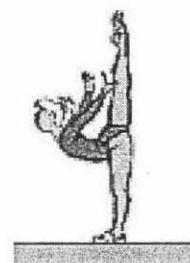
Unit 7:

Fuelling Your Body

Worksheet 7C Food and Energy

The following table shows how many minutes it takes to jog off the energy provided from different foods

Food	Minutes to jog
Stick of celery	1
Piece of sliced cheese	6.2
Apple	4
Slice of bread	6.6
Dessertspoon of butter	7.2
Lean chunk chop	11.4
Carton of low-fat yoghurt	12.4
Salad sandwich	21.6
Cream bun	22.4
Medium packet of potato chips	40
Meat pie	52



Calculate how many kilojoules are used for each activity lasting 30 minutes

Explain why the energy in the foods at the bottom of the table takes longer to jog off than those at the top of the table. Think back to which nutrient provides lots of kilojoules.

Activity	Energy Use per minute	Energy Use in 30 minutes
Walking	21	
Jogging	50	
Swimming	25	
Cycling	34	
Tennis	21	
Skipping	21	
Dancing	17	
Surfing	25	

Module Eight: Role Modeling

Students will be able to:

- Identify the importance of role models and the roles they play (Strand A1 & A4)
- Recognise that role models come from various backgrounds and can be peers (Strand C2 & C3)
- Describe what constitutes a 'good' role model and identify what objectives they would ideally meet (Strand C2 & C3)
- Understand an alternative view on situations, events, relationships etc. (Strand A4)

Resources:

- Worksheet 8 - 'Role Model Oath'
- Magazine or newspaper clippings of possible role models (students to collect prior to beginning Unit 8)

Activities

Class Structure	Activities
Whole Class	Class discussion on role models: <ul style="list-style-type: none"> • What is a role model? • Why would you have one? • Do you have a role model? Who and why? • What areas of society do role models come from?
Pairs	Who could you have as a role model? Using the newspaper and magazine clippings, pairs identify several different people that could potentially be considered role models. What positive trait/s do they possess to be considered a role model? Where else can you find role models?
Whole Class	From the previous activity, write the results of the search on the blackboard. Class discussion on who has been listed and what positive trait they possess to be considered a role model.
Whole Class	Class discussion on where else role models can be found. Class discussion: <ul style="list-style-type: none"> • Can students be role models? • How? • Is there anyone in your school / class that could be considered a

	<p>role model?</p> <ul style="list-style-type: none"> • What traits would a peer role model possess? • Would you like to be a role model? <p>Anyone can be a role model. You don't have to be famous to be a role model. You don't have to be a superstar, an athlete, an actor, professional or a super-talented individual. All that it takes to be a role model is a sincere desire to do the right thing.</p>
Individual	<p>Using handout 8 - 'Role Model Oath' lead students through the oath.</p> <p>What are the benefits of being a role model? Well, you get a lot of respect from family and friends, but most importantly, by being a role model you put yourself in a position to make an impact. You just never know who you'll inspire to greatness! If you decide to take the oath, do it because you know it's the right thing to do.</p> <p>Encourage them to sign the oath to swear that they will endeavor to be better role models for their peers.</p>

Role Model Oath

I promise to always be honest, to always speak the truth. I promise to respect all people and to treat others how I would like to be treated. I will begin by treating myself with respect and with love. And by that I mean that I will only do those things that build me up, I will do things that make me a better person, I will do things that are good for me. I will avoid negative thoughts and I will avoid putting myself down.

I believe in myself. I know I can do anything I set my mind on. I believe in my abilities. I will not believe people who put me down. I will not allow myself to think thoughts that bring me down; I will focus on positive thoughts, thoughts that will make me strong. I will learn more about how to be a positive person. My goal is to be the greatest person that I can be, and no one and nothing will stand in the way of this. From now on, I will live my life with this goal in mind. I will make better decisions, I will treat myself better and I will be a nicer person to all.

I accept myself as I am, and I'm much happier with who I am because I have decided to live a positive life. I will continue to do good because I know that I have the power to make a difference in other people's lives. I believe one of the basic reasons we are all here to help one another. I understand that I am not perfect, but I accept my faults and move forward with a new vision and a new direction.

I _____ promise to take control of my life and to live a positive life from this day on.

(Sign and date)

Unit 9: You Are Part of a Great Sporting Nation

Students will be able to:

- Outline the changes to NZ sporting achievements over the past 100 years
- Identify the changes in sporting / physical activities in our community through immigration
- Describe the role of sport in developing national pride
- Identify the role and growth of New Zealand Maori / Polynesian sports men and women in New Zealand.

Achievement Objectives

- Communicates confidently in a variety of situations (Strand C1)
- Enjoys a sense of belonging (Strand A4)
- Students will understand how physical activity practices are influenced by community and environmental factors (Strand D1)

There is something special about the relationship that New Zealanders share with sport. Whether they are participants or spectators, most New Zealanders incorporate sport into their everyday lives. For many of us, being a New Zealander means having a love of sport and an admiration for sports people. The question is, why do so many New Zealanders link sport so explicitly to our national character? Why do New Zealanders react so strongly to the success of our sporting heroes?

There is no simple answer to these questions. One consideration is the status held by elite athletes in the community. These athletes are often in the international spotlight, therefore acting as national ambassadors.

Sport is also very much linked to our feelings of national pride. As New Zealand is such a diverse nation, sporting victories provide great opportunities to unite all New Zealanders with patriotic fervour.

Sport is often used by the media to help sell more newspapers and magazines, or win higher ratings. This also encourages people to become more like their sporting heroes and delivers an image of 'healthy, active New Zealanders'.

Sport is an integral part of New Zealand culture and our way of life.

Activities

Class Structure	Activities	Teaching Points
Whole Class	Who do you admire in sport and why?	Teacher leads class in discussion on students' favourite sporting individuals or teams. Most popular nominees are recorded on the board.
Group Work	Working in three groups, each focusing on one of the top three athletes, students analyse why these athletes are popular and present their reasons to the class.	
Whole Class	<p>'Know Your Celebrity' (sporting version of 'Celebrity Heads' game).</p> <p>A student places the name of a well-known sporting personality on their head (the object is to guess the name of their athlete) and asks questions to which the class responds with 'yes' or 'no' answers.</p>	
Individual	Research an athlete that they admire - looking at achievements, activities outside sport and personal background.	Profiles completed on large (A3) sheets and posted on the walls in the class.
Whole Class	<p>Who were past New Zealand sporting greats?</p> <p>Class discussion.</p> <p>Which past New Zealand sportspeople are comparable to our current champions?</p>	Requires historical research into past New Zealand sporting icons.

<p>Group Work</p>	<p>Using the examples below, students find a sporting equivalent to past greats.</p> <p>Teachers lists the following New Zealand Sporting greats: Richard Hadlee (cricket) Martin Crowe (cricket) Chris Lewis (tennis) John Walker (athletics) Murray Halberg (athletics) Sean Fitzpatrick (rugby) John Kirwin (rugby) Sir Peter Blake (sailing) Rob Waddell (rowing) Ian Ferguson (rowing) Paul McDonald (rowing) Rick Wells (triathlon) Erin Baker (triathlon)</p> <p>Other individuals within teams: Sailing Cricket Rugby league Rugby union Soccer Netball Hockey</p> <p>What sort of changes have new knowledge and technology provided to current athletes?</p> <ul style="list-style-type: none"> • Diet • Clothing • Shoes • Training techniques 	<p>Sporting greats - current and past</p> <p>Cricketing greats</p> <ul style="list-style-type: none"> • Richard Hadlee • Martin Crowe • Chris Cairns • Nathan Astle <p>Athletics greats</p> <ul style="list-style-type: none"> • John Walker • Murray Halberg • Beatrice Faumuina • Craig Barrett <p>Rugby greats</p> <ul style="list-style-type: none"> • Sean Fitzpatrick • John Kirwin • Jonah Lomu • Doug Howlett <p>Sailing greats</p> <ul style="list-style-type: none"> • Sir Peter Blake • Dean Barker <p>Rowing greats</p> <ul style="list-style-type: none"> • Rob Waddell • Ian Ferguson • Paul McDonald • Georgina and Caroline Evers-Swindell <p>Triathlon</p> <ul style="list-style-type: none"> • Rick Wells • Erin Baker • Cameron Brown • Terrenzo Bozzone
<p>Whole Class</p>	<p>Teacher discusses the paralympic games - why is it only recently that New Zealanders have become more aware of the Paralympics.</p>	<p>Provides the opportunity to discuss the role the media plays in the development of sport in New Zealand.</p> <p>Other examples to discuss - the growth of wheelchair basketball.</p>

Whole Class	<p>What New Zealand Maori / Polynesian athletes do you know of?</p> <p>Current or past?</p> <p>Students research the role New Zealand Maori / Polynesian sportspeople have played in New Zealand in all forms of sport.</p>	
Whole Class	<p>What have these leading New Zealand sportsmen and women done for our country?</p> <p>Why are these sporting figures important to us as New Zealanders?</p> <p>Apart from their sporting achievements - how have these athletes helped shape our national identity?</p>	Students discuss the role that sport plays in our feelings of national identity.
Whole Class	<p>Do you remember a New Zealander winning at the Sydney 2000 Olympic or Paralympic Games - where were you and how did you feel?</p> <p>How did we all react when New Zealanders won at events such as the Sydney 2000 Olympics and Paralympic games?</p> <p>How did the country respond?</p>	Utilising the Olympic and Paralympic Games as a tangible example, focus on the wider role sport plays in New Zealand.
Whole Class	<p>Research exercise -</p> <p>Students research the different sports and activities played by men, women and children 100 years ago. This could include concepts of family life, education, leisure, living conditions, work, dress and transport etc. A comparison of family life back then and now could be made. Students could interview family members about early family stories and events.</p>	By historically looking at New Zealand sport, students can see how cultural changes such as immigration have affected our day-to-day lives and how these factors shape our society.

Whole Class	<p>Research exercise - Migrants have introduced a variety of sports / activities to New Zealand.</p> <p>Students investigate different cultures and sports / activities introduced to New Zealand, e.g. soccer.</p> <p>Who are some of our sporting identities who were born overseas?</p>	
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